



Universidad del Desarrollo

Facultad de Ingeniería

**PLANES DE DESCONTAMINACIÓN ATMOSFÉRICA EN CHILE:
EVALUACIÓN DE IMPACTO, ATRIBUCIONES Y TENDENCIAS**

APPENDICES

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Tesis presentada a la Facultad de Ingeniería de la Universidad del Desarrollo
para optar al grado de Magister en Ciencias de la Ingeniería

PROFESOR GUÍA:

PhD ZOE FLEMING

Septiembre, 2024

SANTIAGO, CHILE

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Estructura del Anexo

Para cada PDA se muestra la siguiente información:

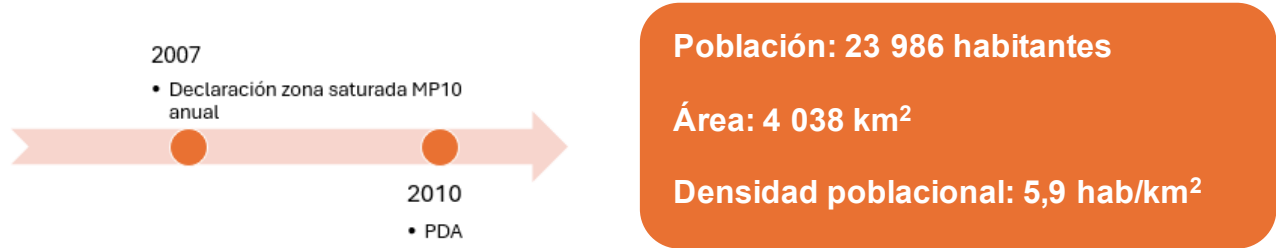
Contextualización geográfica y definición PDA

- 1) **Línea de tiempo** indicando año de declaración de zona saturada, instalación de PDA y modificaciones, en caso de presentarse.
- 2) **Caracterización de la zona** del PDA, población, área y densidad poblacional.
- 3) Las **principales medidas** descrita en el plan.
- 4) **Mapa del área**, mostrando el área total bajo el PDA y zonas urbanas (achuradas).

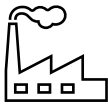
Gráficos

- 5) Para PDA que consideran concentraciones anuales se incluye gráfico con promedios anuales.
- 6) Series de tiempo de todas las estaciones en el PDA a) MP_{10} y b) $MP_{2,5}$
- 7) Episodios críticos, mostrando días con episodios en cada año en caso de ocurrencia.
- 8) Duración de episodios, mostrando cantidad y duración de días en cada año
- 9) Puntos de Quiebre de MP_{10} y $MP_{2,5}$, para las estaciones donde se logró realizar el análisis.
- 10) Tendencias MP_{10} y $MP_{2,5}$. En los casos que fue posible se incluyen tendencia antes y después de la implementación del PDA.
- 11) Tendencia Percentil 95 para MP_{10} y $MP_{2,5}$.

Anexo I: PDA para Tocopilla y zona circundante



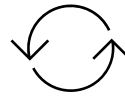
PRINCIPALES MEDIDAS



Límites máximos de emisión para termoeléctricas y empresas mineras



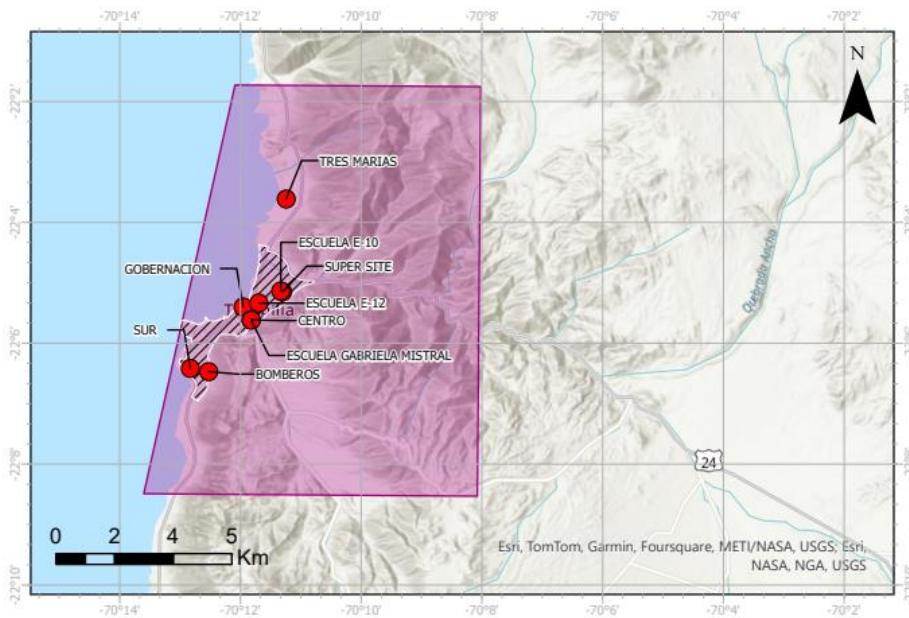
Acciones para reducir emisiones por operación de empresas



Compensación de emisiones



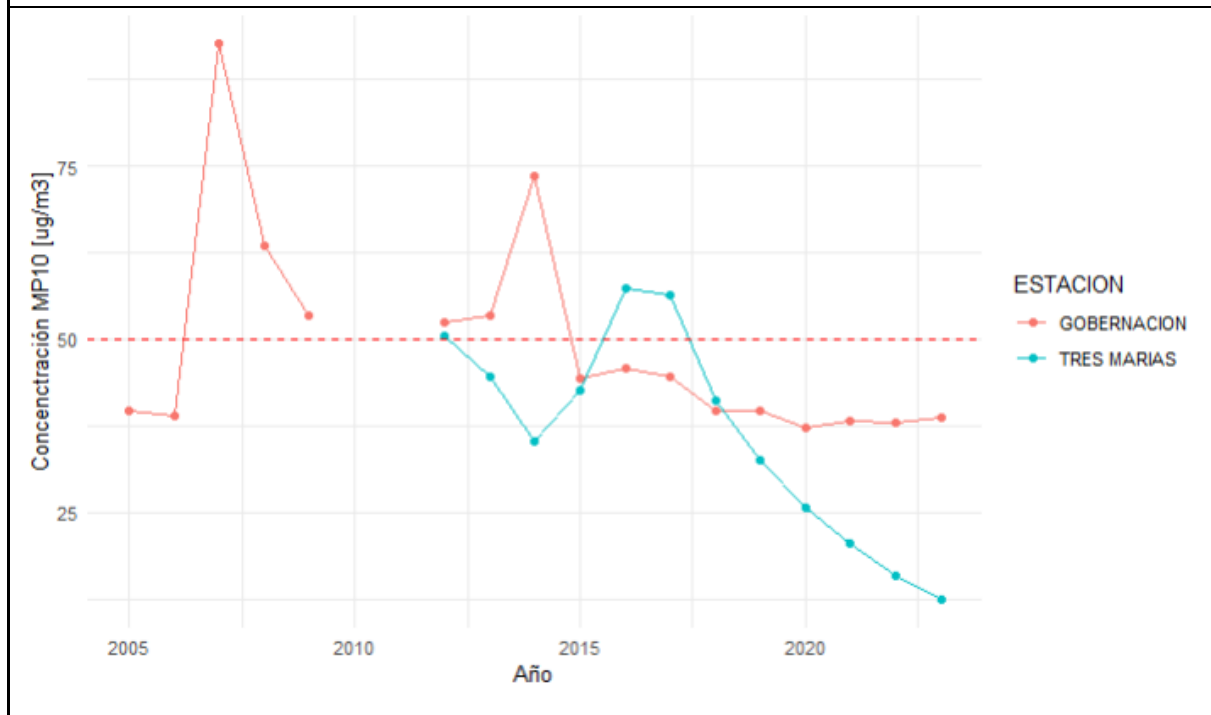
Educación Ambiental



Estaciones consideradas:

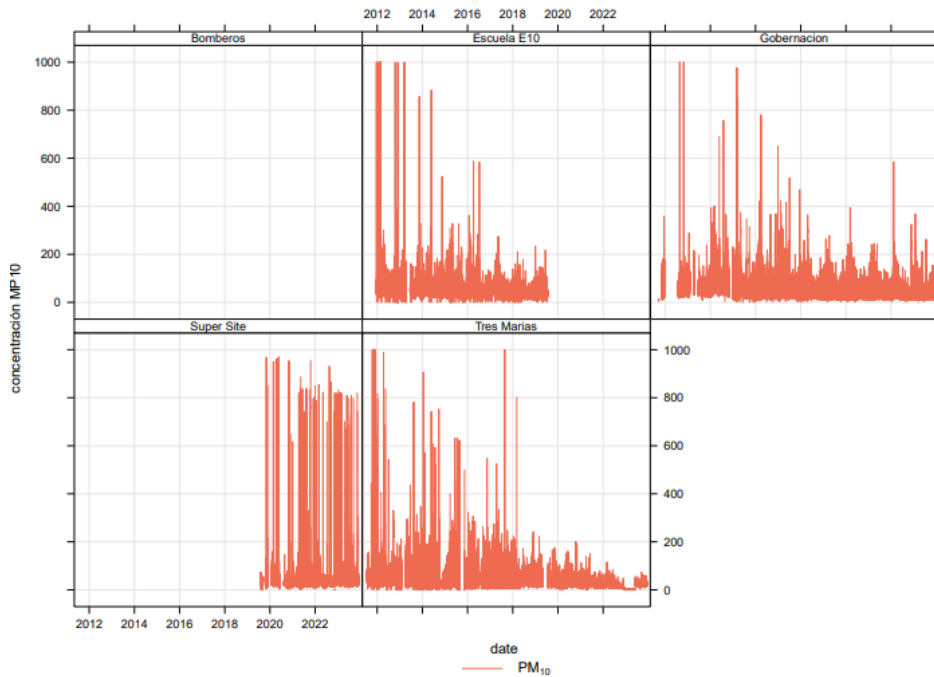
- Bomberos
- Escuela E-10
- Gobernación

PROMEDIO ANUALES MP10 POR ESTACIÓN

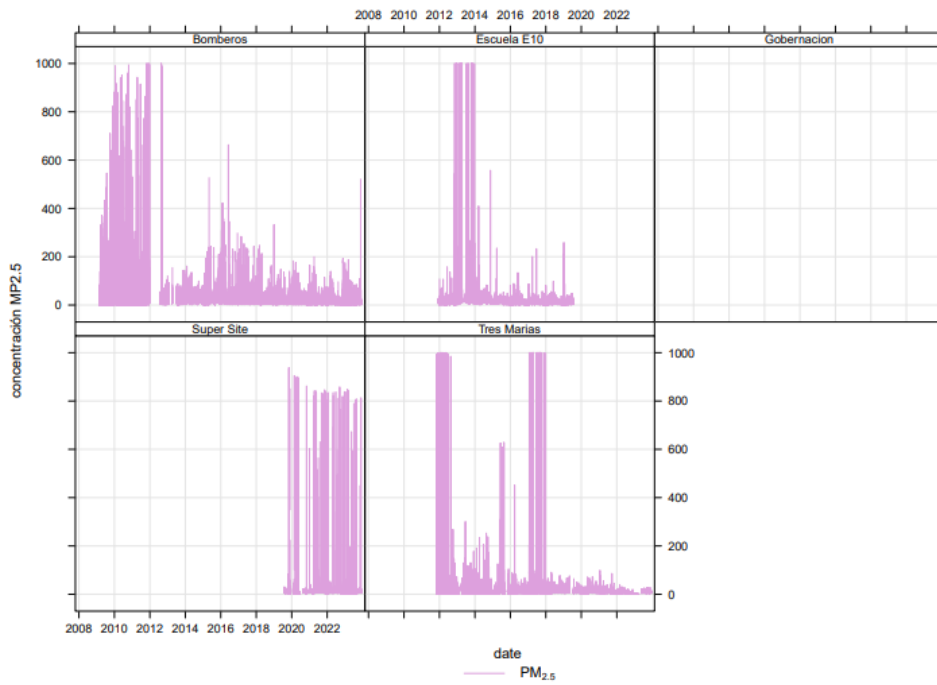


SERIES DE TIEMPO

MP₁₀

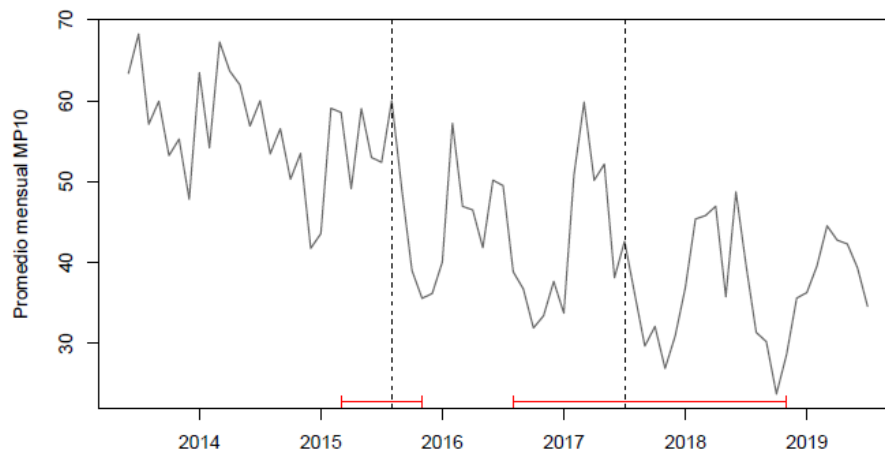


MP_{2.5}

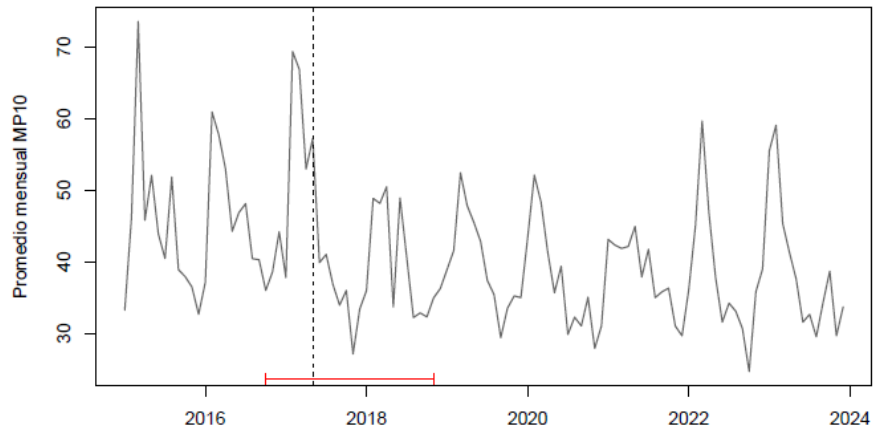


PUNTOS DE QUIEBRE

Tocopilla - Escuela E10 (MP10)

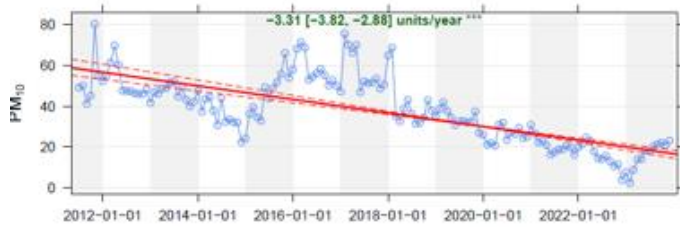


Tocopilla – Estacion Gobernacion (MP10)



TENDENCIAS

Tres Mariás



Gobernación

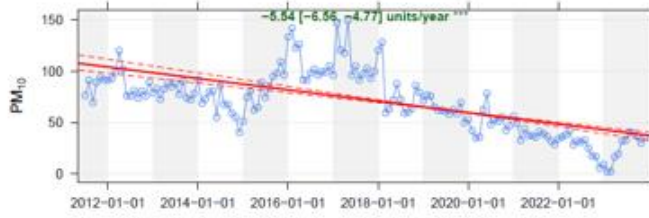


Bomberos



TENDENCIA PERCENTIL 95

Tres Marías



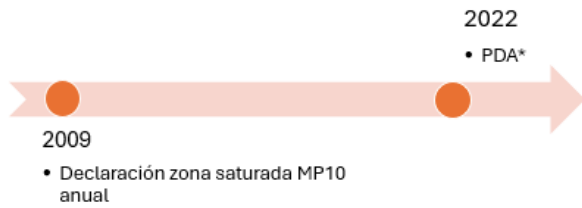
Gobernación



Bomberos



Anexo II: PDA para la ciudad de Calama y su área circundante

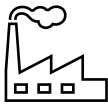


Población: 165 731 habitantes

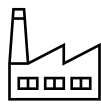
Área: 1 440 km³

Densidad poblacional: 115.1 hab/km²

PRINCIPALES MEDIDAS



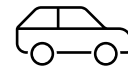
Control de emisiones de calderas



Control de emisiones para CODELCO



Control de emisiones de procesadoras de residuos industriales



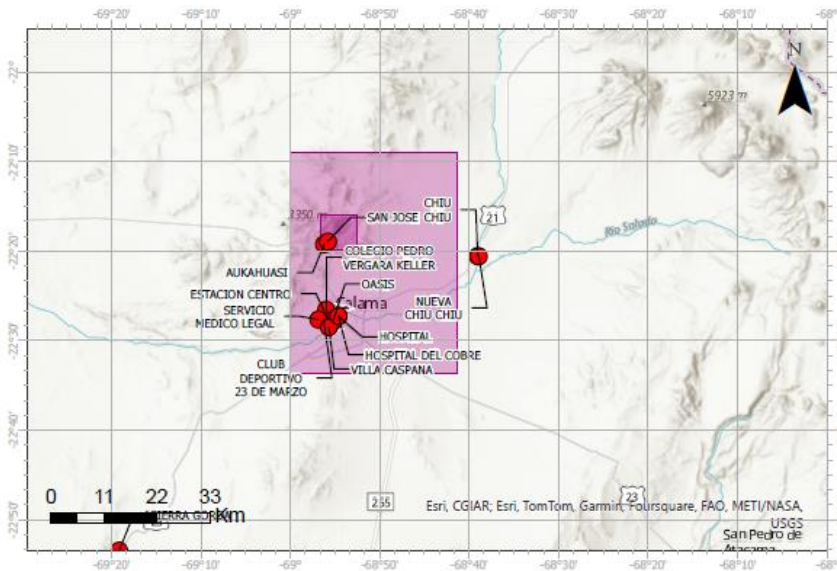
Control de emisiones de transporte



Educación Ambiental



Seguimiento de la calidad del aire



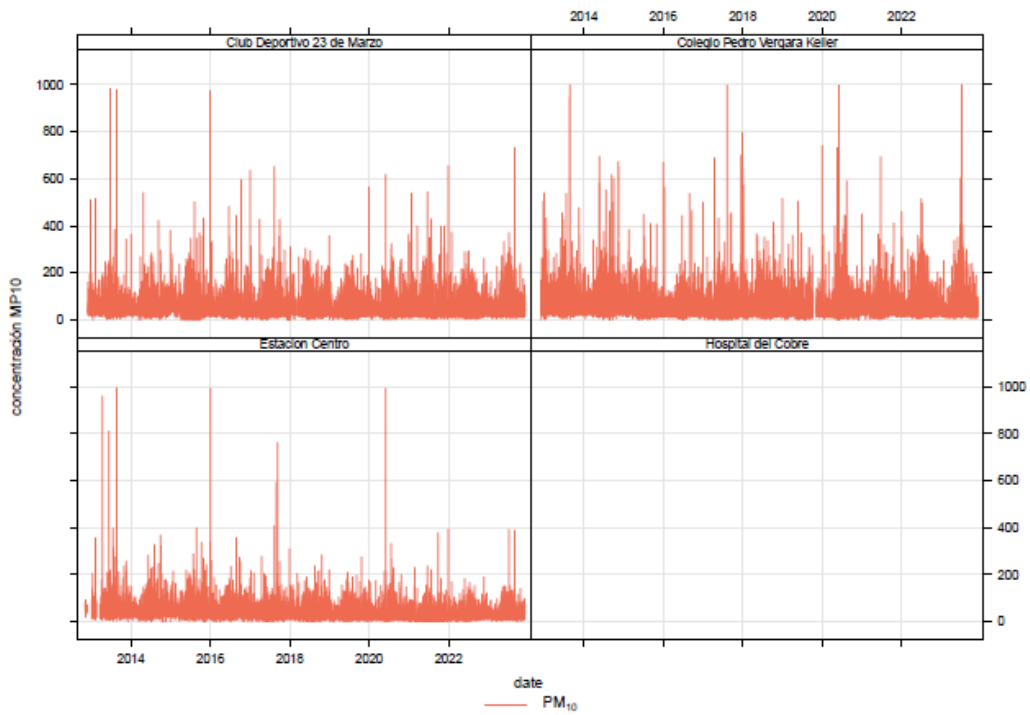
Estaciones consideradas:

- Club Deportivo 23 de marzo
- Colegio Pedro Vergara Keller
- Estación Centro

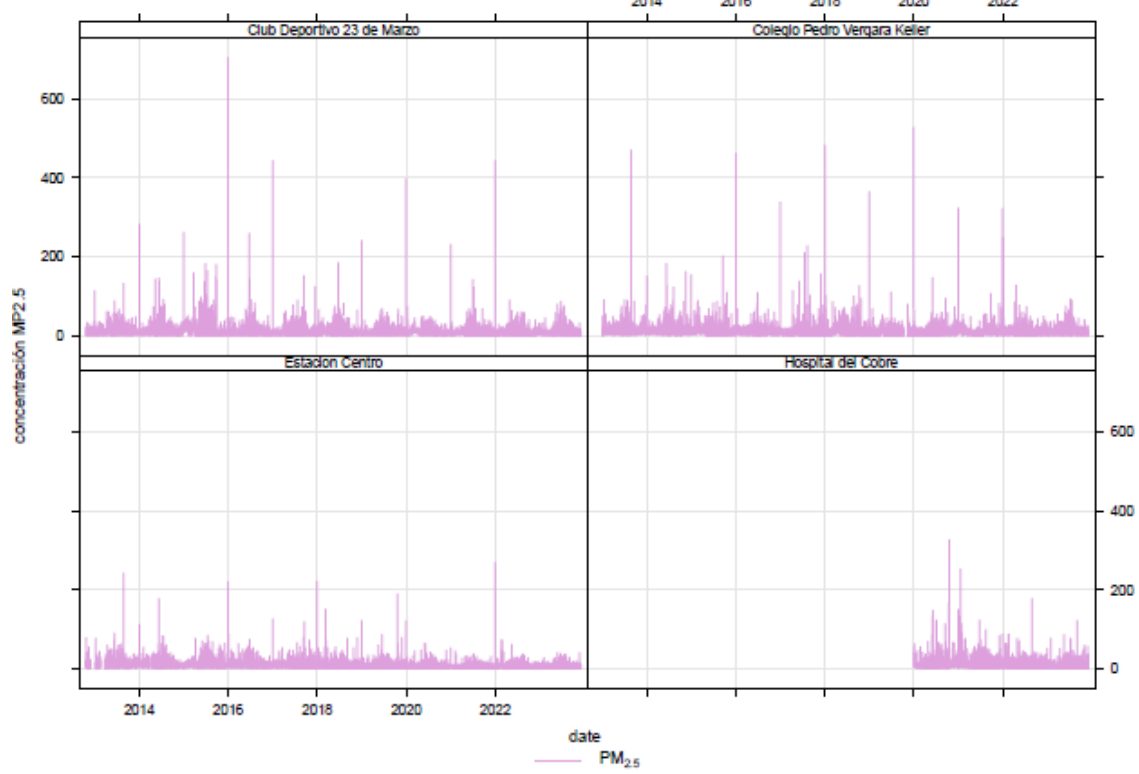


SERIES DE TIEMPO

MP₁₀

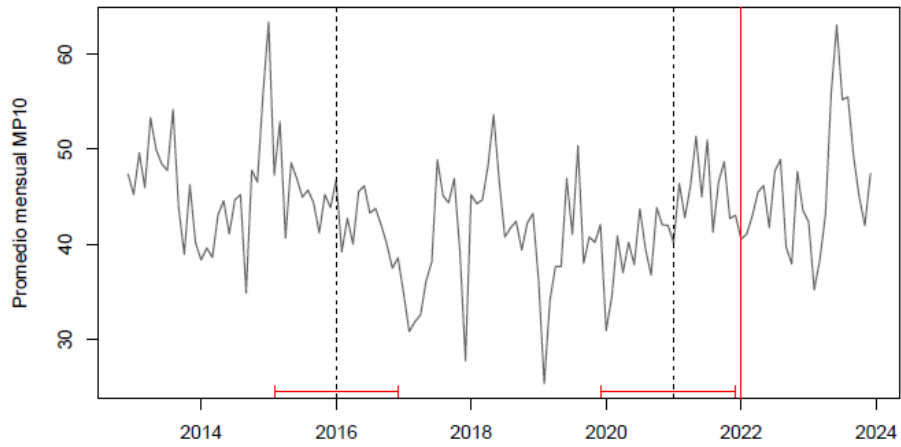


MP_{2.5}

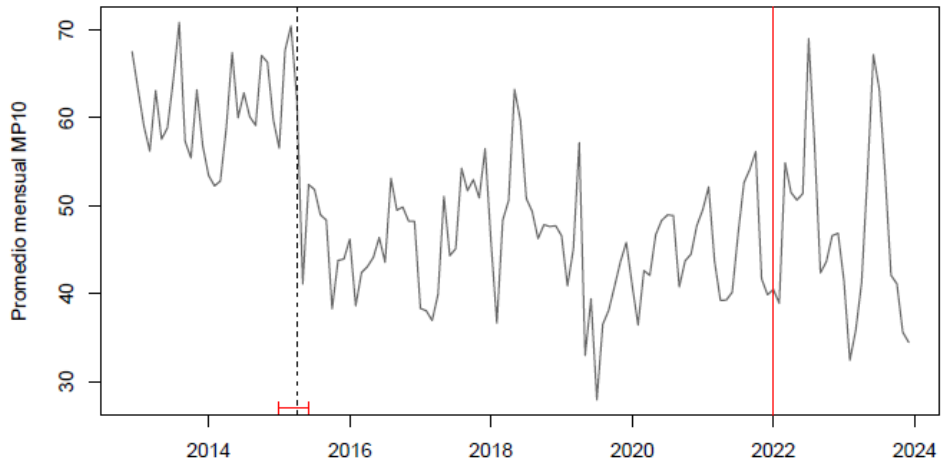


PUNTOS DE QUIEBRE

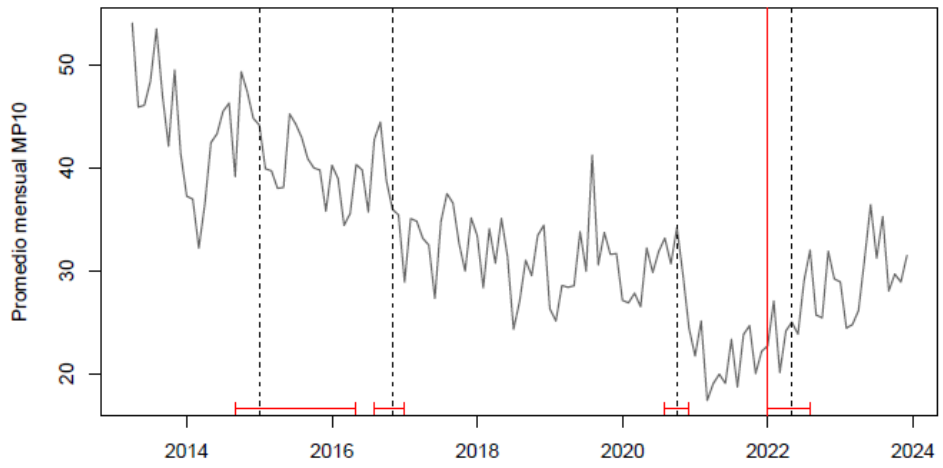
Calama – Club Deportivo 23 de Marzo (MP₁₀)



Calama – Colegio Pedro Vergara Keller (MP10)

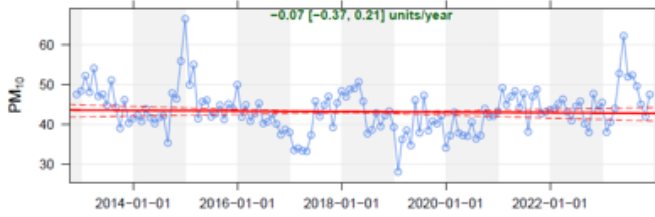


Calama – Estacion Centro (MP10)

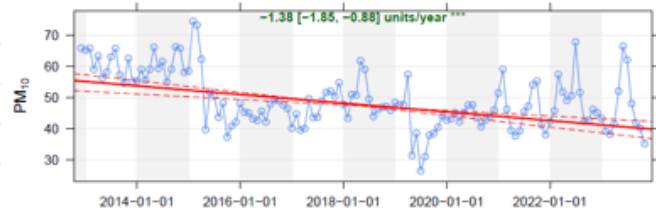


TENDENCIAS

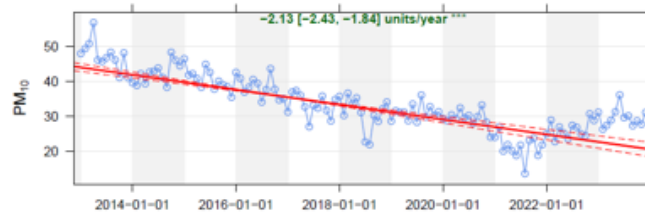
Club Deportivo 23 de marzo



Colegio Pedro Vergara Keller



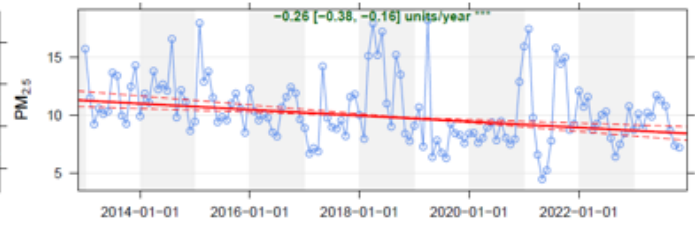
Estación Centro



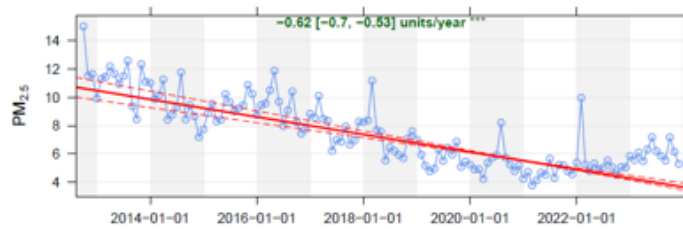
Club Deportivo 23 de marzo



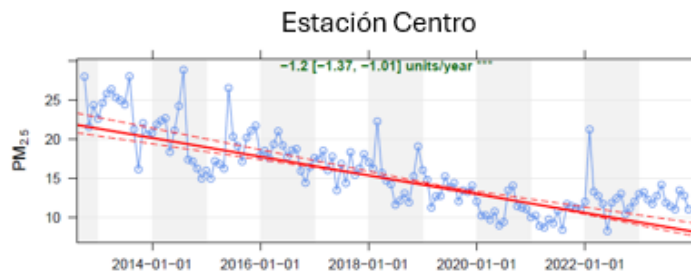
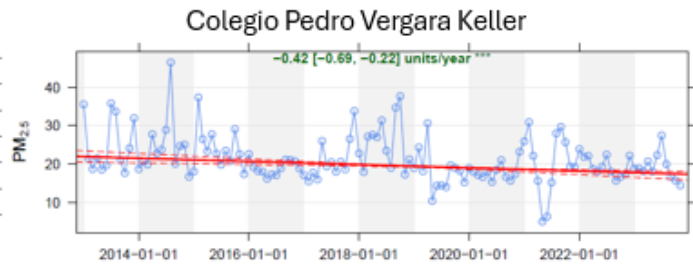
Colegio Pedro Vergara Keller



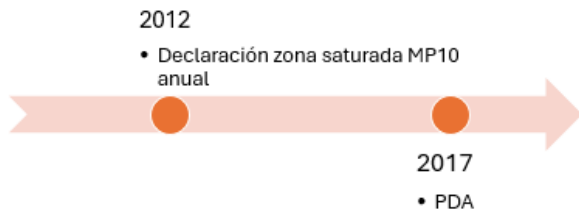
Estación Centro



TENDENCIA PERCENTIL 95



Anexo III: PDA para Huasco y su zona circundante

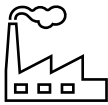


Población: 10 429 habitantes

Área: 1 601 km³

Densidad poblacional: 6,5 hab/km²

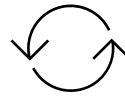
PRINCIPALES MEDIDAS



Límites máximos de emisión para planta de pellet CAP y central termoeléctrica



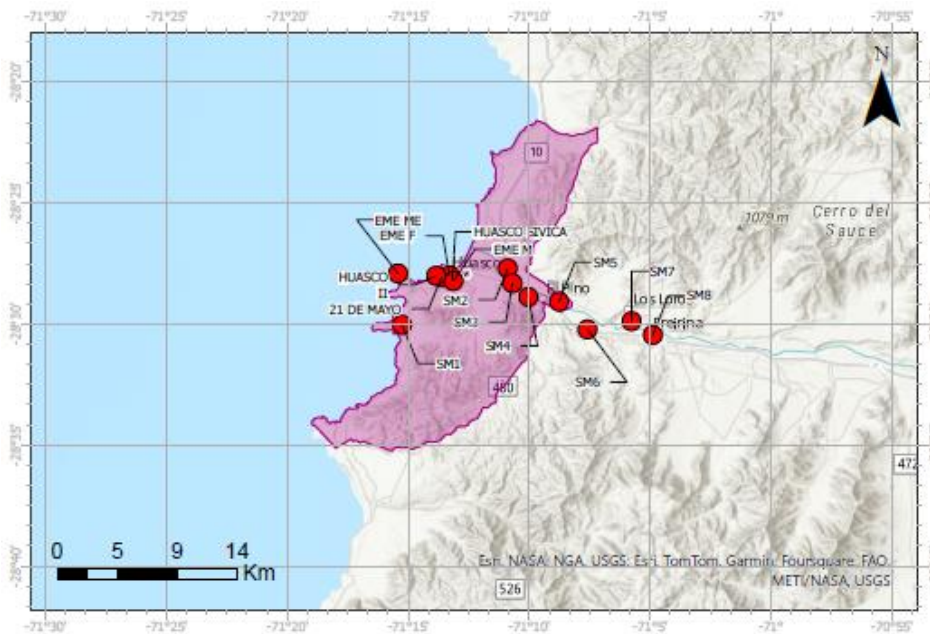
Acciones para reducir emisiones por operación de empresas



Compensación de emisiones



Educación Ambiental

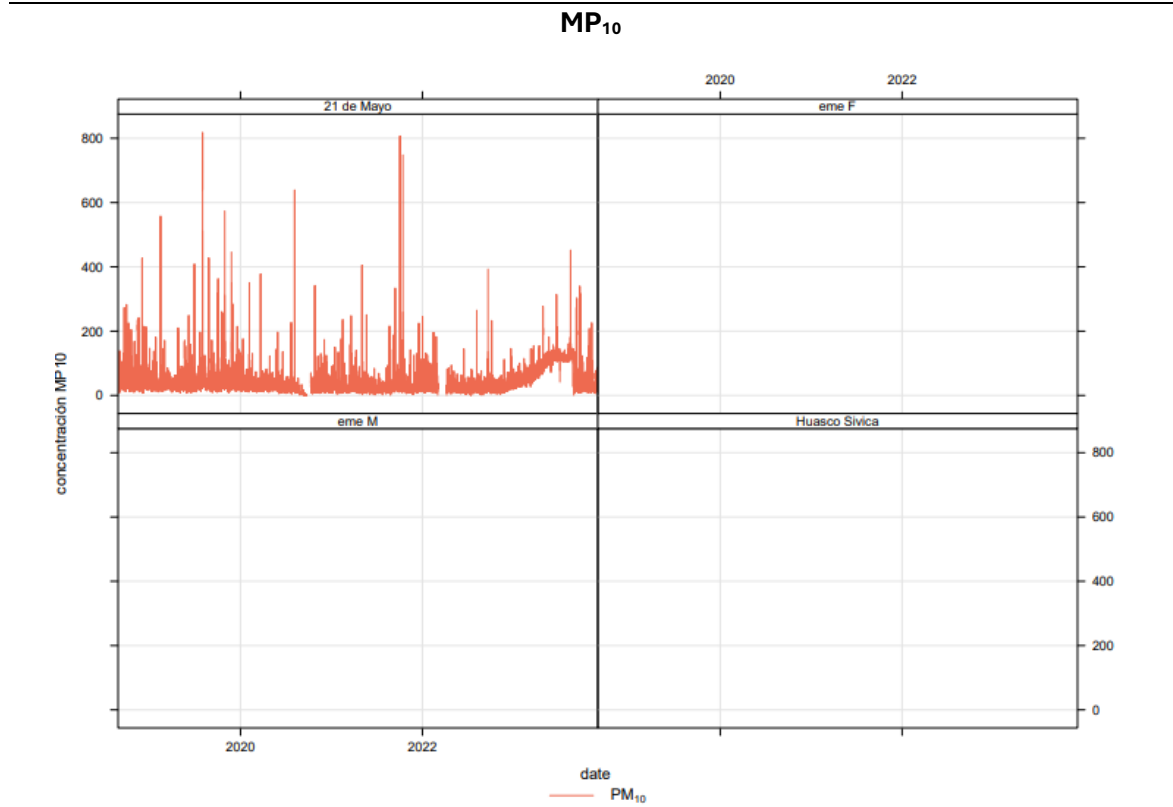


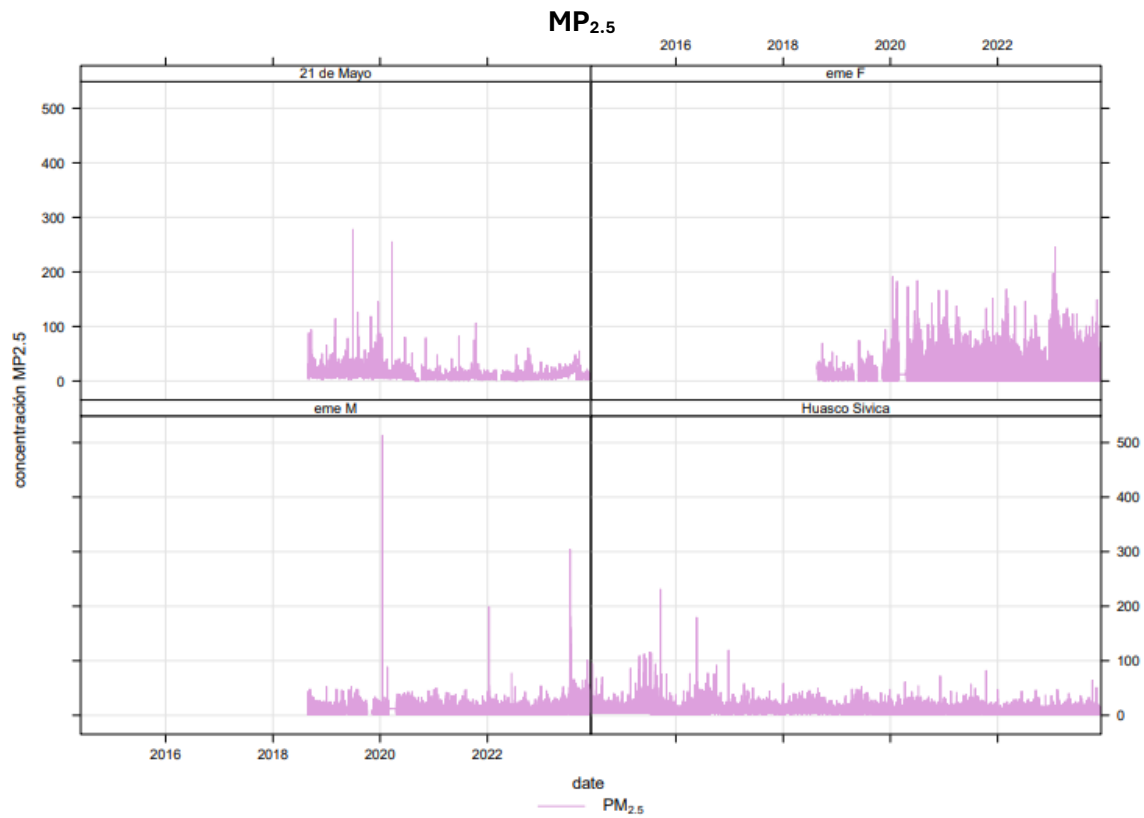
Estaciones consideradas:

- 21 de mayo
- Huasco Sívica



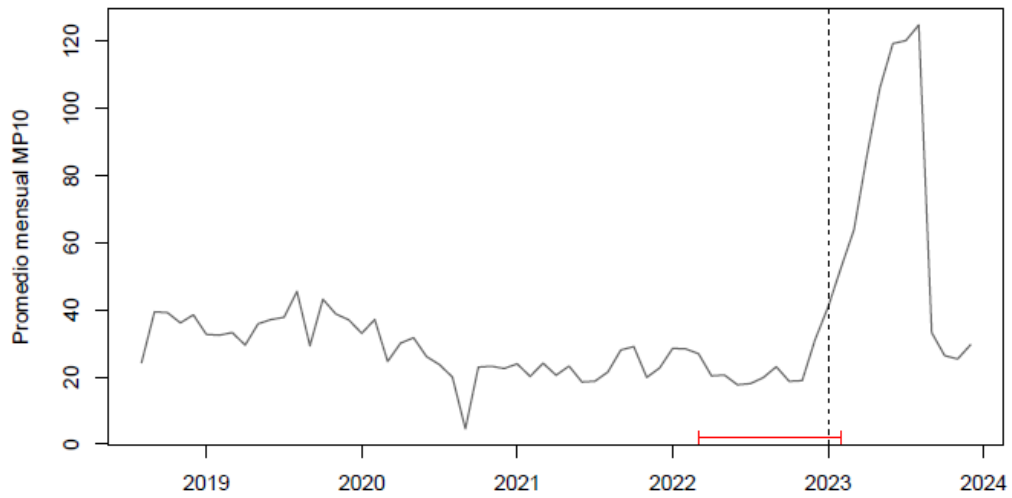
SERIES DE TIEMPO





PUNTOS DE QUIEBRE

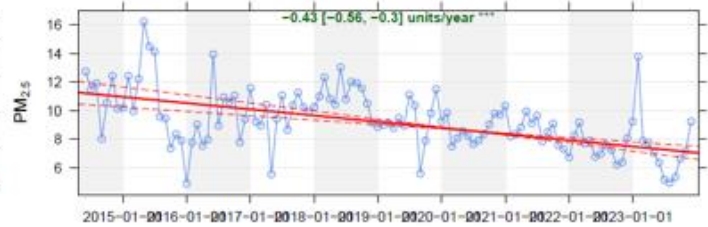
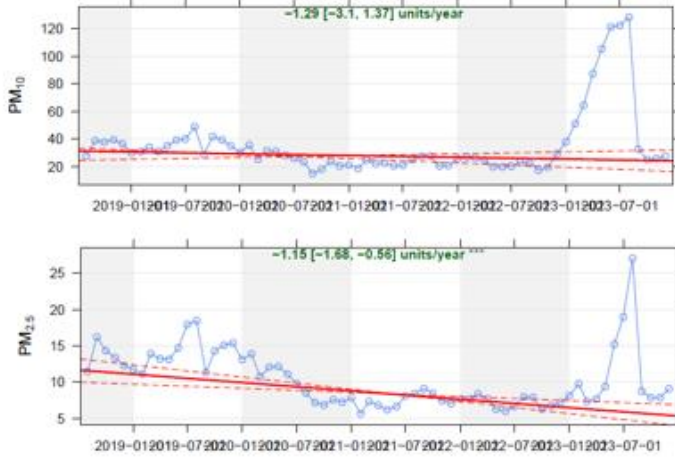
Huasco - Estacion 21 de Mayo (MP10)



TENDENCIAS

21 de Mayo

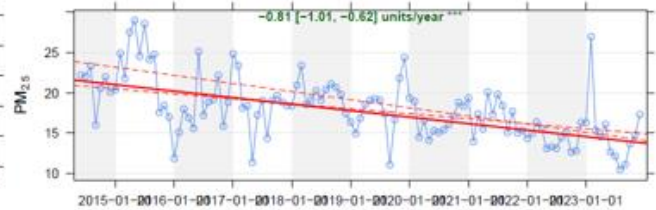
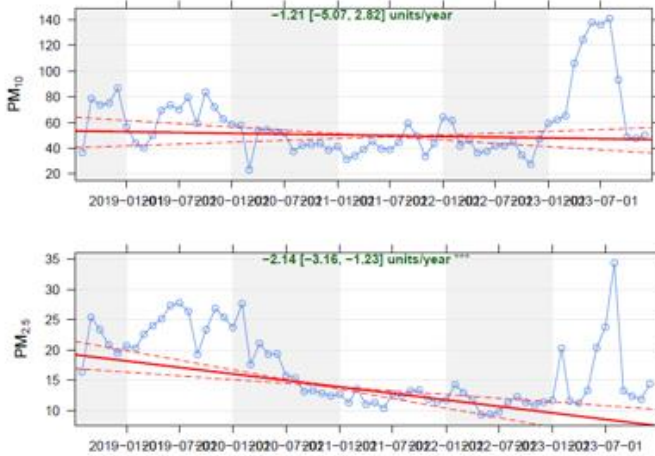
Huasco Sívica



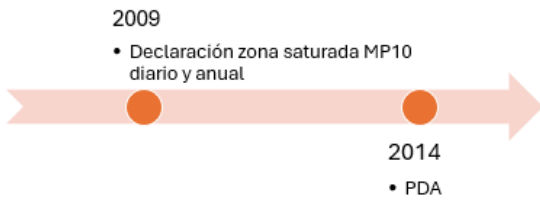
TENDENCIA PERCENTIL 95

21 de Mayo

Huasco Sívica



Anexo IV: PDA para Andacollo y sectores aledaños

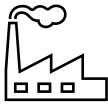


Población: 8 300 habitantes

Área: 310 km³

Densidad poblacional: 26.8 hab/km²

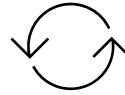
PRINCIPALES MEDIDAS



Límites máximos de emisión para empresas mineras



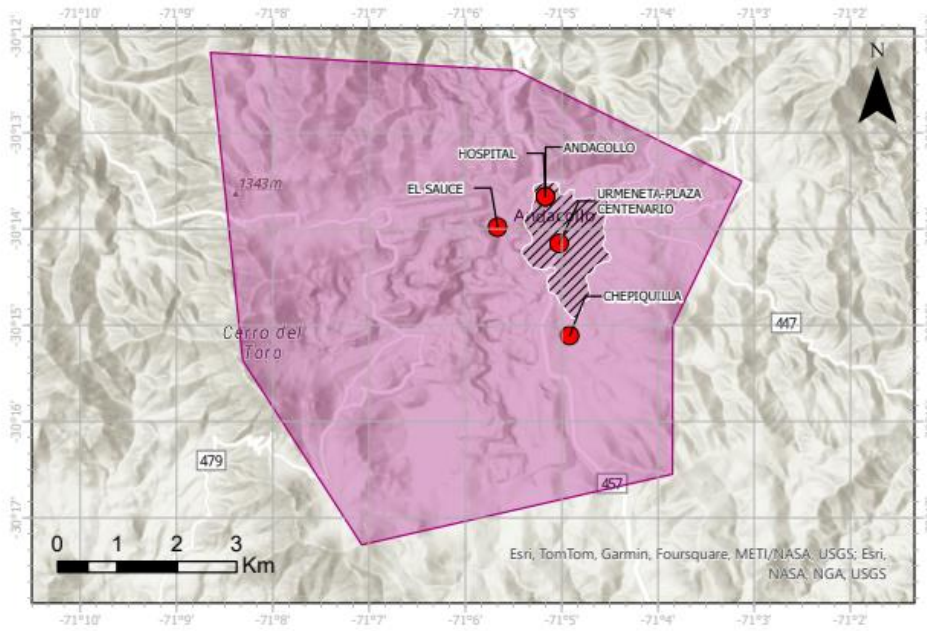
Acciones para reducir emisiones por operación de empresas y en localidad de Andacollo



Compensación de emisiones



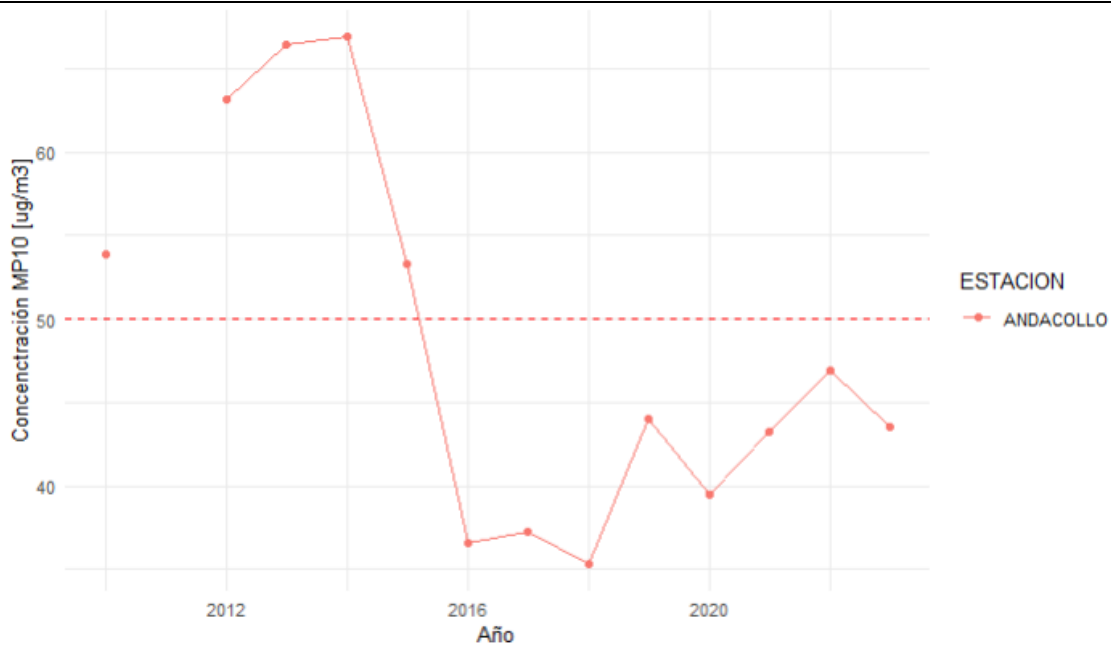
Educación Ambiental



Estaciones consideradas:

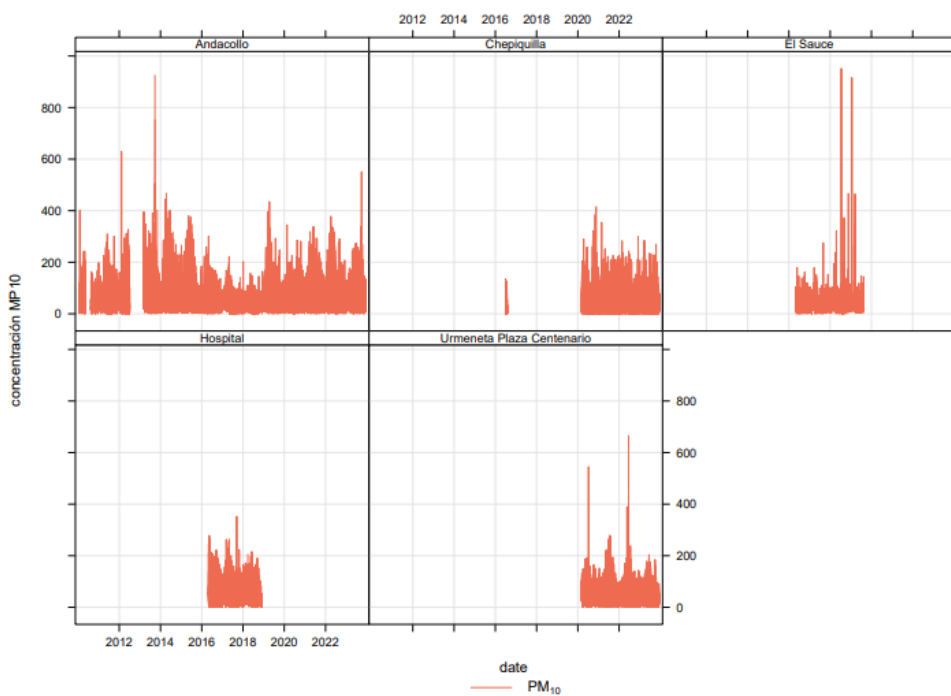
- Andacollo

PROMEDIO ANUALES MP10 POR ESTACION



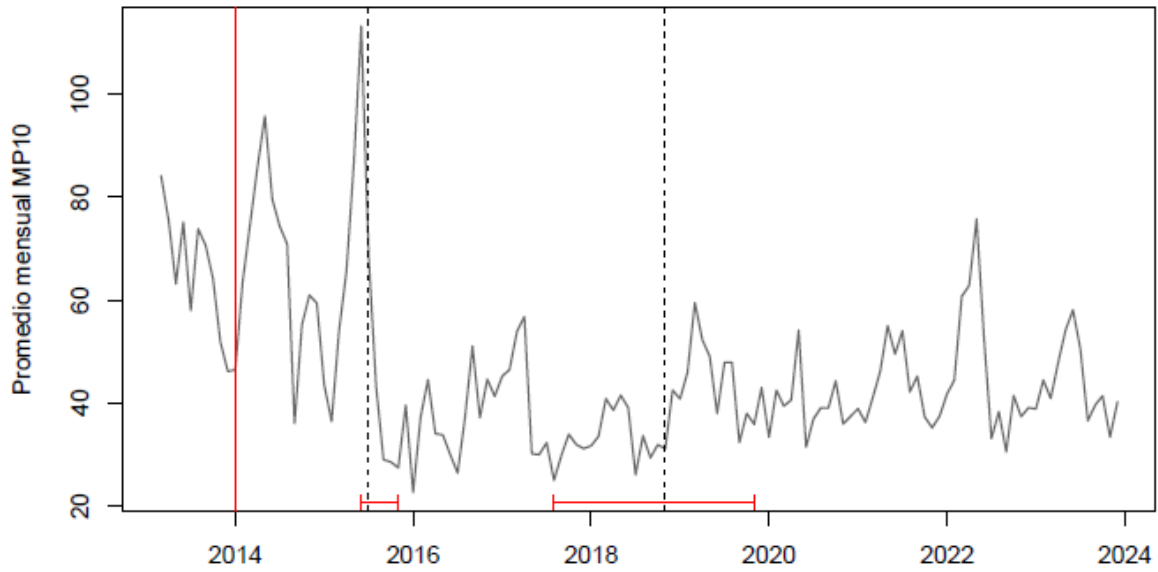
SERIES DE TIEMPO

MP₁₀

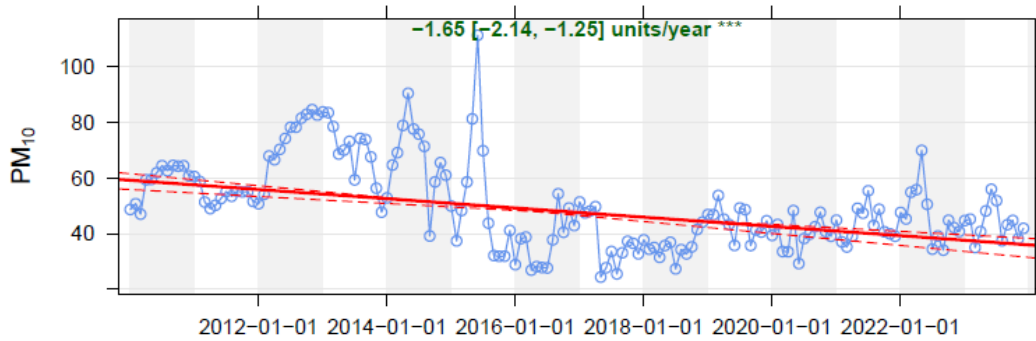


PUNTOS DE QUIEBRE

Andacollo - Estacion Andacollo (MP10)



TENDENCIAS



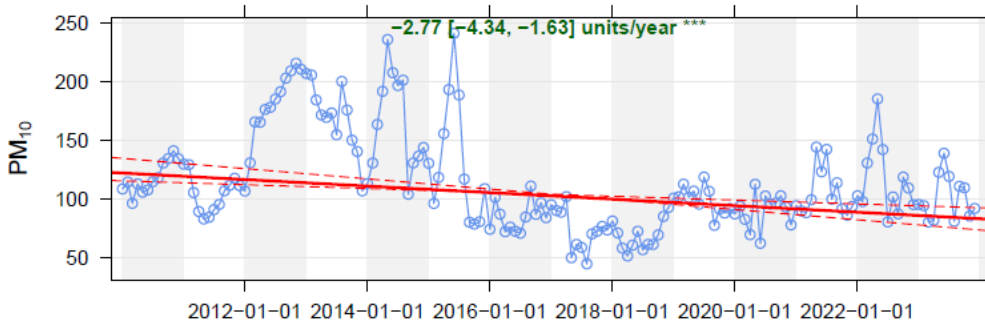
Antes PDA



Después PDA



TENDENCIA PERCENTIL 95



Anexo V: PDA para las comunas de Concón, Quintero y Puchuncaví

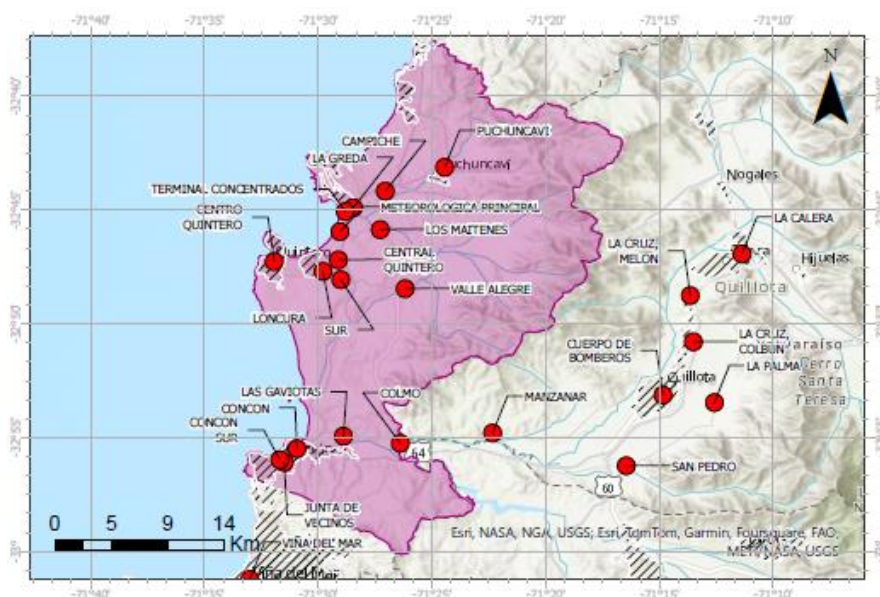
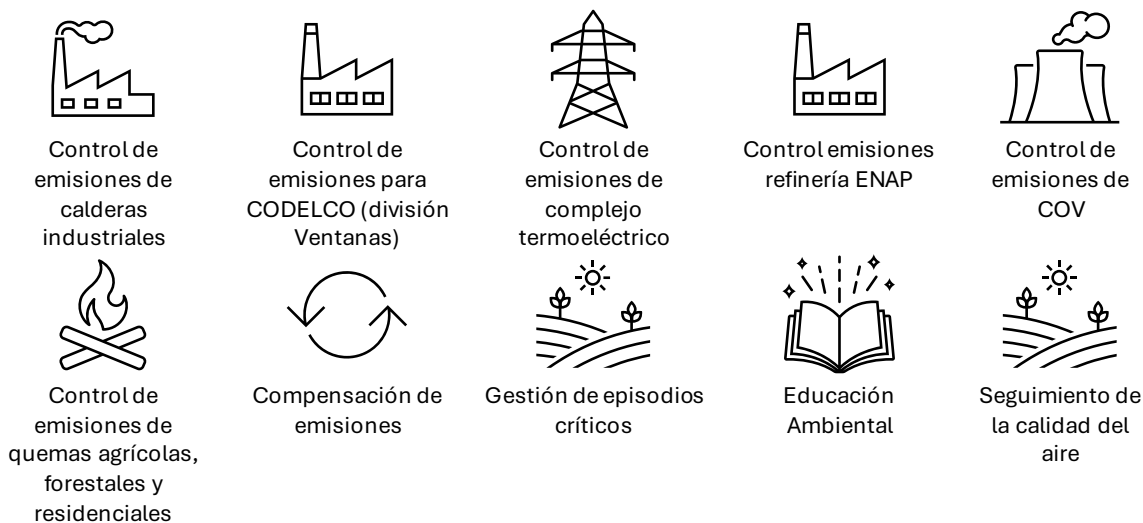


Población: 92 621 habitantes

Área: km³

Densidad poblacional: hab/km²

PRINCIPALES MEDIDAS

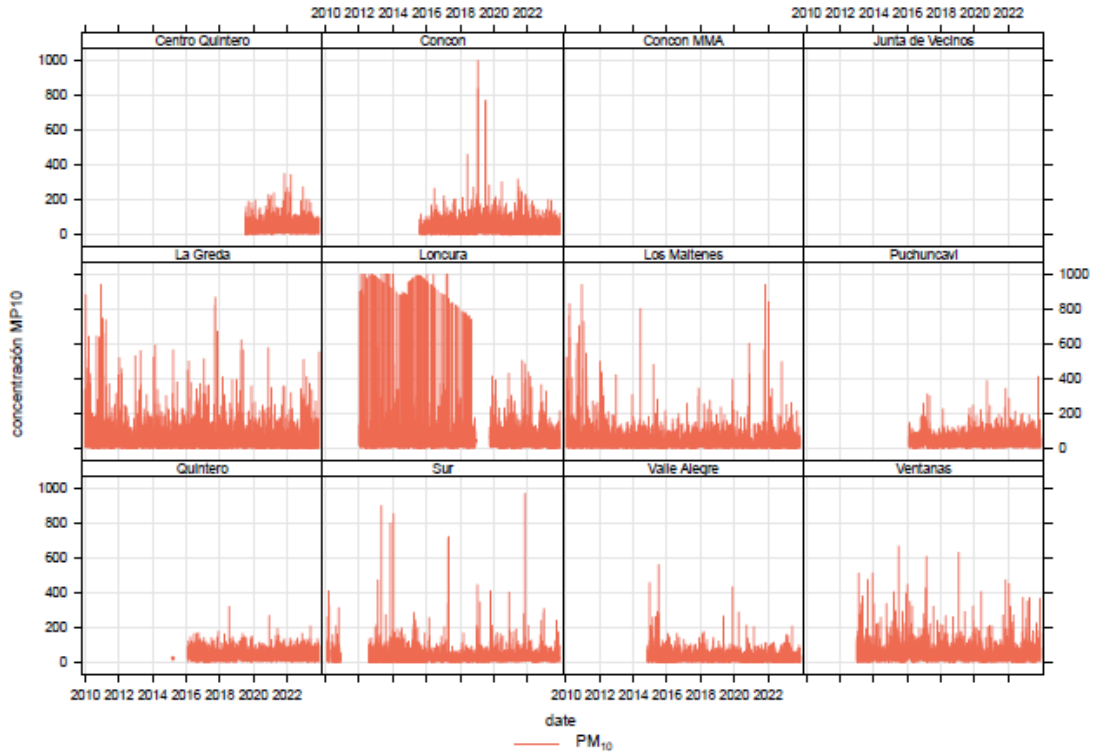


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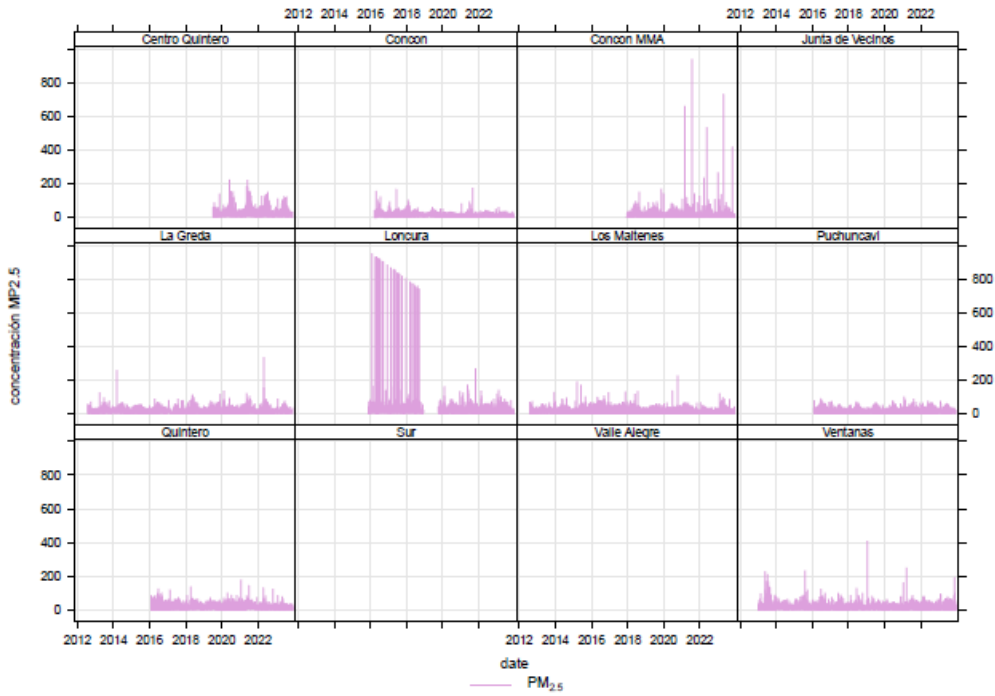
- Concón MAA
- La Greda
- Loncura
- Los Maitenes
- Puchuncaví
- Quintero
- Sur
- Valle Alegre
- Ventanas

SERIES DE TIEMPO

MP₁₀

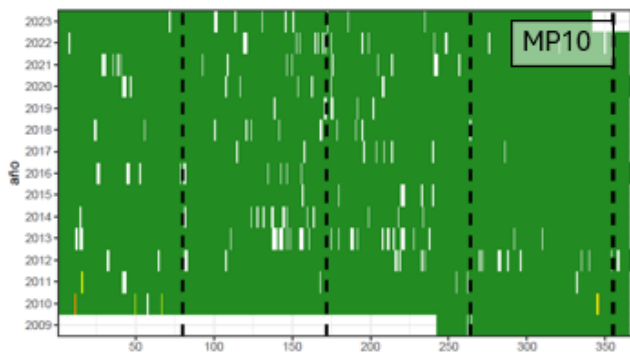


MP_{2.5}

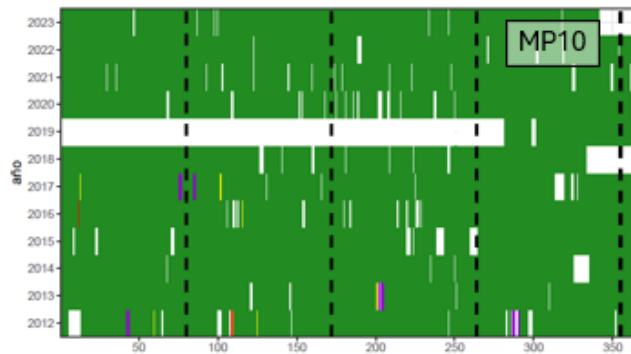


EPISODIOS CRÍTICOS

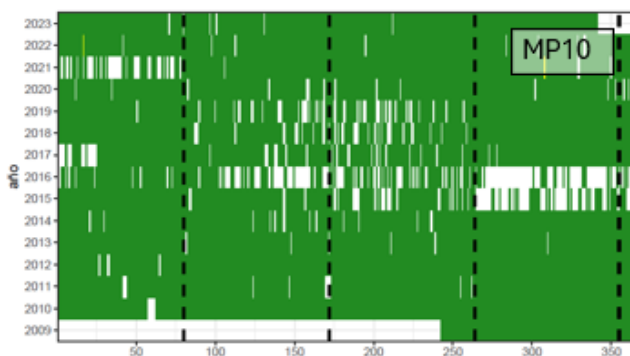
La Greda



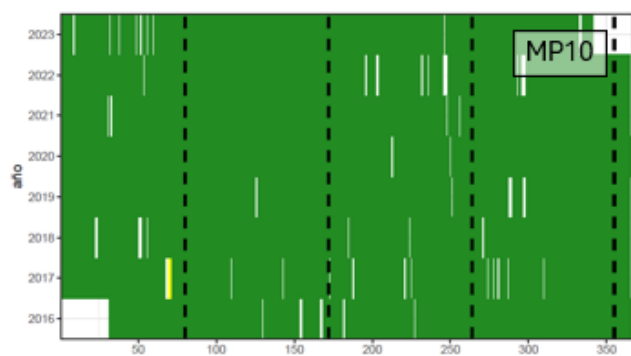
Loncura



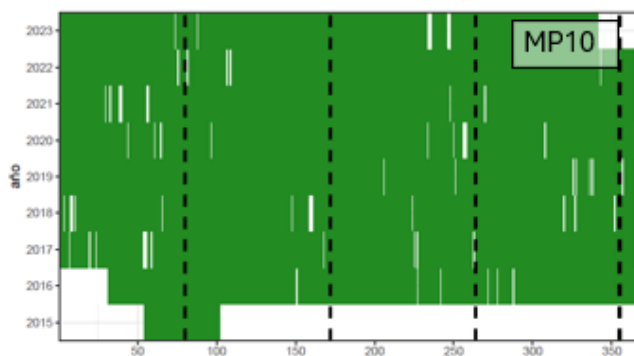
Los Maitenes



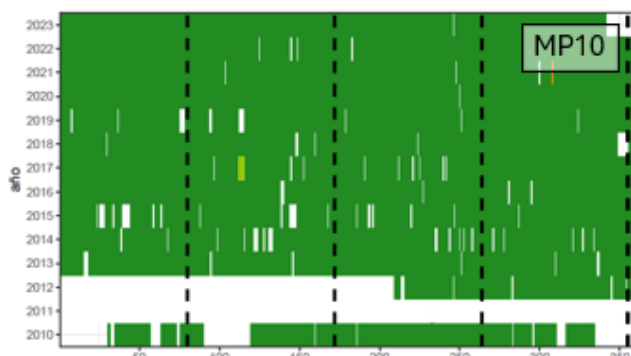
Puchuncaví



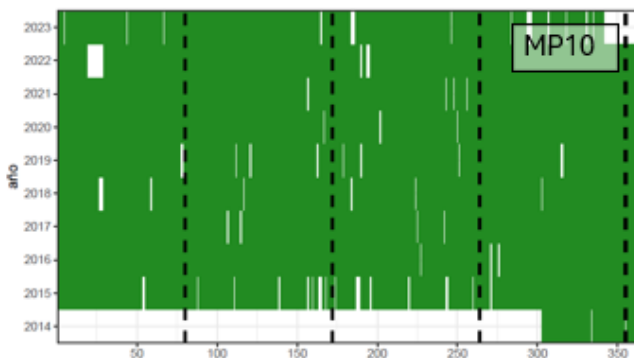
Quintero



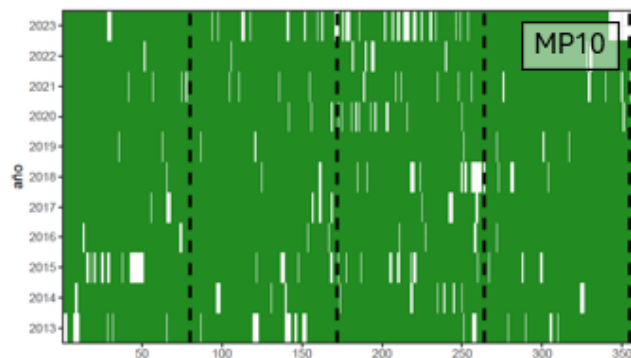
Sur



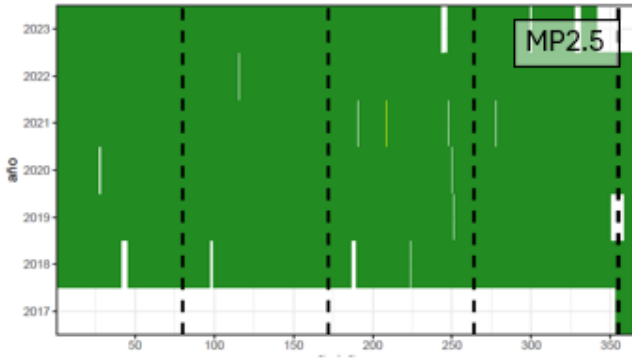
Valle Alegre



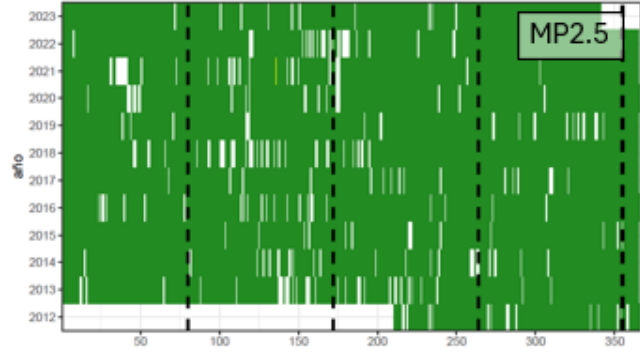
Ventanas



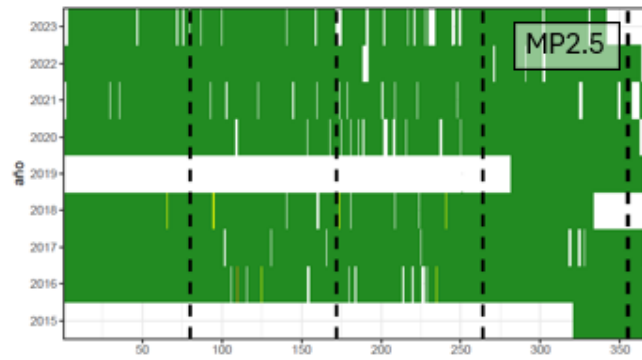
Concón MMA



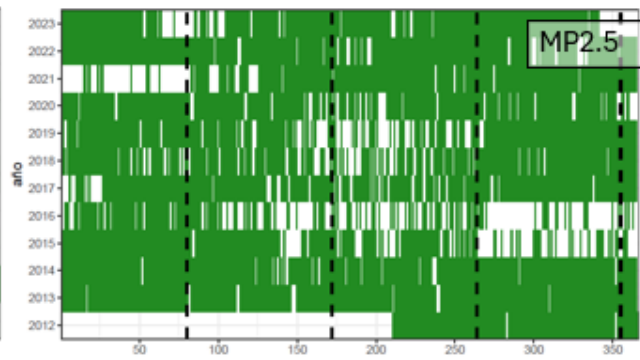
La Greda



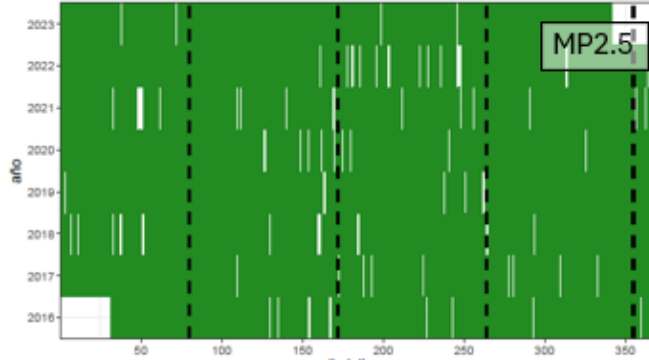
Loncura



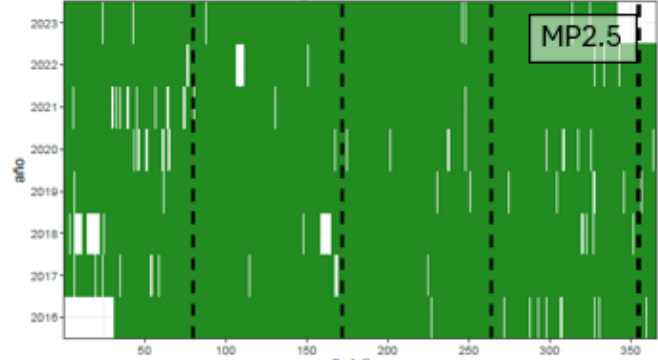
Los Maitenes



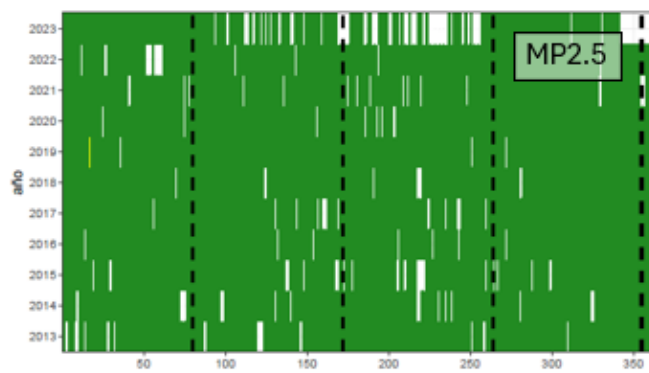
Puchuncaví

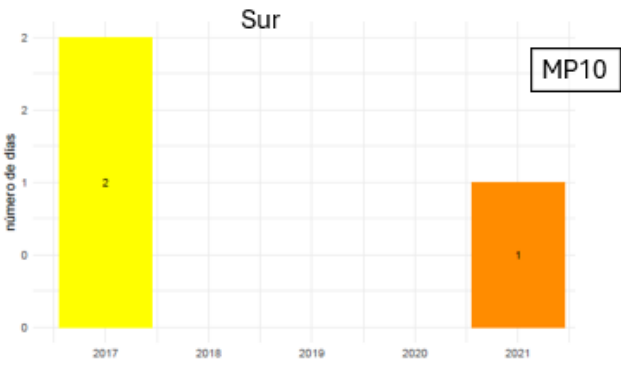
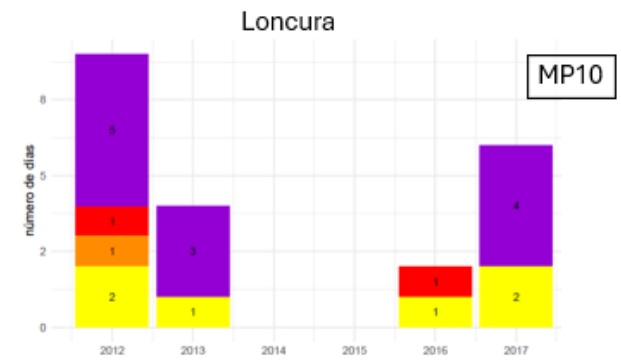
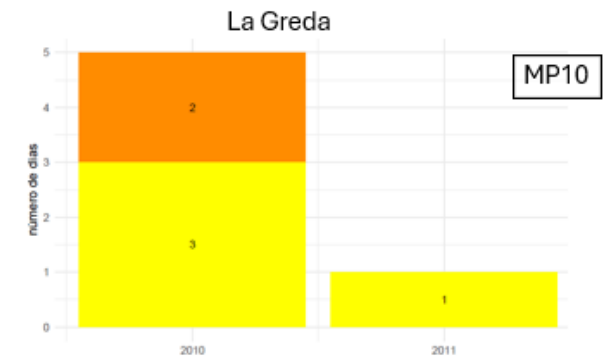


Quintero



Ventanas

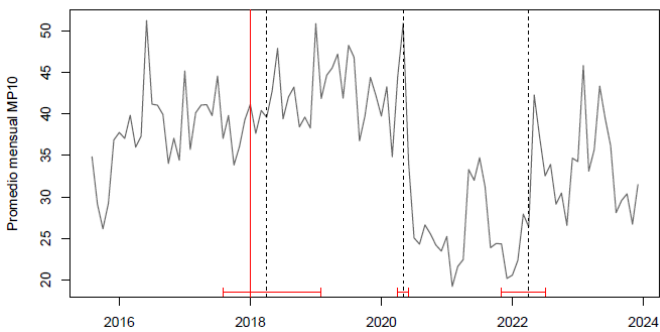




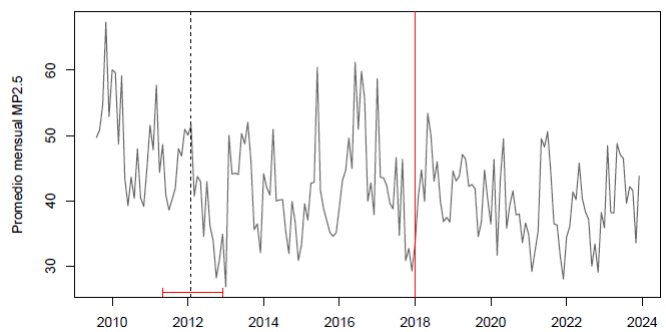
PUNTOS DE QUIEBRE

MP10

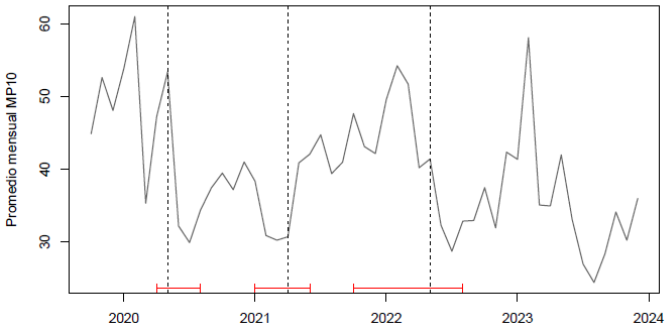
Concon Quintero Puchuncavi – Estacion Concon (MP10)



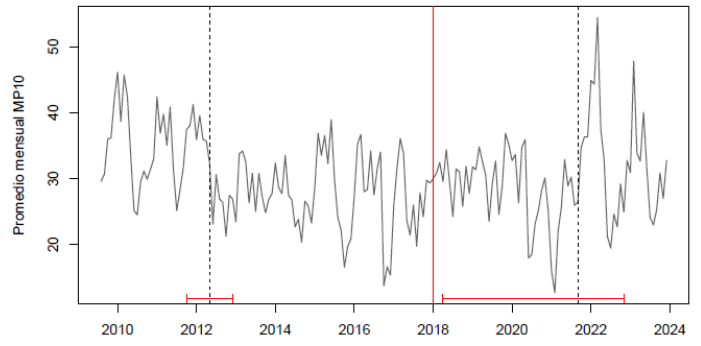
Concon Quintero Puchuncavi – Estacion La Greda (MP10)



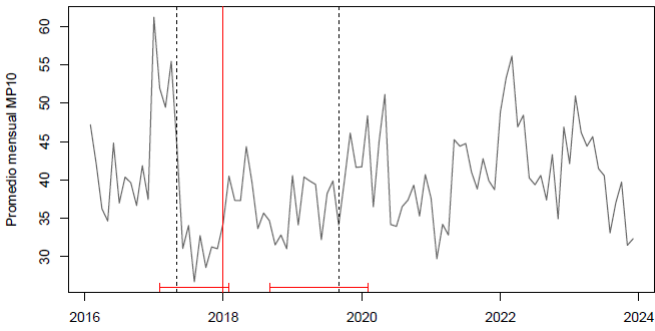
Concon Quintero Puchuncavi – Estacion Loncura (MP10)



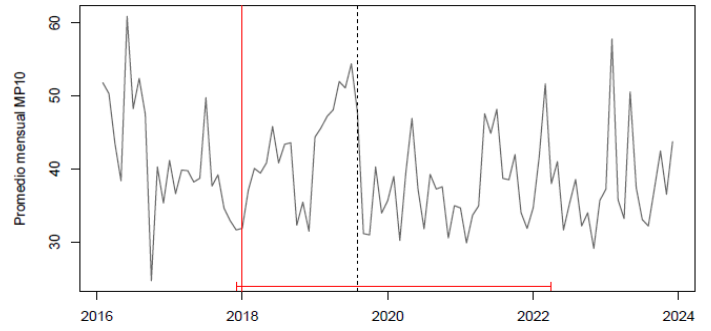
Concon Quintero Puchuncavi – Estacion Los Maitenes (MP10)



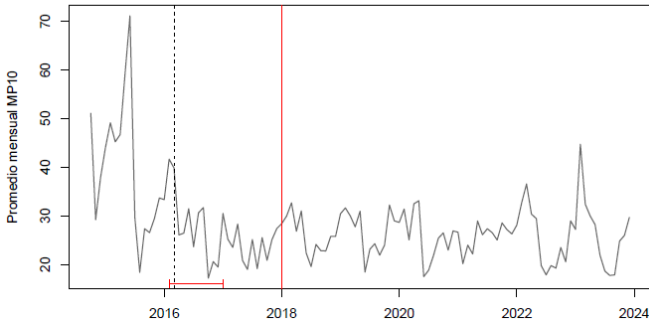
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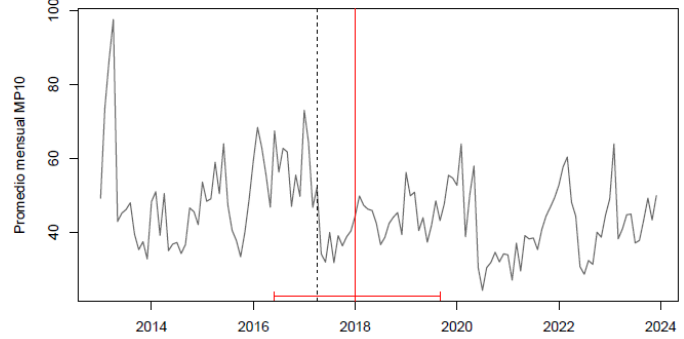
Concon Quintero Puchuncavi – Estacion Quintero (MP10)



Concon Quintero Puchuncavi – Estacion Valle Alegre (MP10)



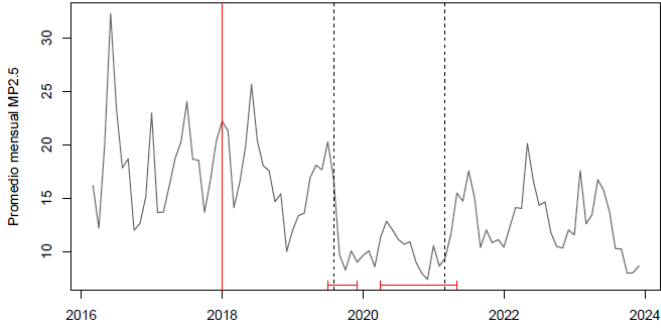
Concon Quintero Puchuncavi – Estacion Ventanas (MP10)



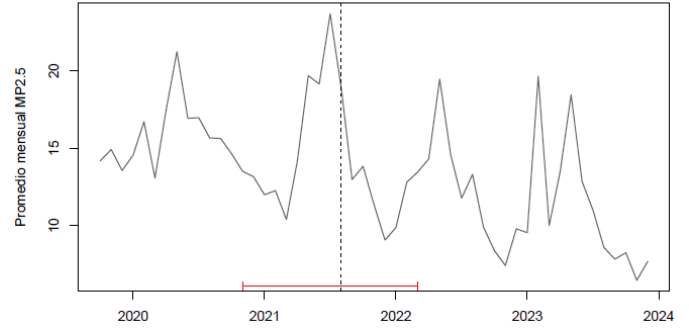
PUNTOS DE QUIEBRE

MP2.5

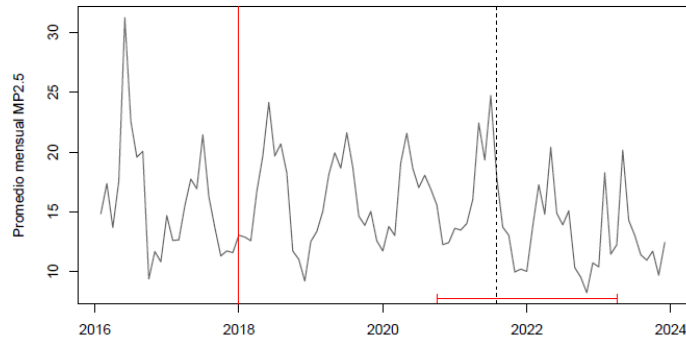
Concon Quintero Puchuncavi – Estacion Concon (MP2.5)



Concon Quintero Puchuncavi – Estacion Loncura (MP2.5)



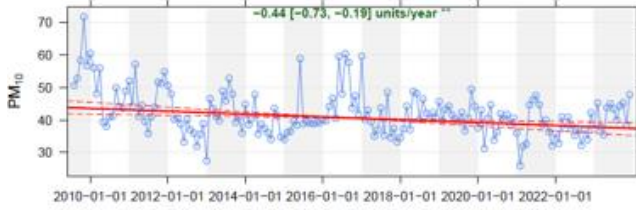
Concon Quintero Puchuncavi – Estacion Quintero (MP2.5)



TENDENCIAS

MP10

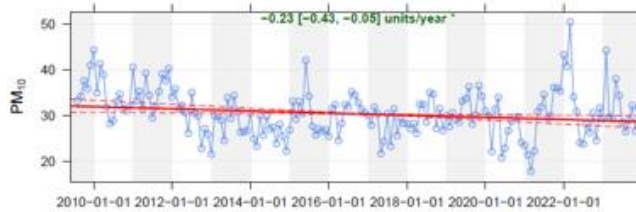
La Greda



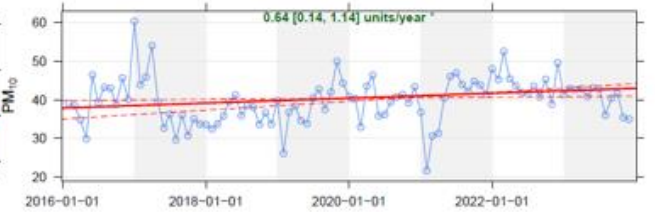
Loncura



Los Maitenes



Puchuncaví



Quintero



Sur



Valle Alegre



Ventanas



MP2.5

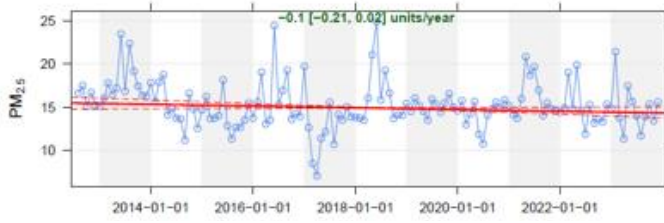
Los Maitenes



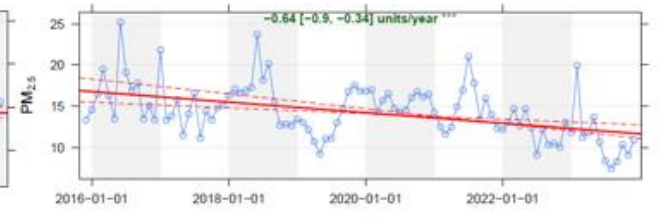
Concón MMA



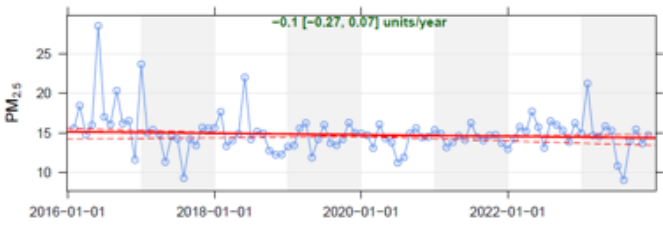
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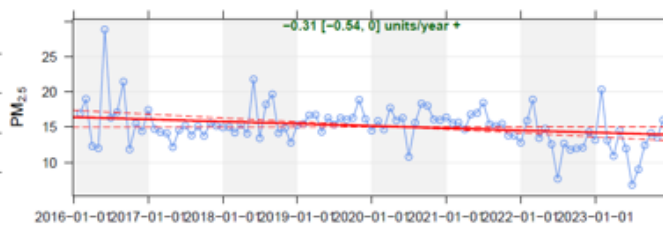
Loncura



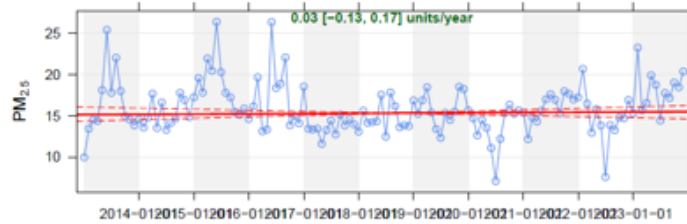
Puchuncaví



Quintero

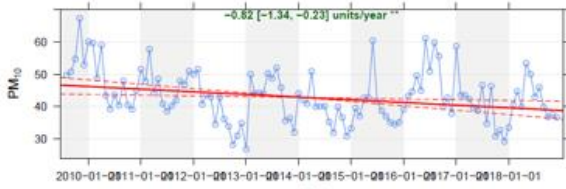


Ventanas

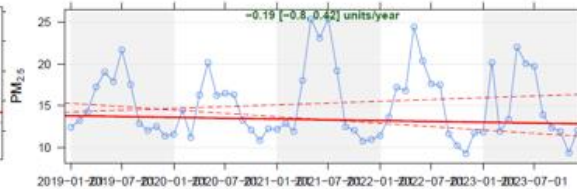
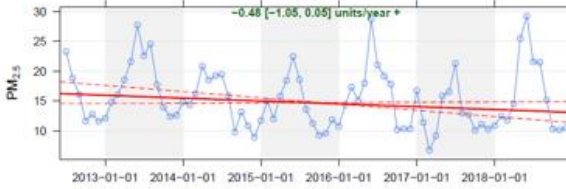
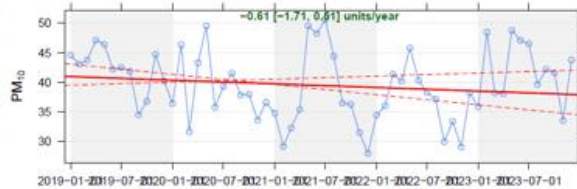


La Greda

Antes PDA



Después PDA

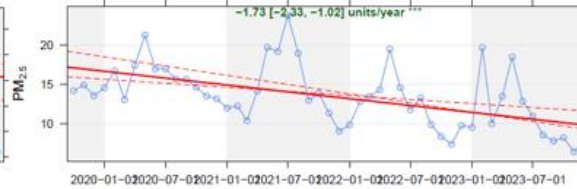
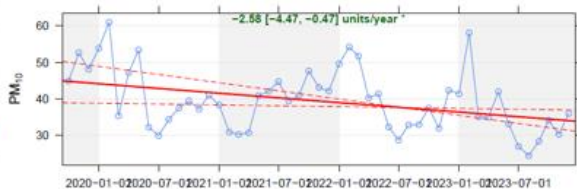


Loncura

Antes PDA

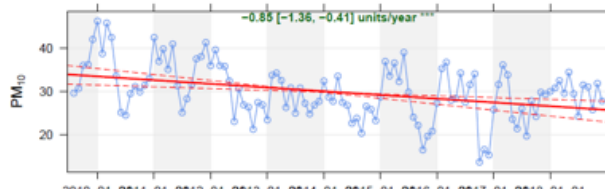


Después PDA

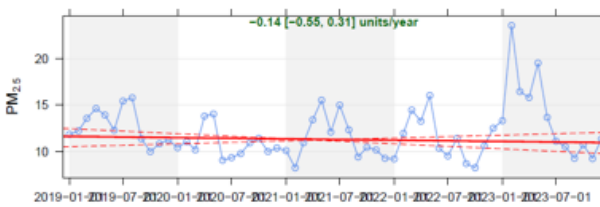
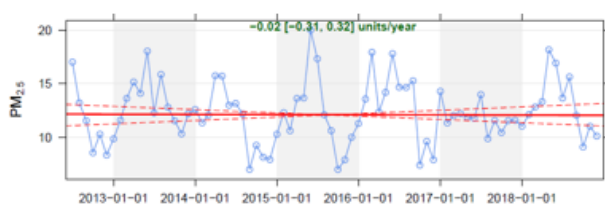


Los Maitenes

Antes PDA



Después PDA

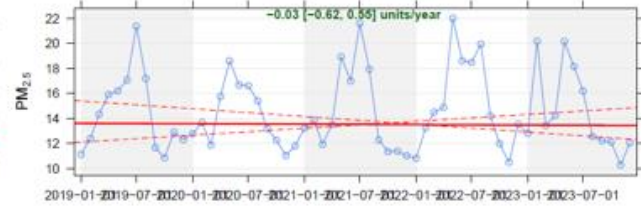
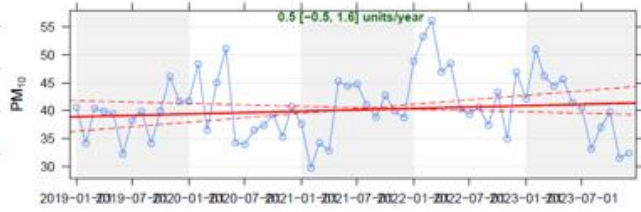


Puchuncaví

Antes PDA

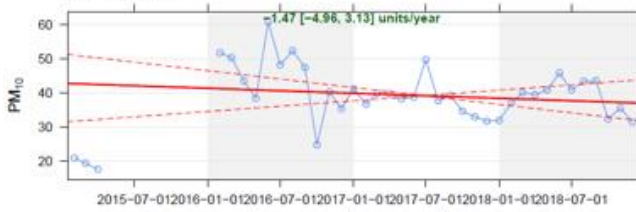


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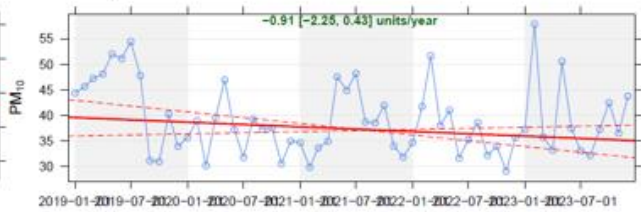


Quintero

Antes PDA

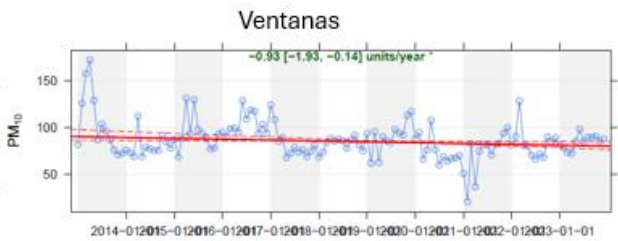
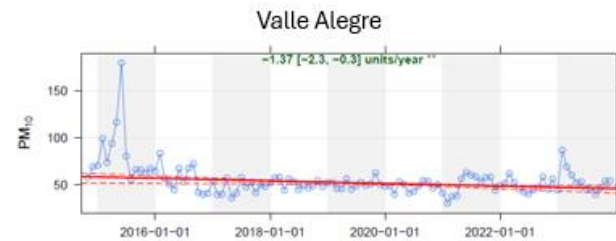
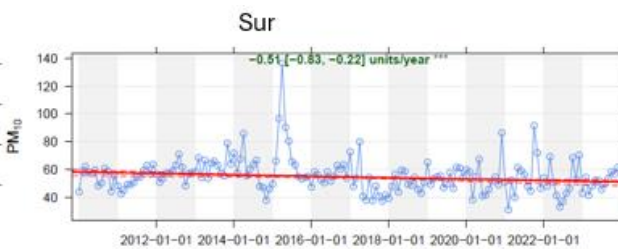
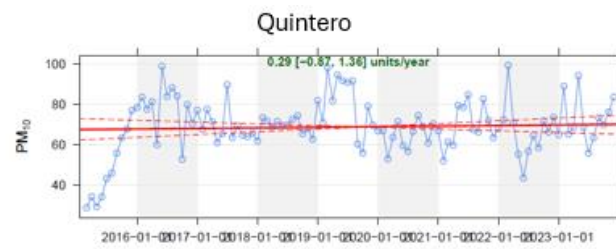
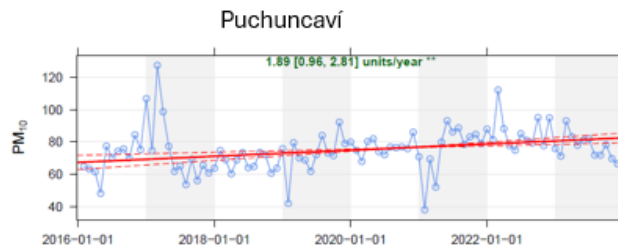
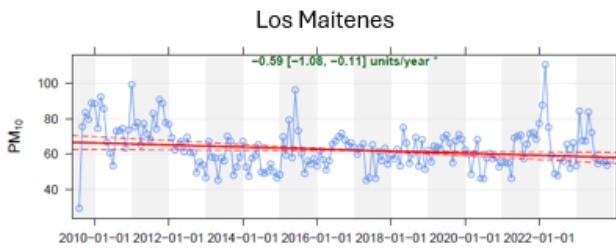
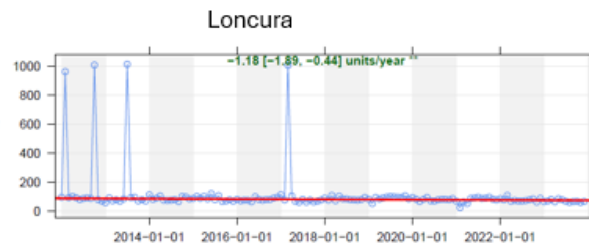
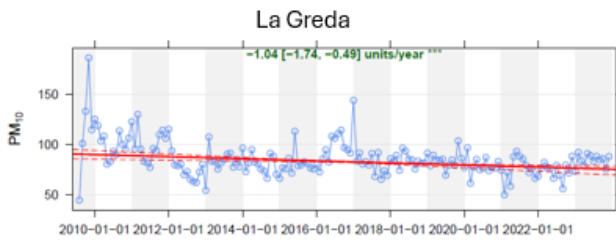


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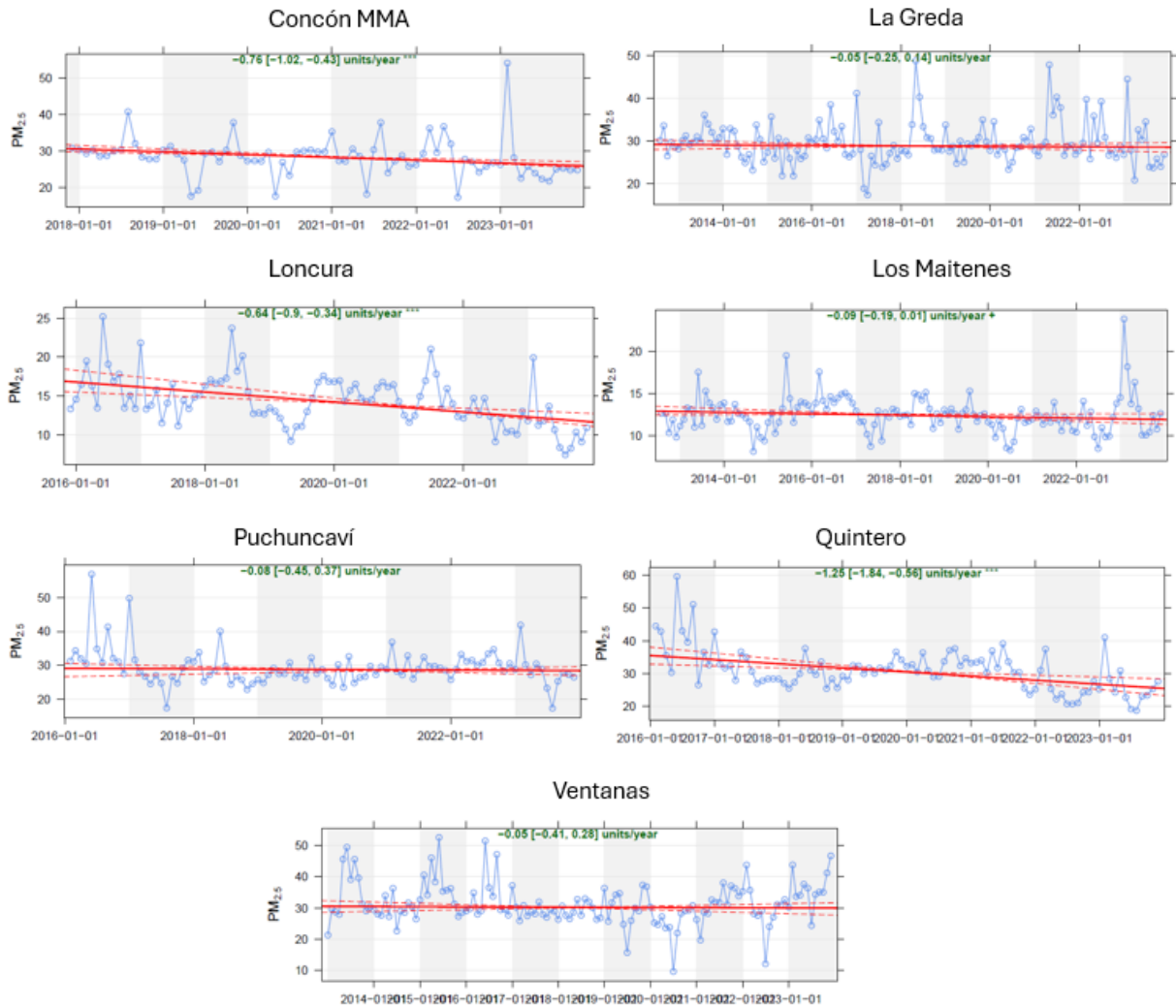


TENDENCIA PERCENTIL 95

MP10



MP2.5



Anexo VI: PDA para la región Metropolitana

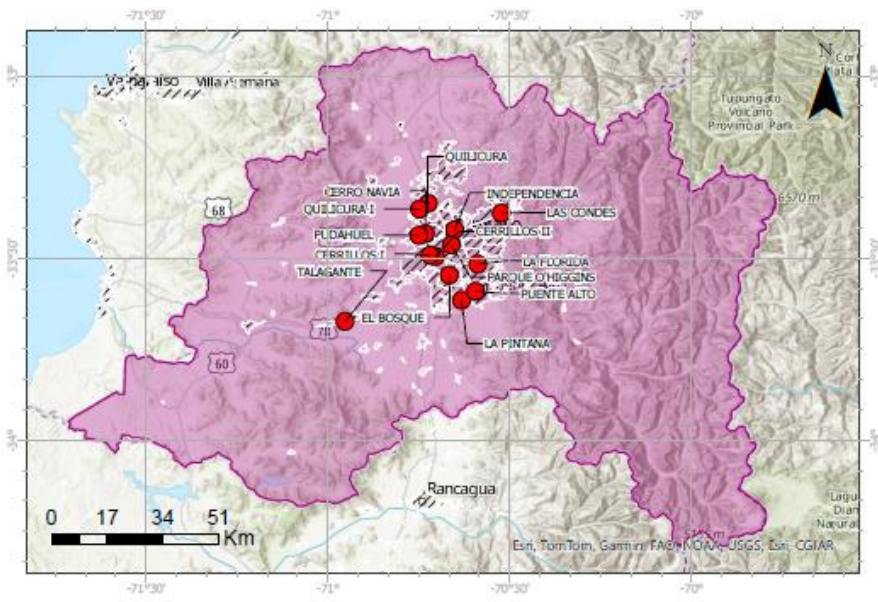


Población: 7 140 674 habitantes

Área: 15 554,5 km²

Densidad poblacional: 459,1 hab/km²

PRINCIPALES MEDIDAS

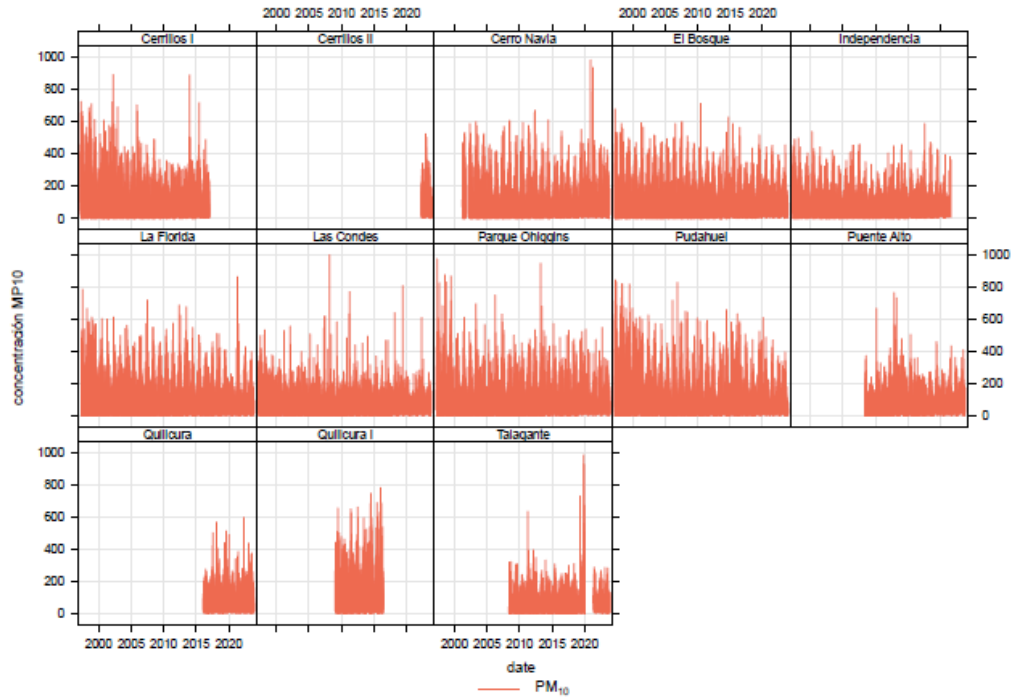


Estaciones consideradas:

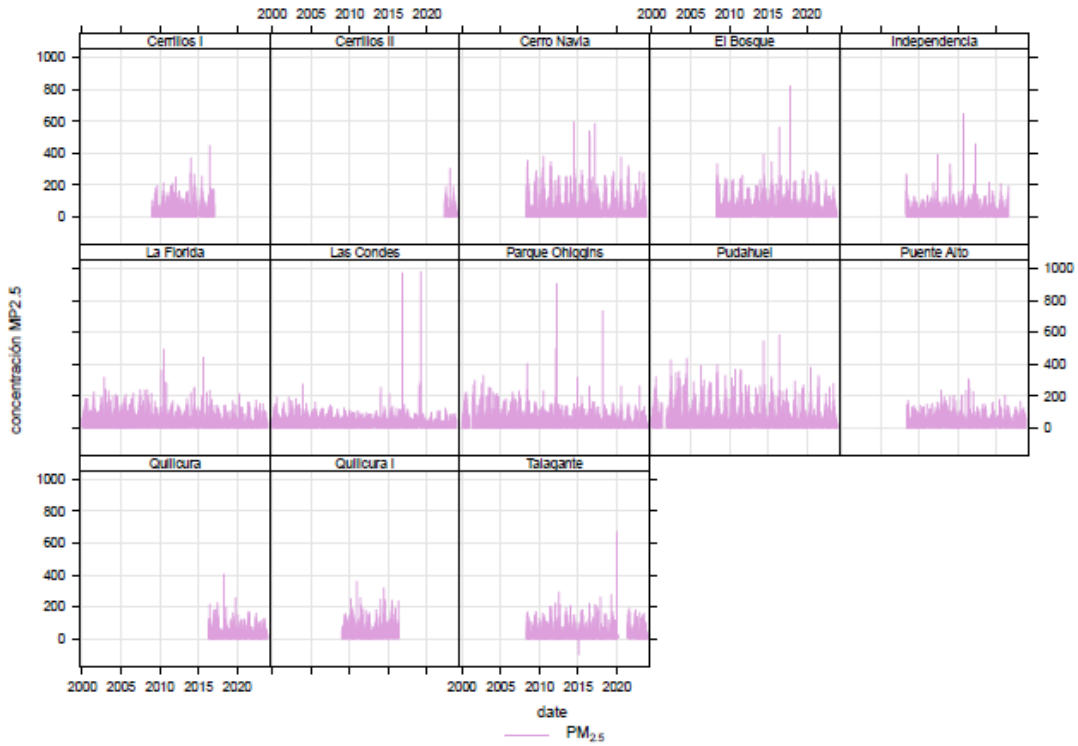
- Cerro Navia
- El Bosque
- Independencia
- La Florida
- Las Condes
- Parque O'Higgins
- Pudahuel
- Puente Alto

SERIES DE TIEMPO

MP₁₀

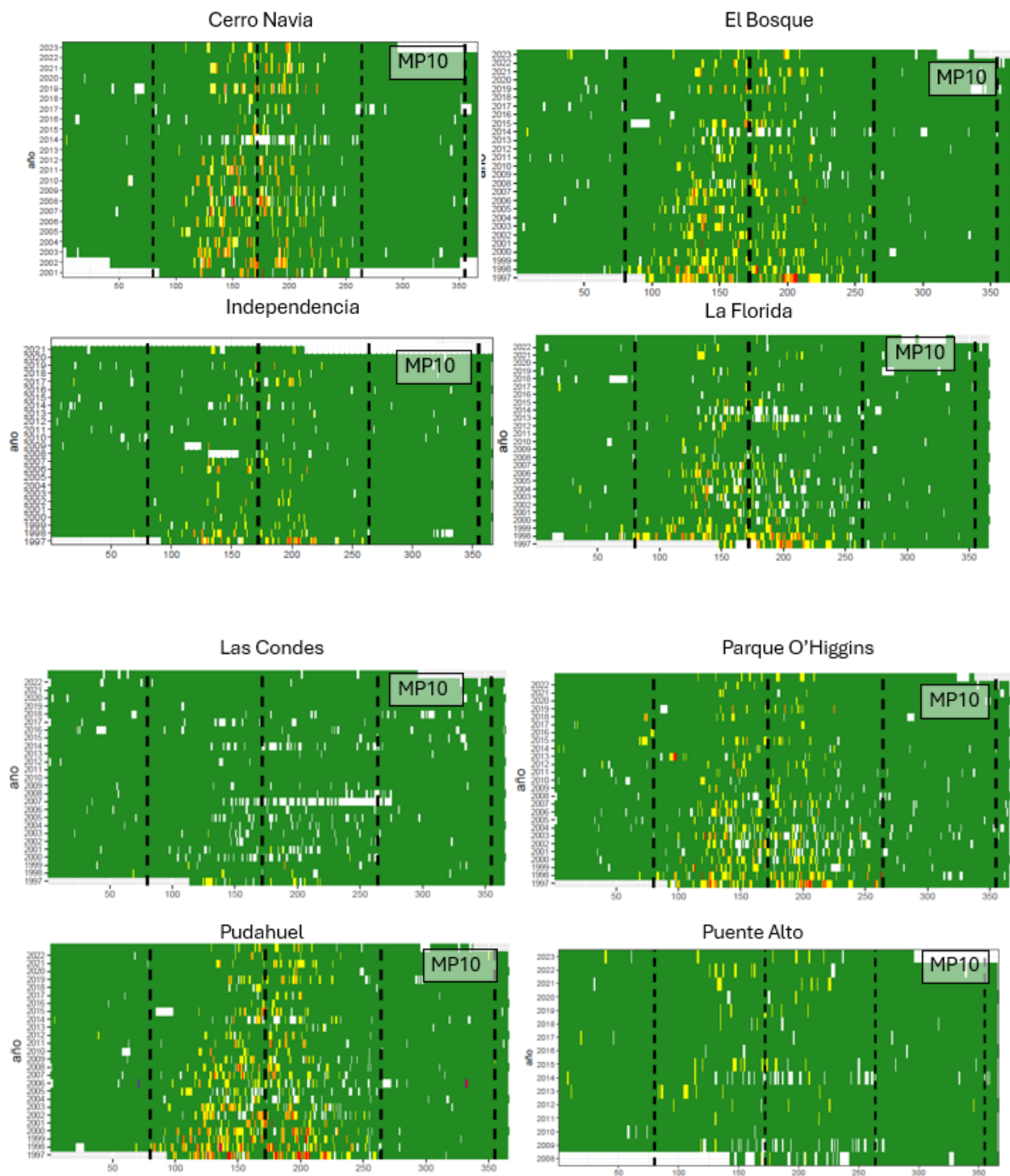


MP_{2.5}



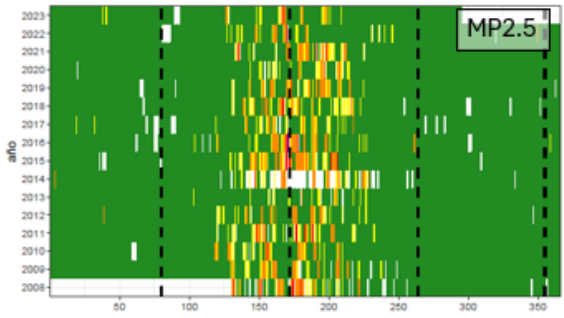
EPISODIOS CRÍTICOS

MP10

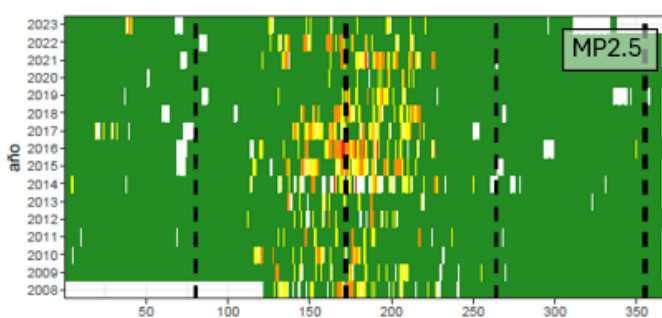


MP2.5

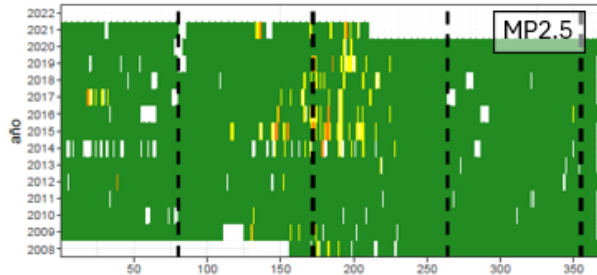
Cerro Navia



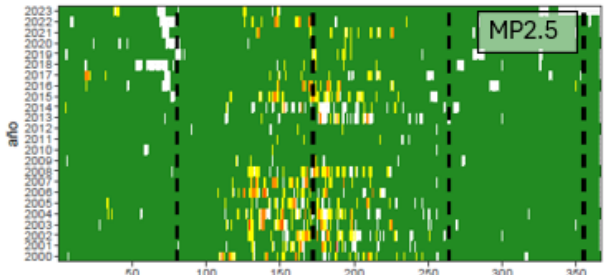
El Bosque



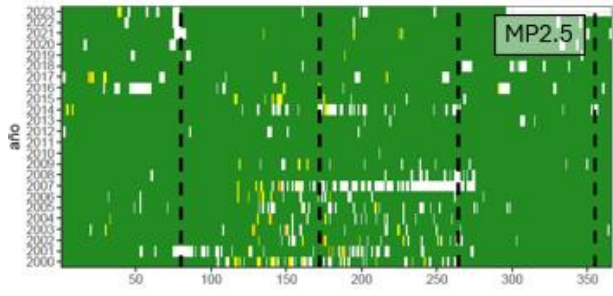
Independencia



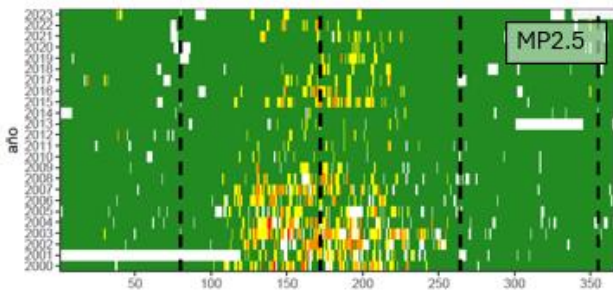
La Florida



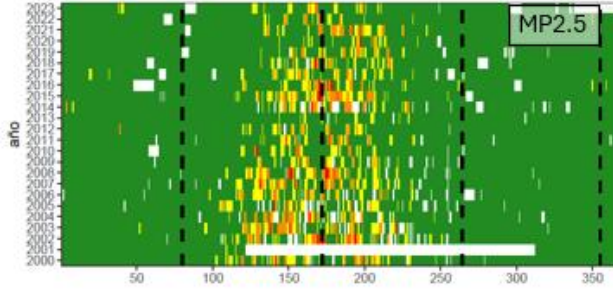
Las Condes



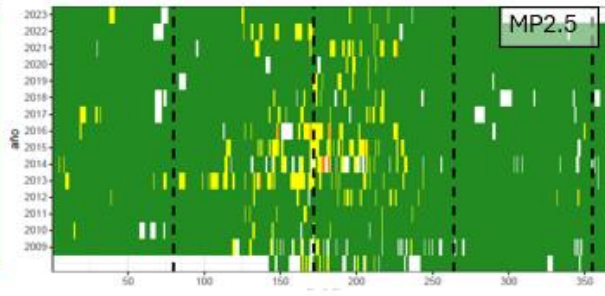
Parque O'Higgins



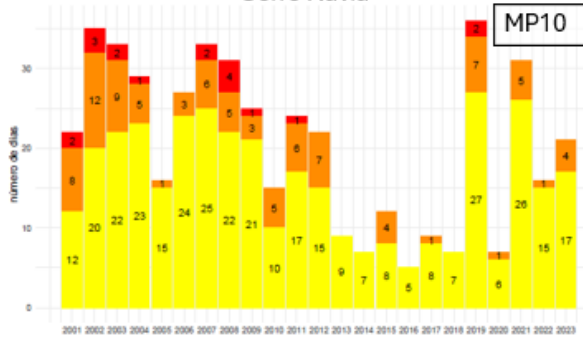
Pudahuel



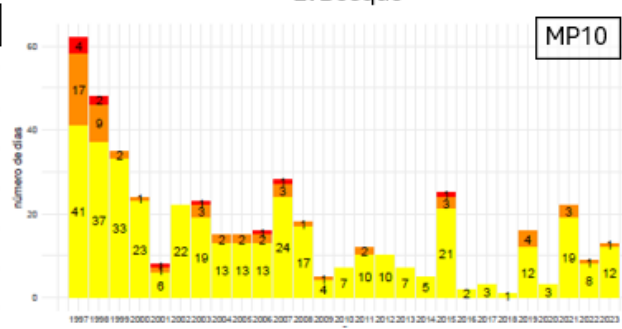
Puente Alto



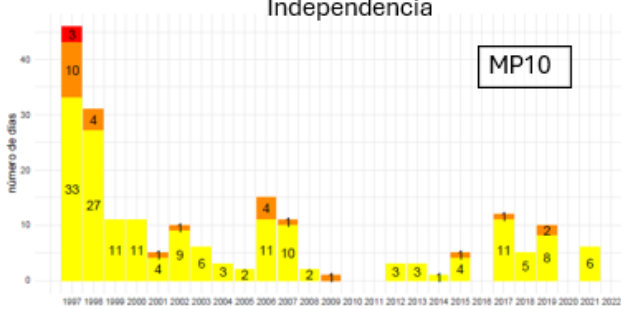
Cerro Navia



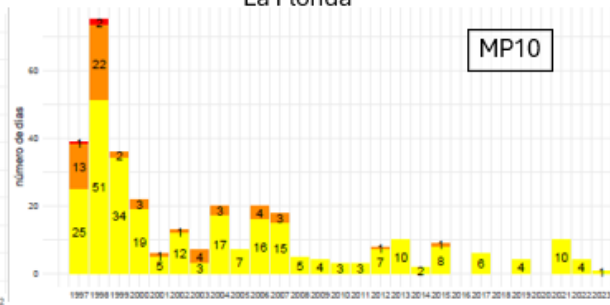
El Bosque



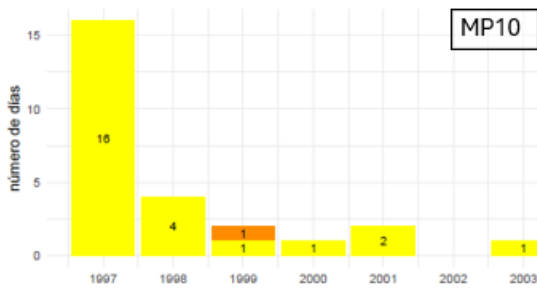
Independencia



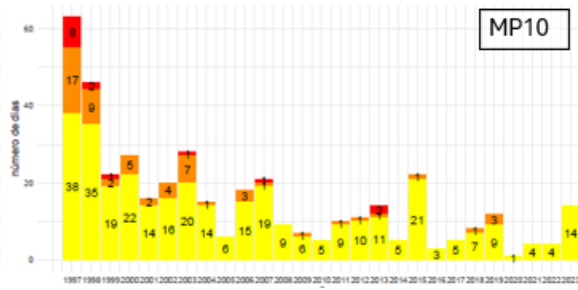
La Florida



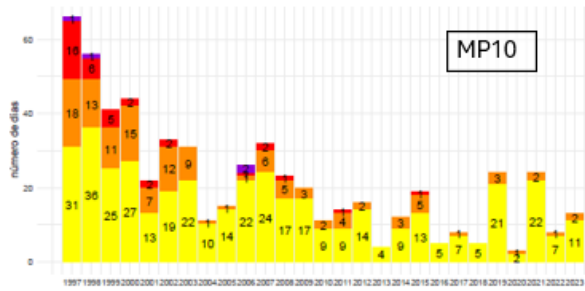
Las Condes

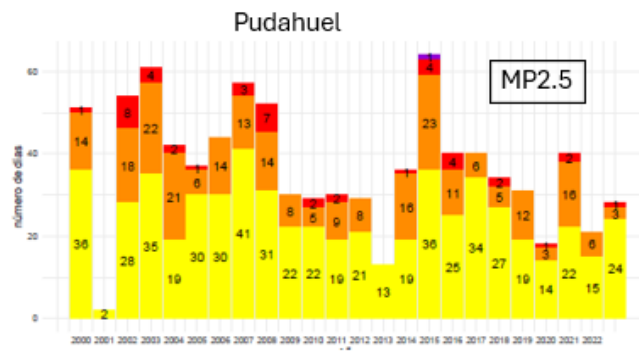
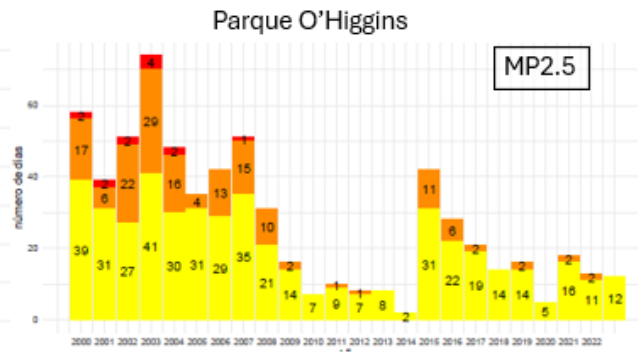
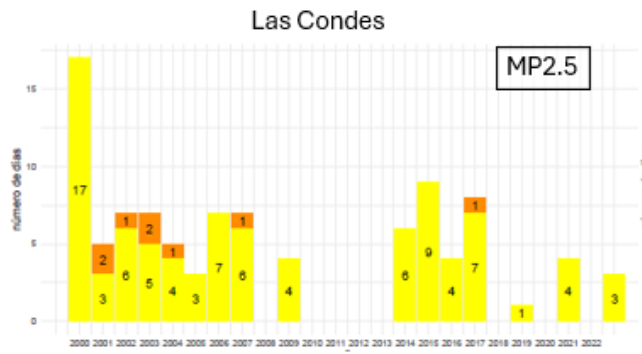
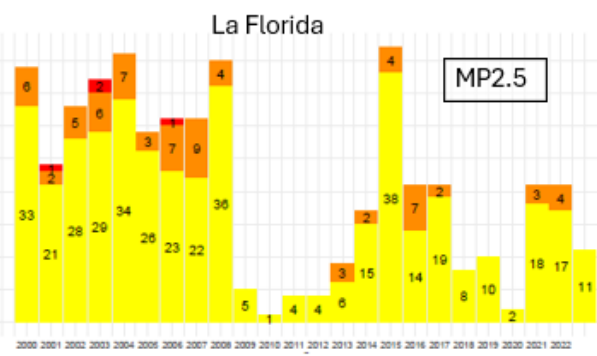
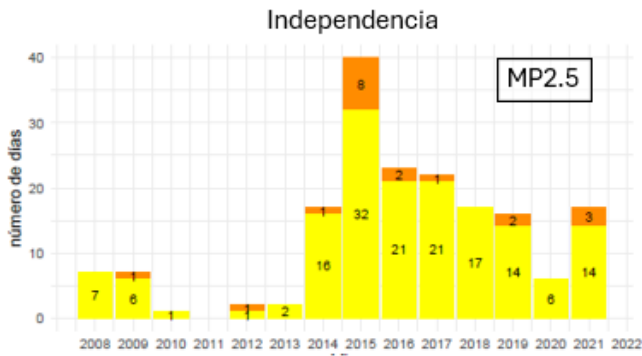
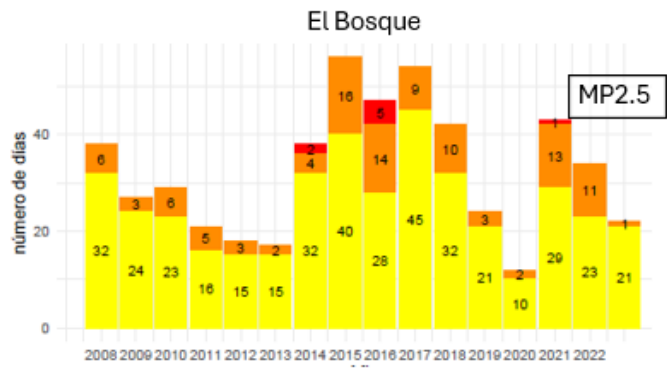
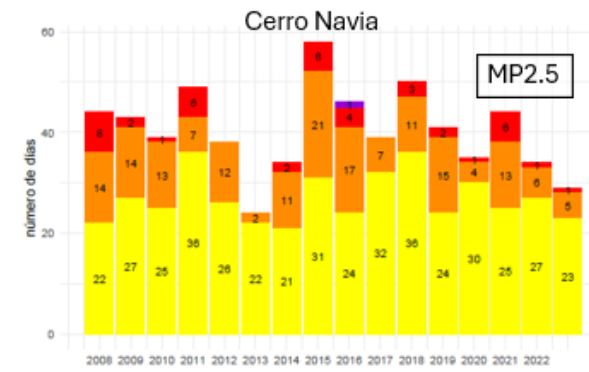


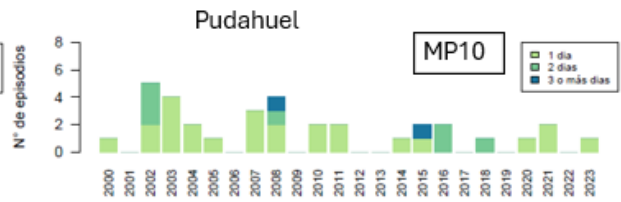
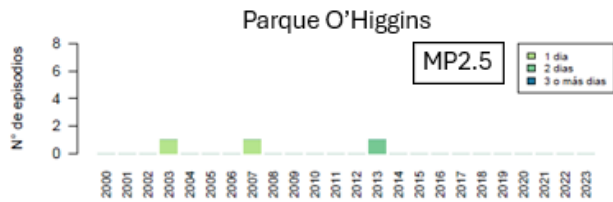
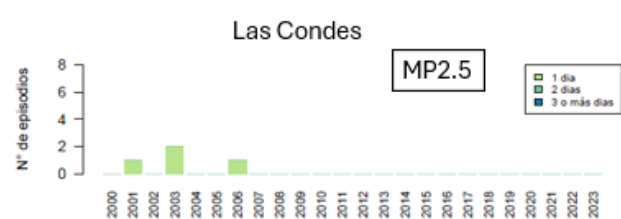
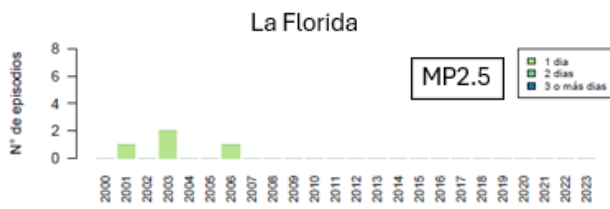
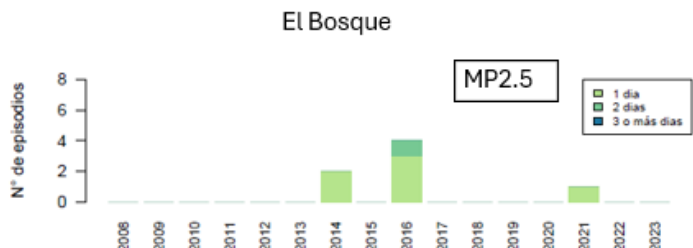
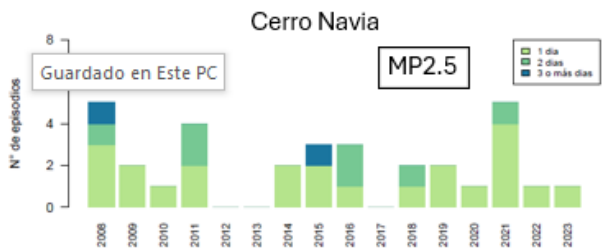
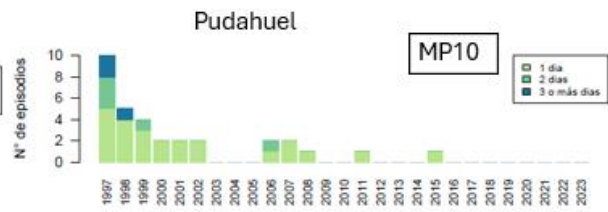
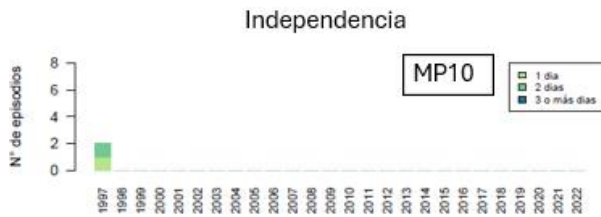
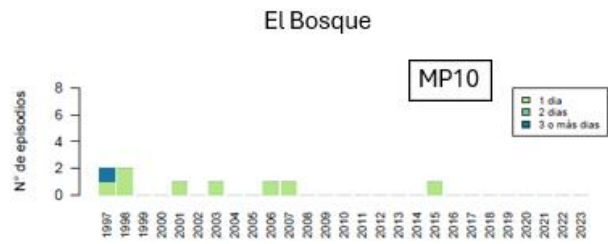
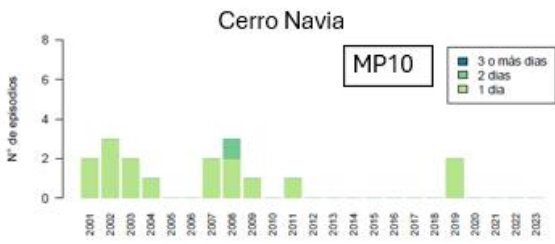
Parque O'Higgins



Pudahuel

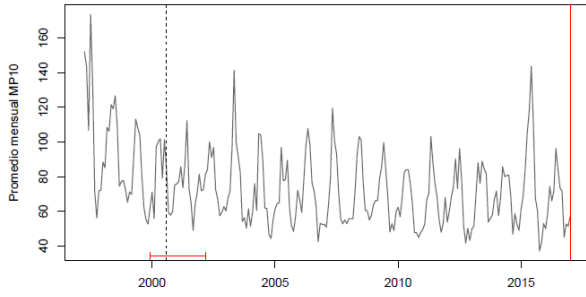




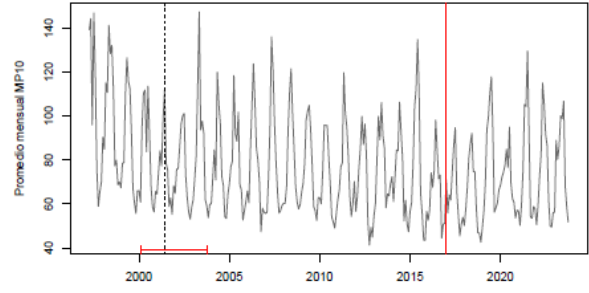


PUNTOS DE QUIEBRE

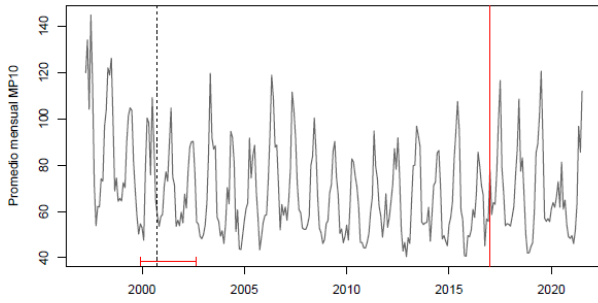
RM - Estacion Cerrillos 1 (MP10)



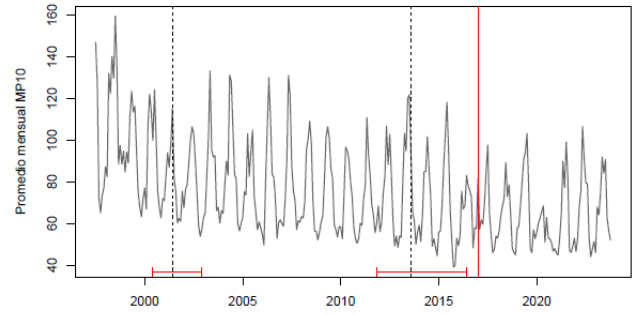
RM - Estacion El Bosque (MP10)



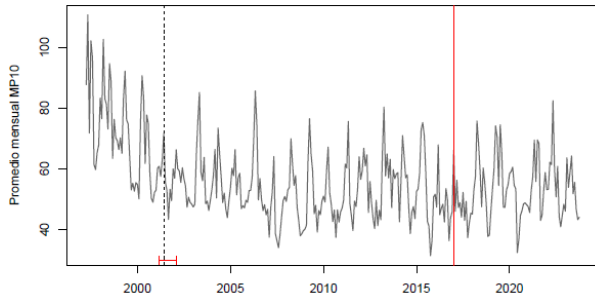
RM - Estacion Independencia (MP10)



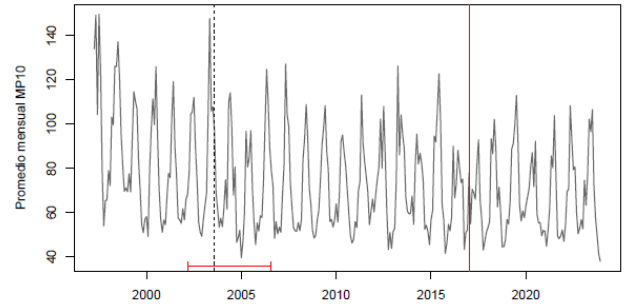
RM - Estacion La Florida (MP10)



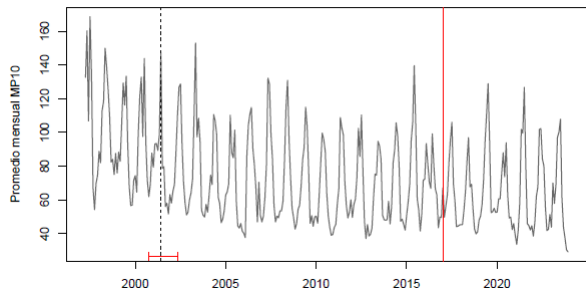
RM - Estacion Las Condes (MP10)



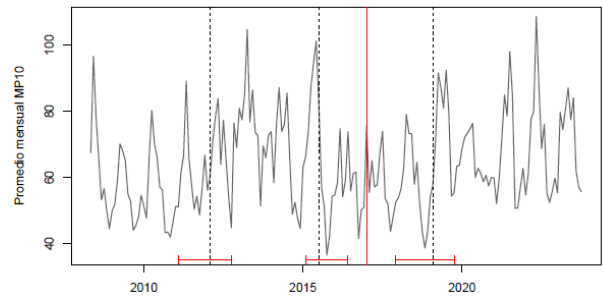
RM - Estacion Parque O'Higgins (MP10)



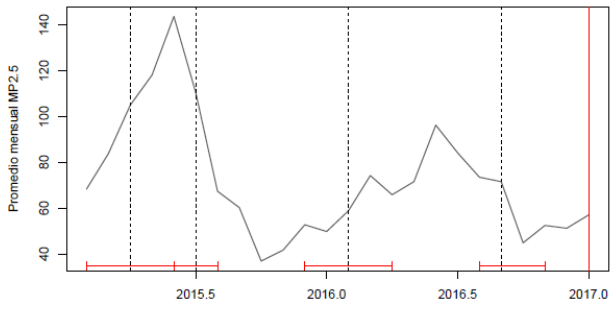
RM - Estacion Pudahuel (MP10)



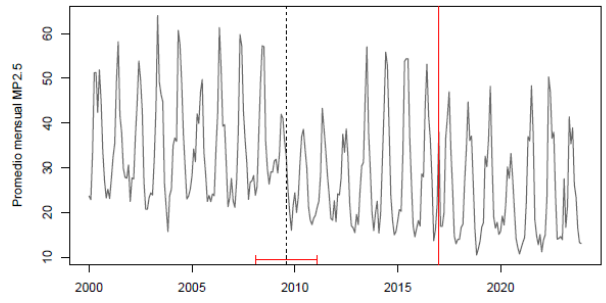
RM - Estacion Puente Alto (MP10)



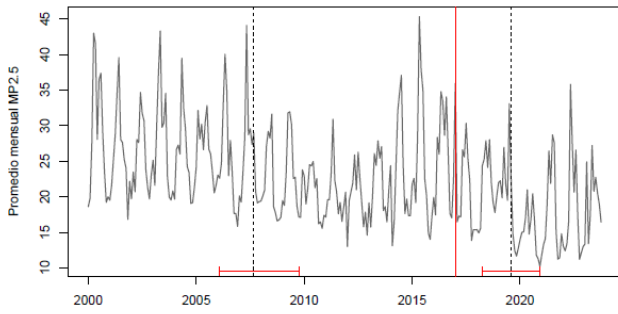
RM - Estacion Cerrillos 1 (MP2.5)



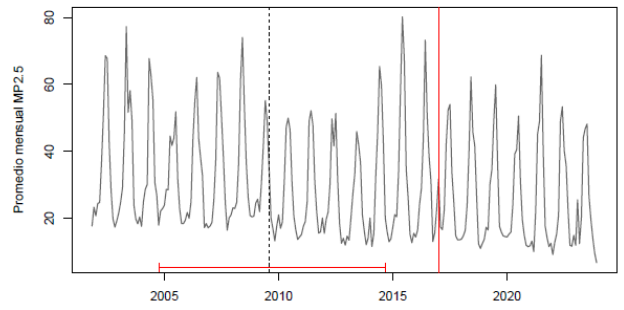
RM - Estacion La Florida (MP2.5)



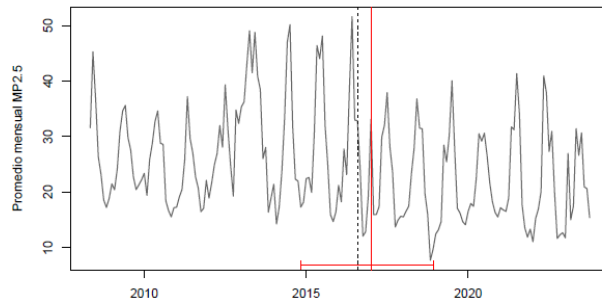
RM - Estacion Las Condes (MP2.5)



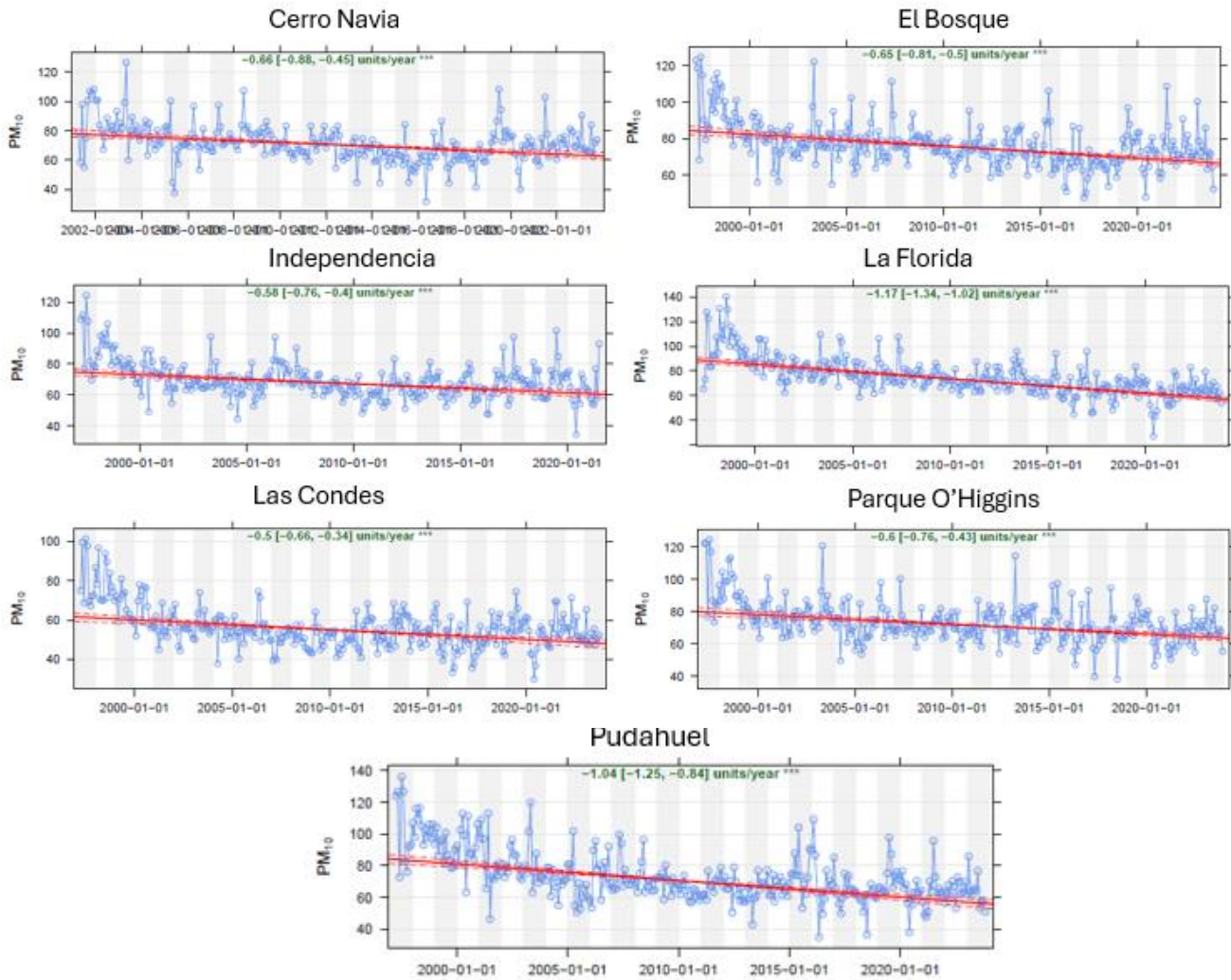
RM - Estacion Pudahuel (MP2.5)

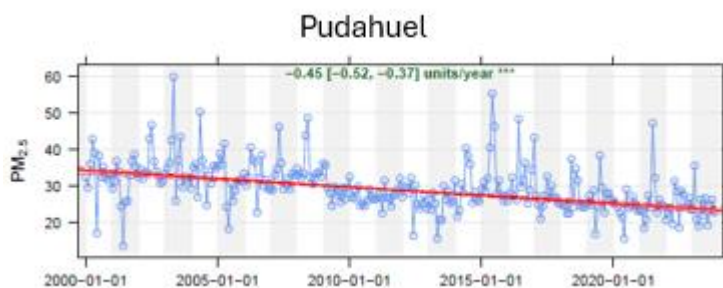
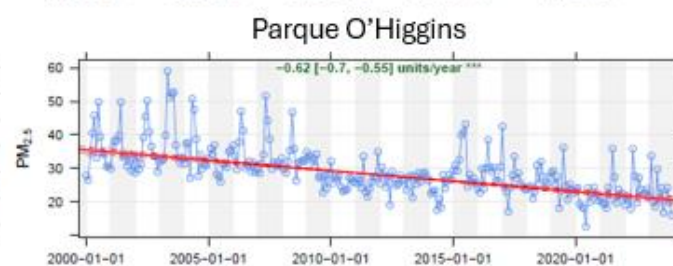
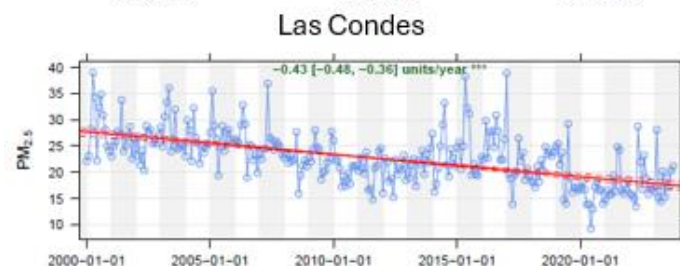
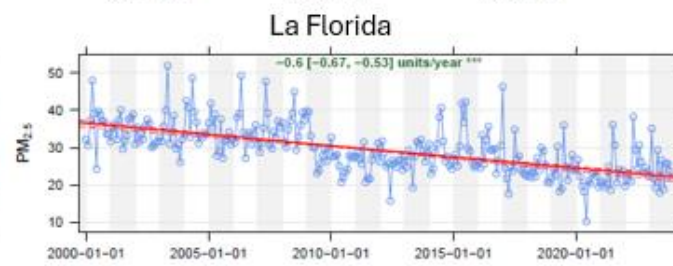
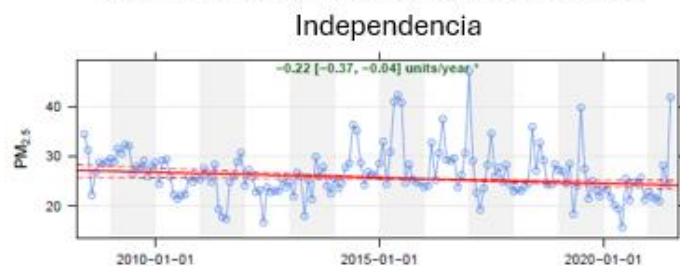
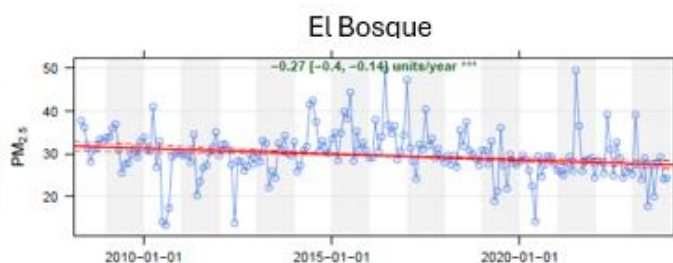
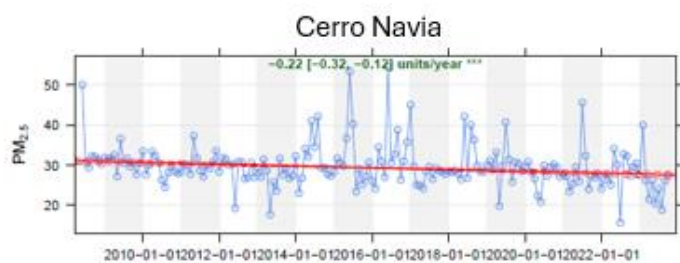


RM - Estacion Puente Alto (MP2.5)



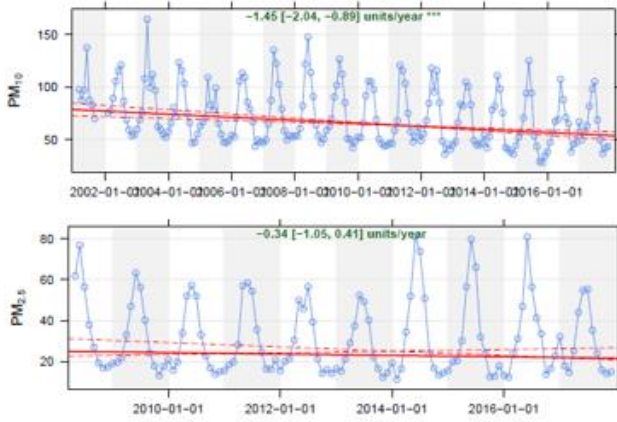
TENDENCIAS



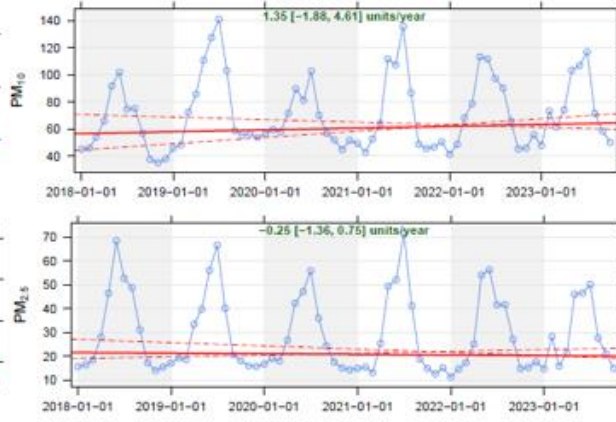


Cerro Navia

Antes PDA

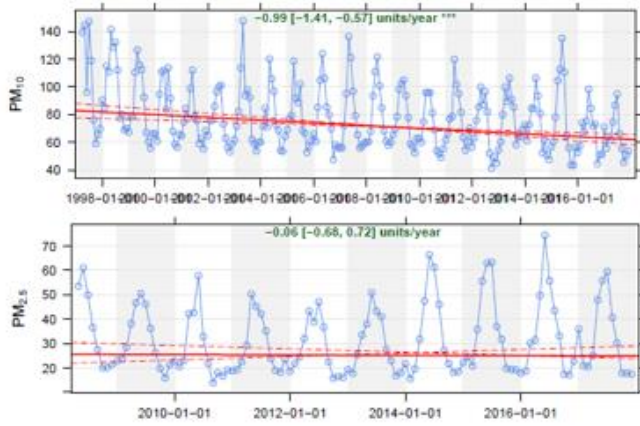


Después PDA

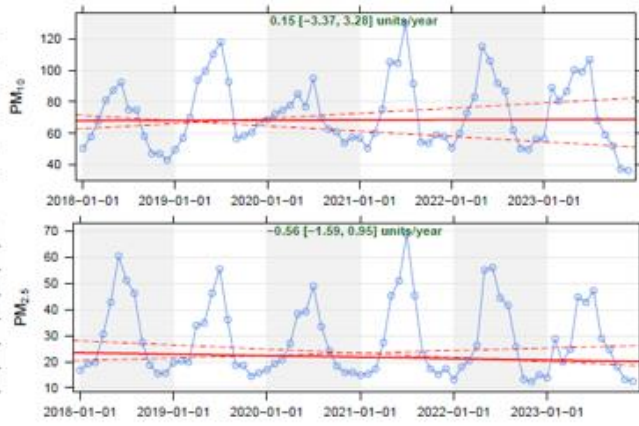


El Bosque

Antes PDA

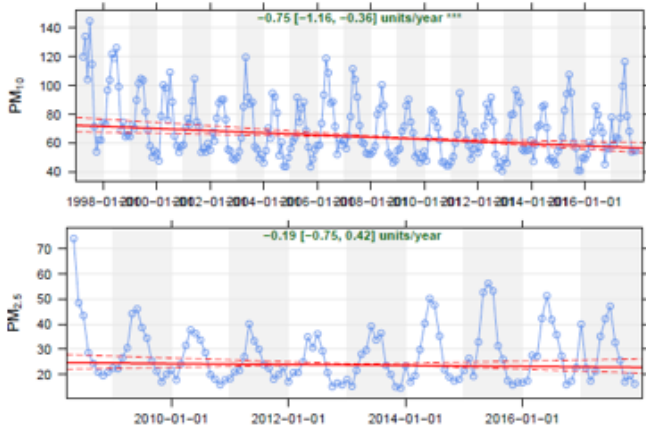


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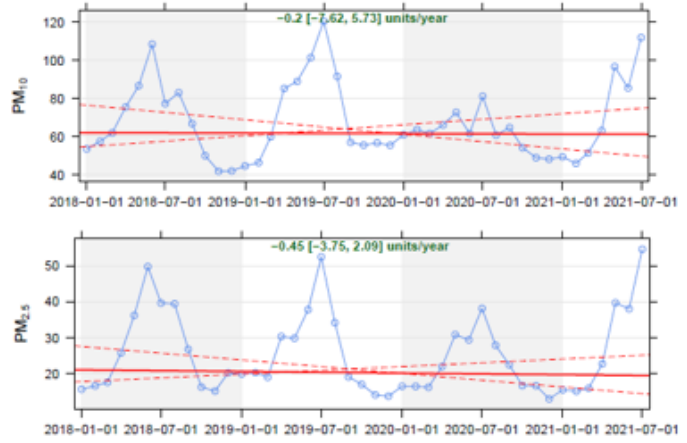


Independencia

Antes PDA

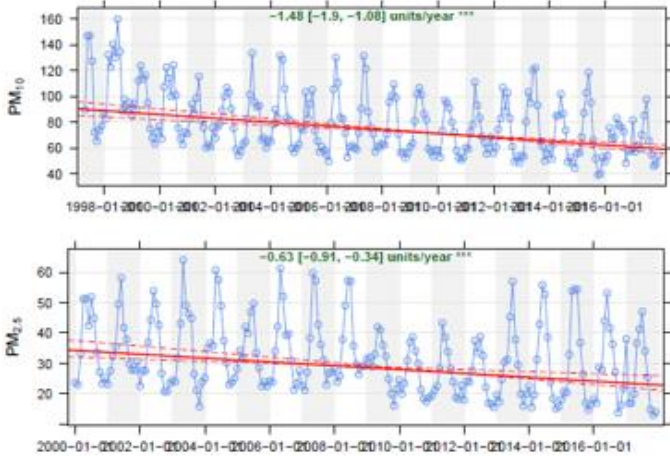


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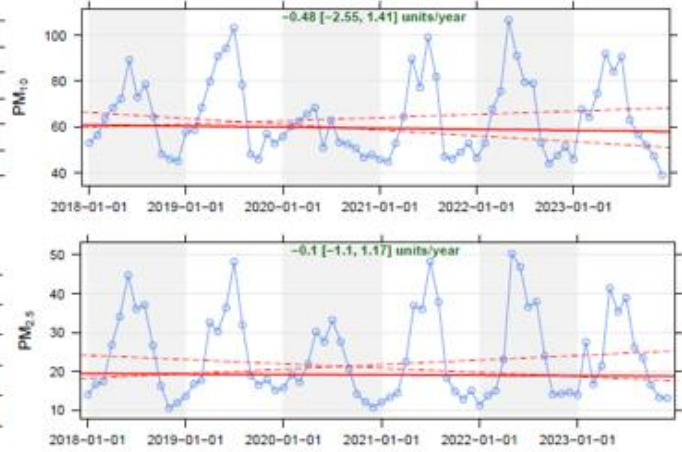


La Florida

Antes PDA

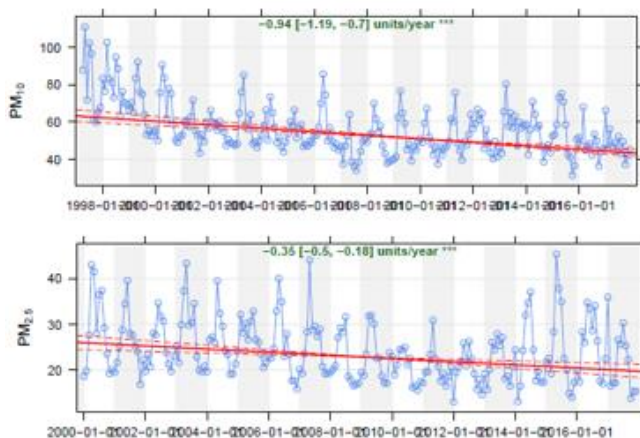


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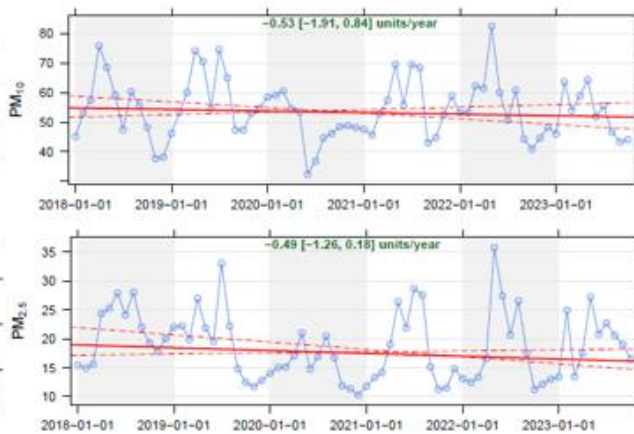


Las Condes

Antes PDA

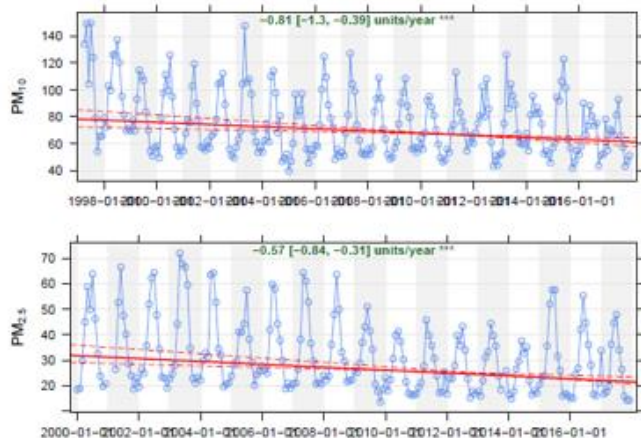


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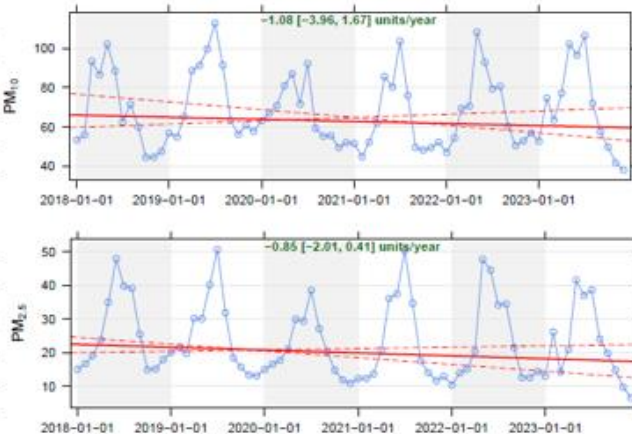


Parque O'Higgins

Antes PDA

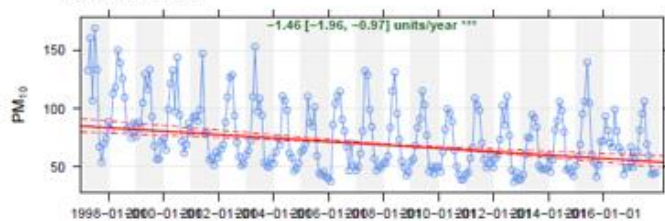


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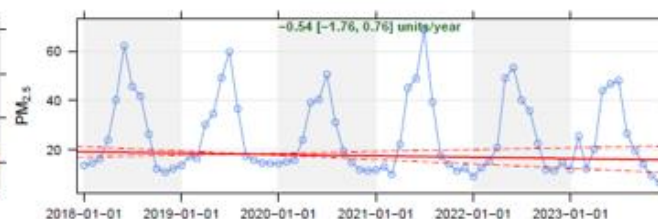
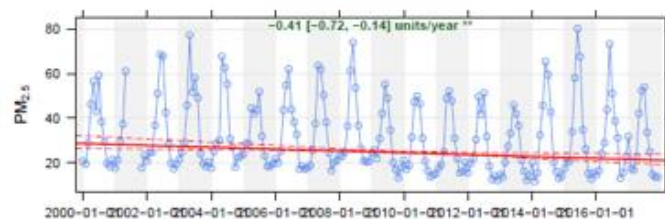
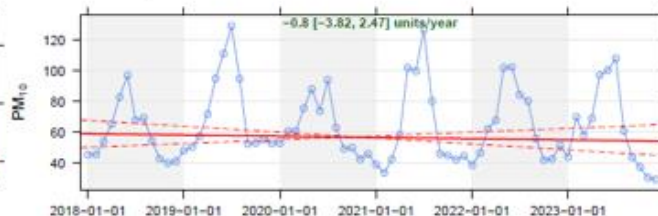


Pudahuel

Antes PDA

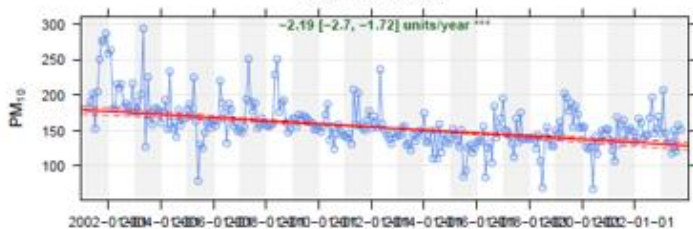


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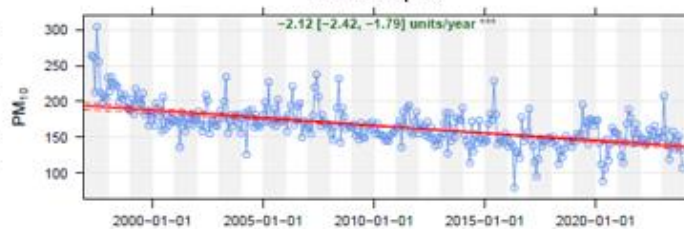


TENDENCIA PERCENTIL 95

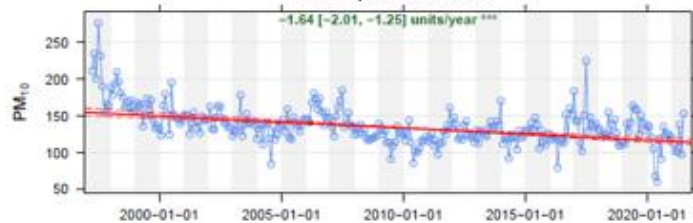
Cerro Navia



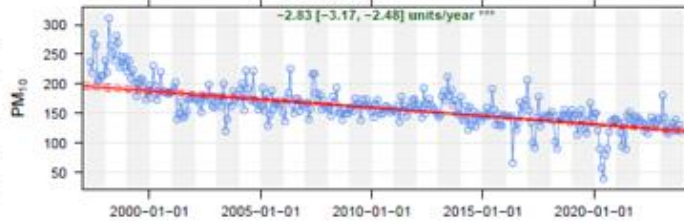
El Bosque



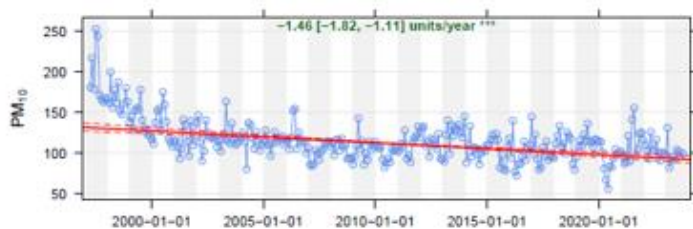
Independencia



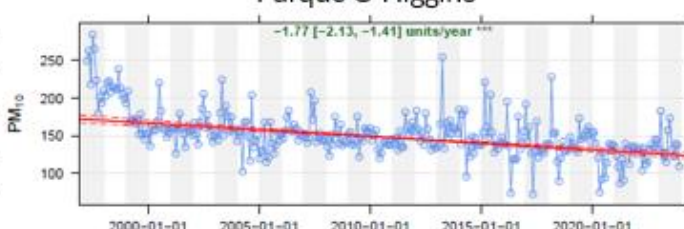
La Florida



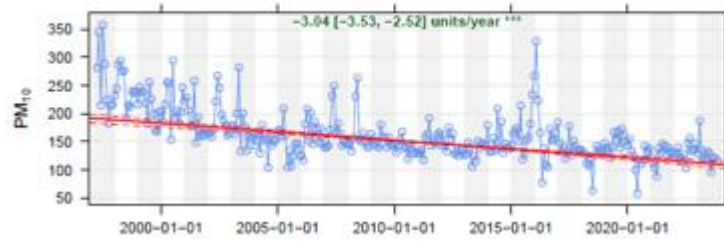
Las Condes



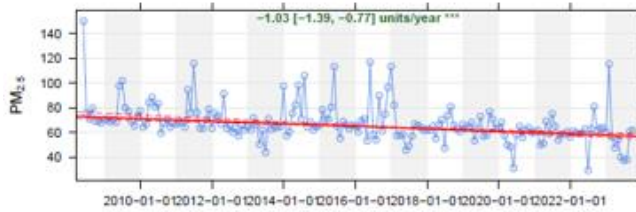
Parque O'Higgins



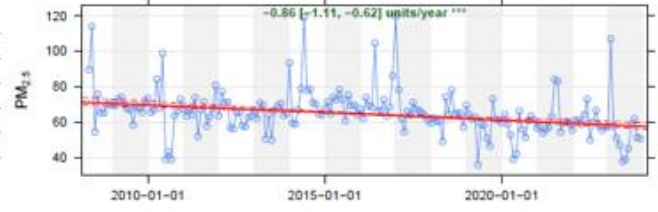
Pudahuel



Cerro Navia



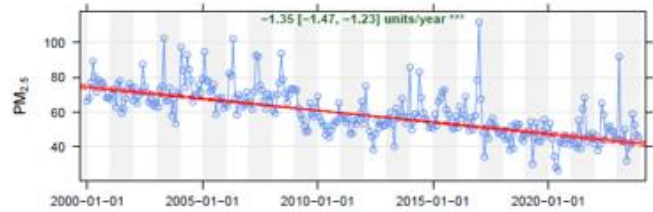
El Bosque



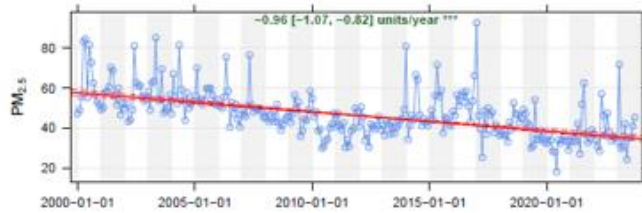
Independencia



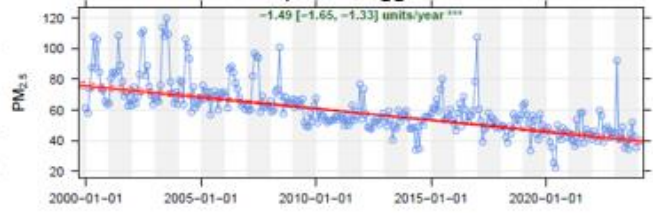
La Florida



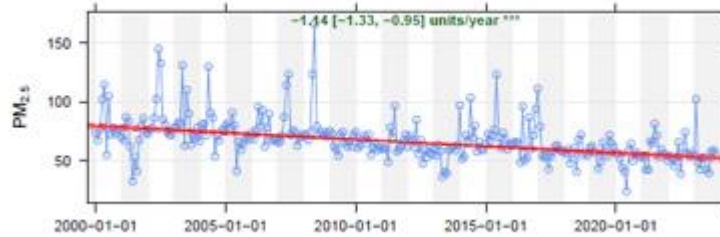
Las Condes



Parque O'Higgins



Pudahuel



Anexo VII: PDA para el Valle Central de la Región del Libertador General Bernardo O'Higgins

2009

- Declaración zona saturada MP10 diario y anual

2021

- PDA



2017

- Declaración zona saturada MP2.5 diario y anual

Población: 705 576 habitantes

Área: 310 km³

Densidad poblacional: 26,8 hab/km²

PRINCIPALES MEDIDAS



Uso y mejoramiento de calidad de leña



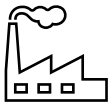
Uso y mejoramiento de artefactos



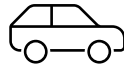
Mejoramiento eficiencia térmica de viviendas



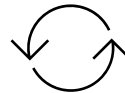
Control de emisiones a quemas agrícolas y domiciliarias



Control de emisiones a fuentes estacionarias



Control de emisiones a fuentes móviles



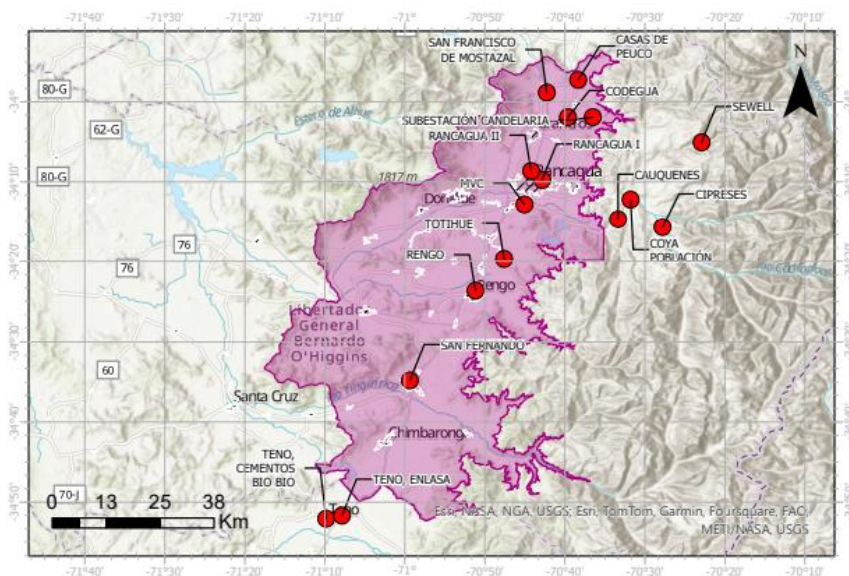
Compensación de emisiones



Educación ambiental



Gestión de episodios críticos

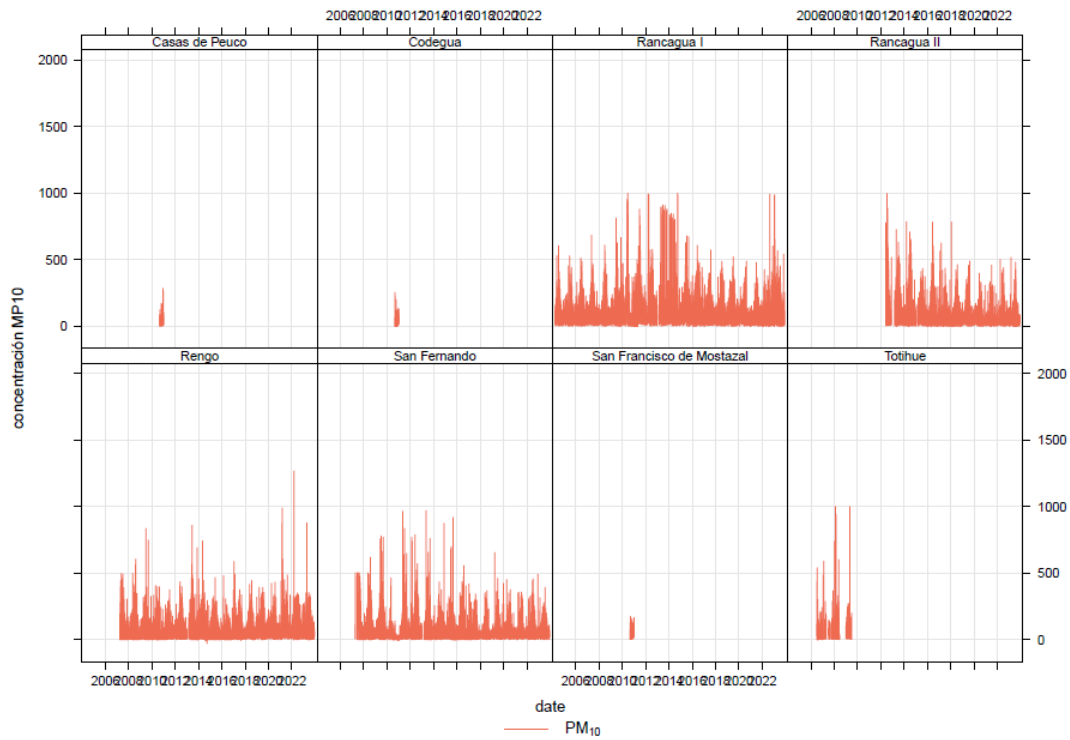


Estaciones consideradas:

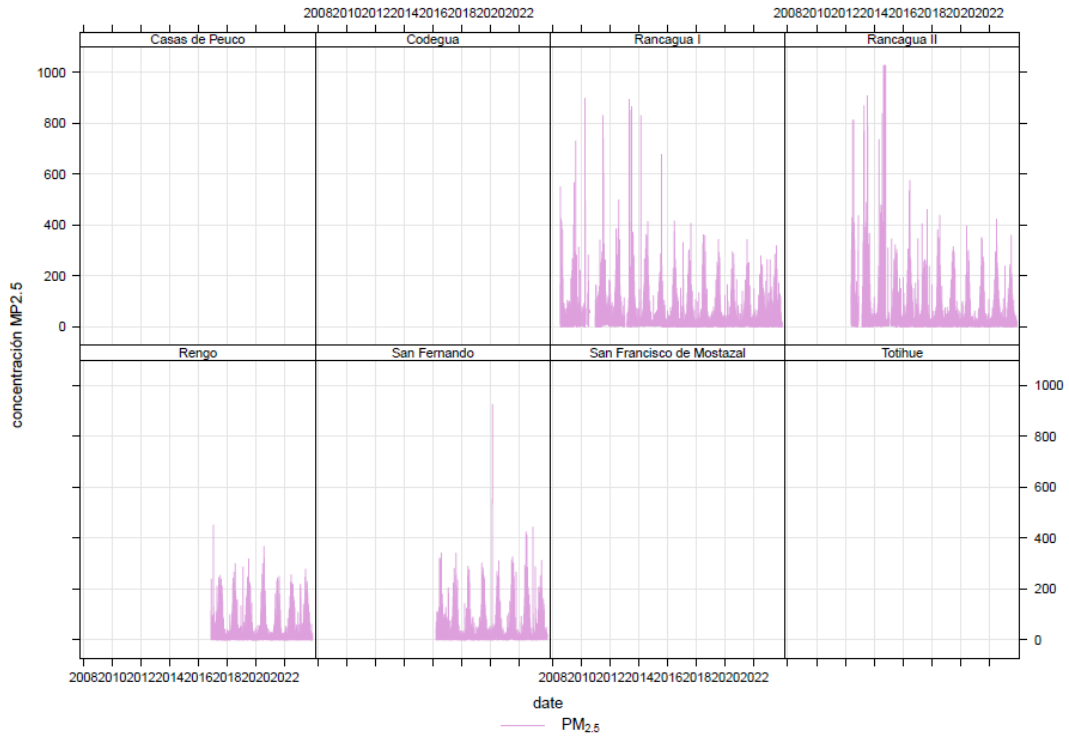
- Rancagua 1
- Rancagua 2
- Rengo
- San Fernando

SERIES DE TIEMPO

MP₁₀

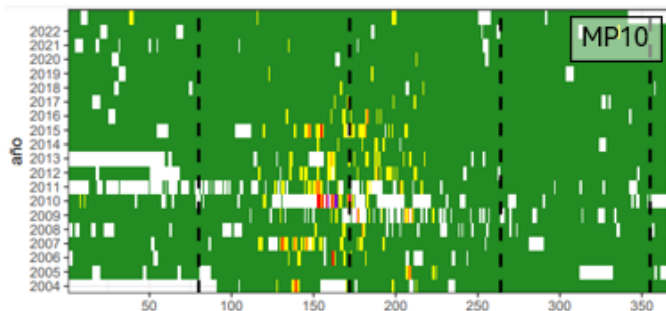


MP_{2.5}

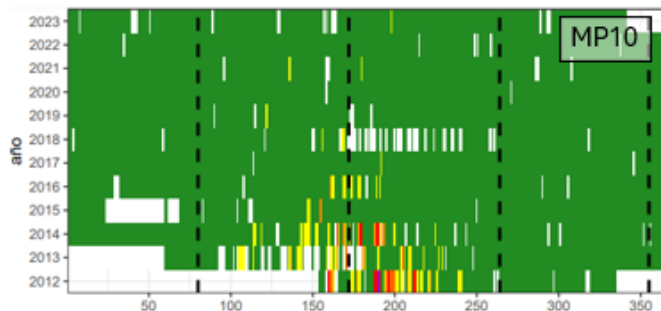


EPISODIOS CRÍTICOS

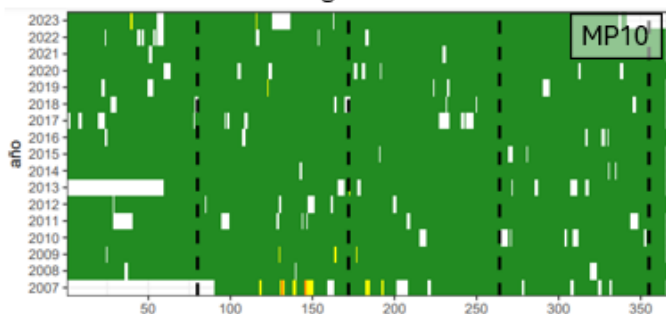
Rancagua 1



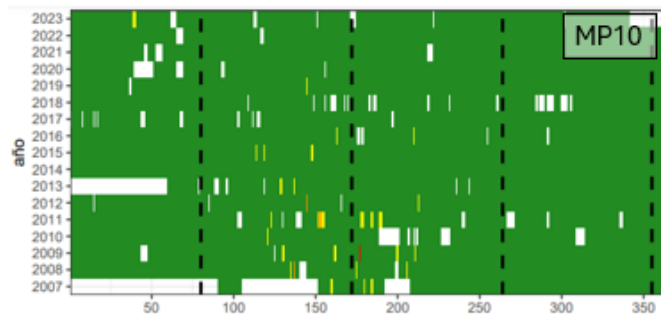
Rancagua 2



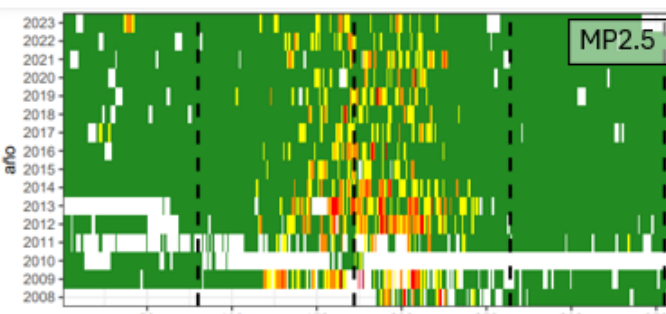
Rengo



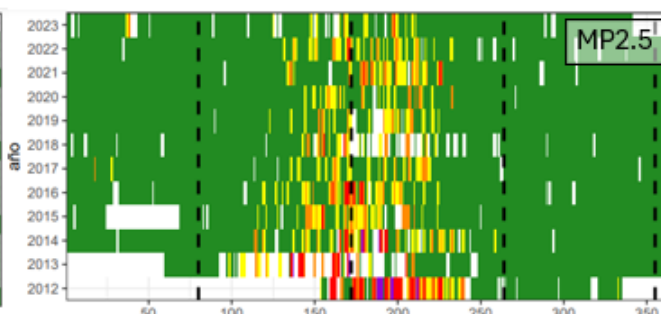
San Fernando



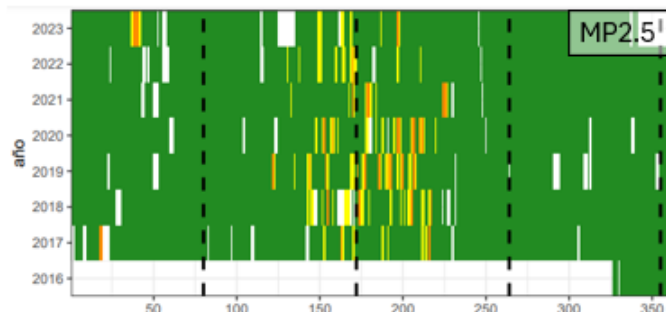
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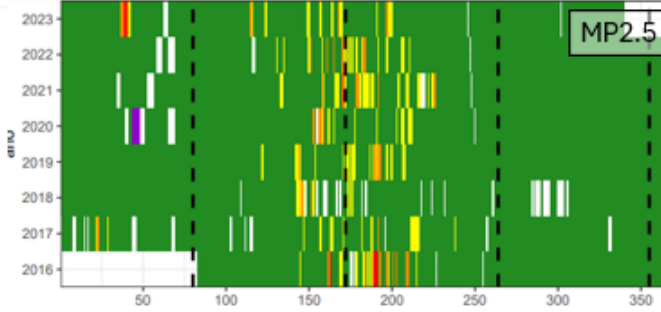
Rancagua 2



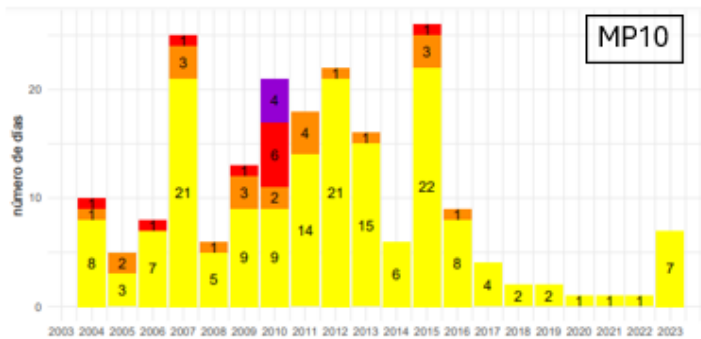
Rengo



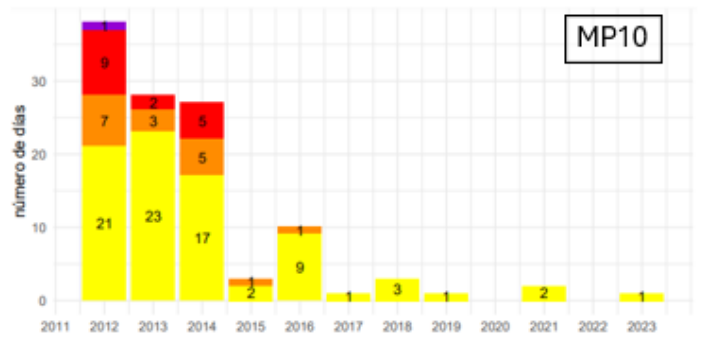
San Fernando



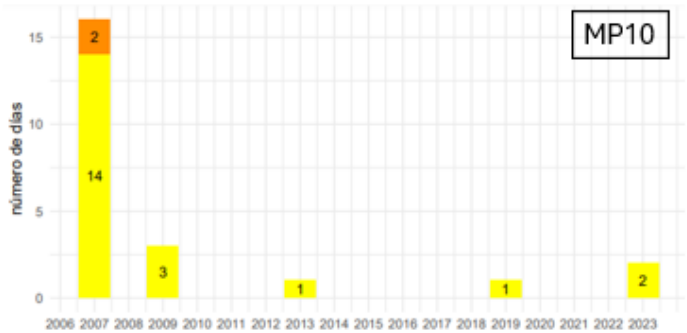
Rancagua 1



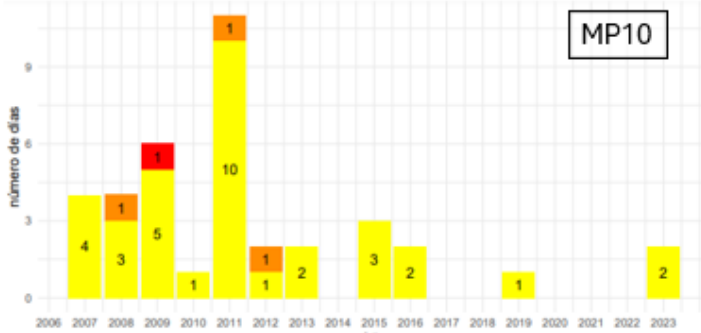
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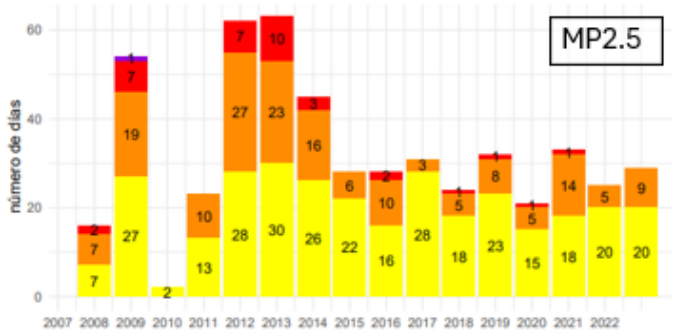
Rengo



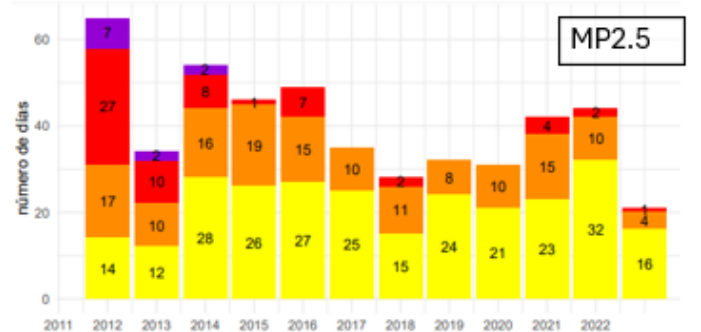
San Fernando



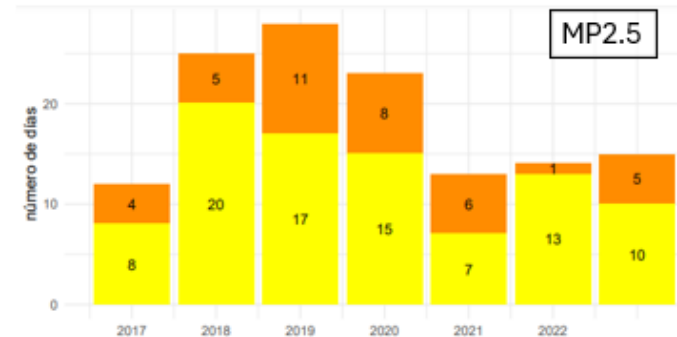
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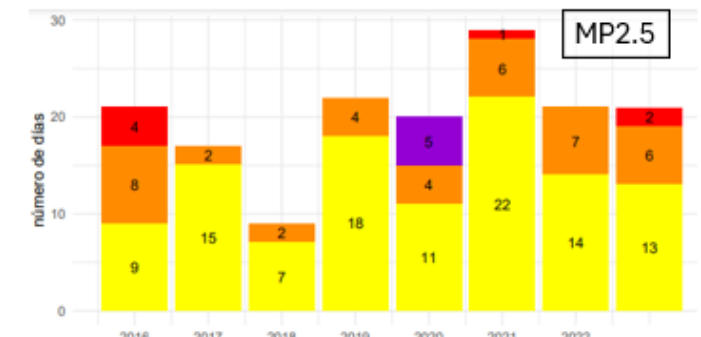
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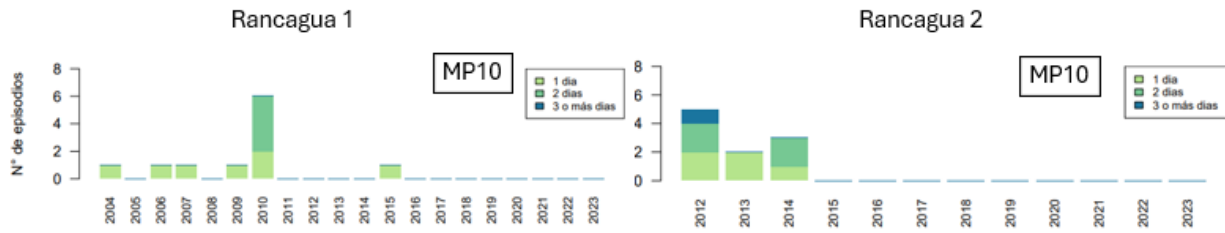
Rengo



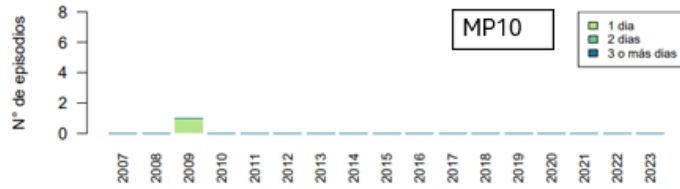
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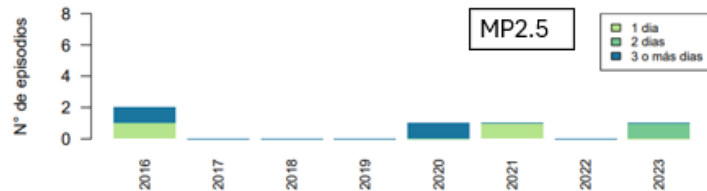
DURACIÓN EPISODIOS CRÍTICOS



San Fernando

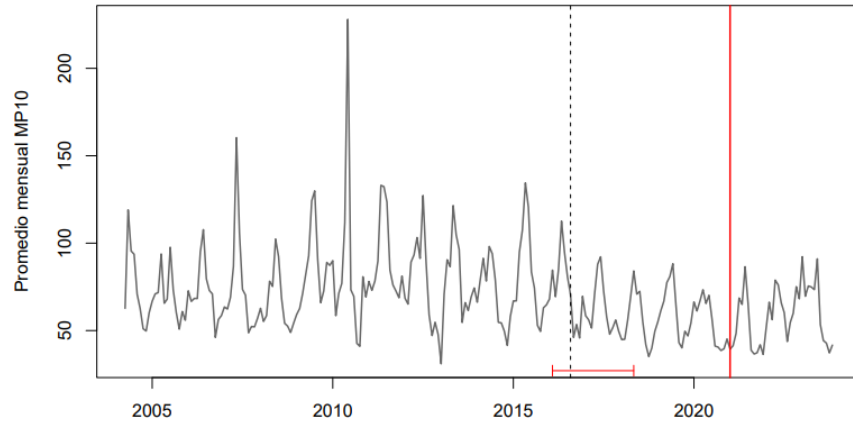


San Fernando

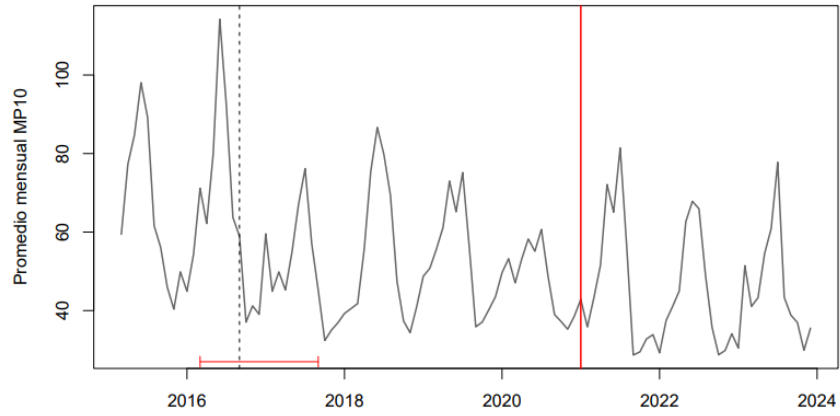


PUNTOS DE QUIEBRE

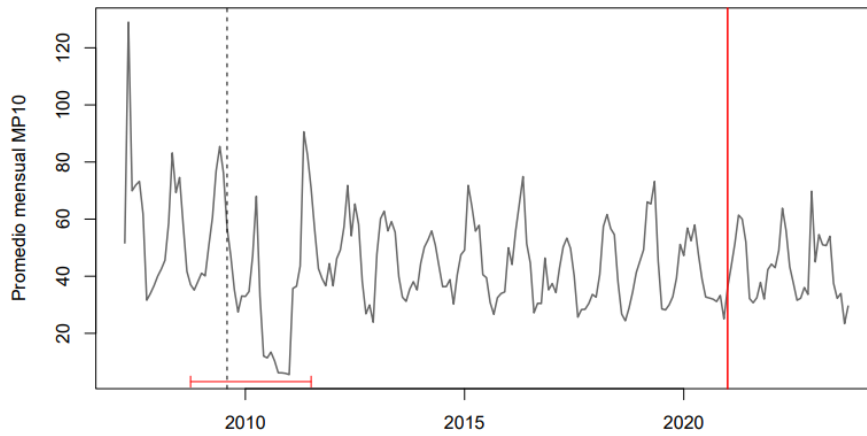
O'Higgins - Estacion Rancagua 1 (MP10)



O'Higgins - Estacion Rancagua 2 (MP10)

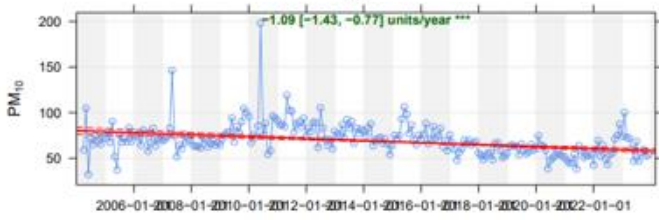


O'Higgins - Estacion San Fernando (MP10)

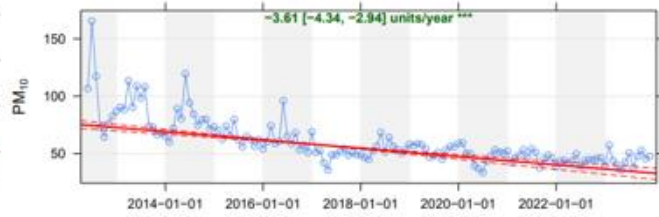


TENDENCIAS

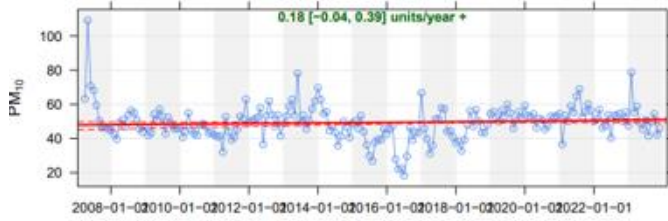
Rancagua 1



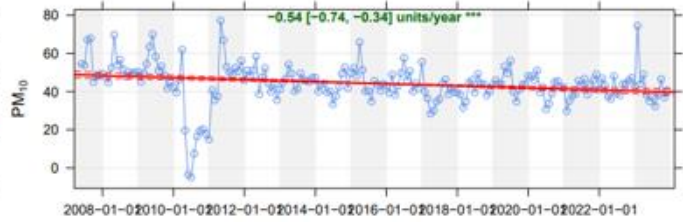
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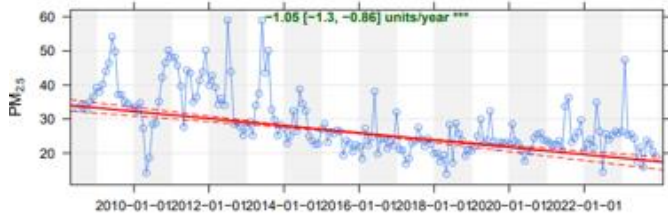
Rengo



San Fernando



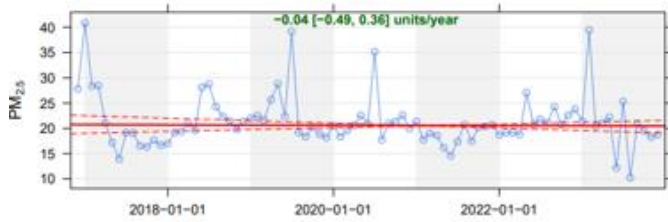
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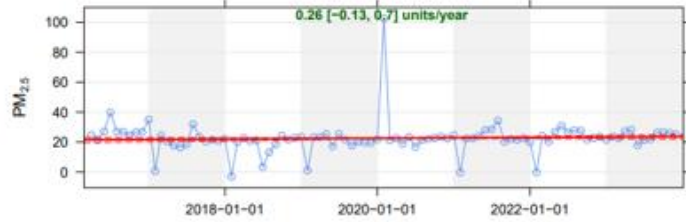
Rancagua 2



Rengo

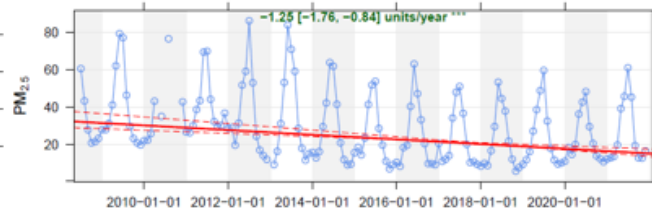
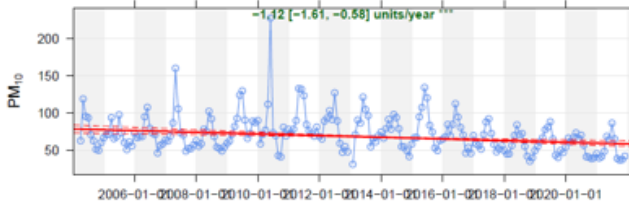


San Fernando

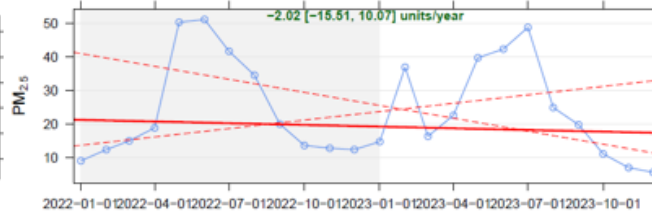
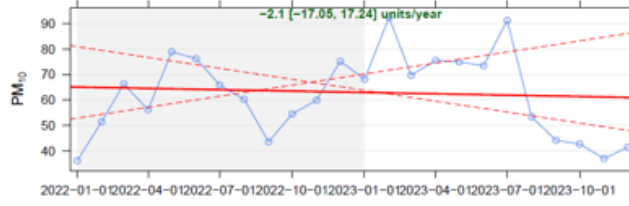


RANCAGUA 1

Antes PDA

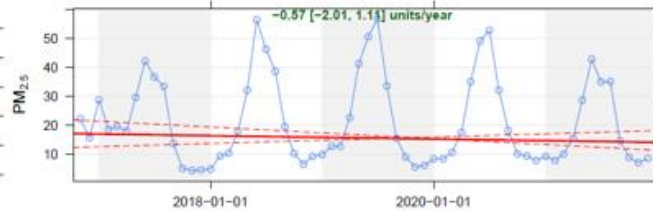
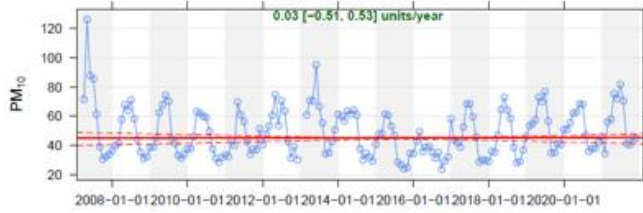


Después PDA

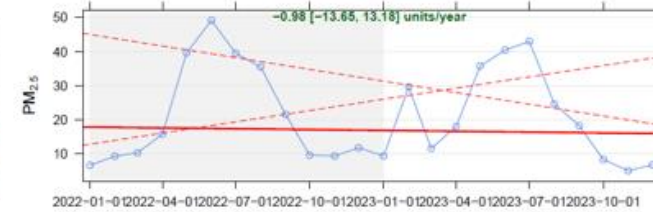
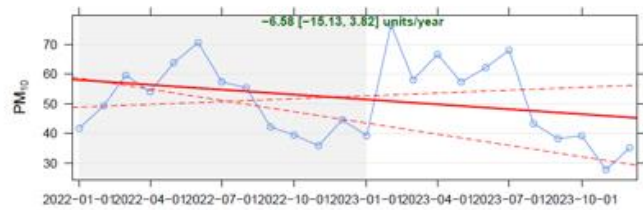


RENGO

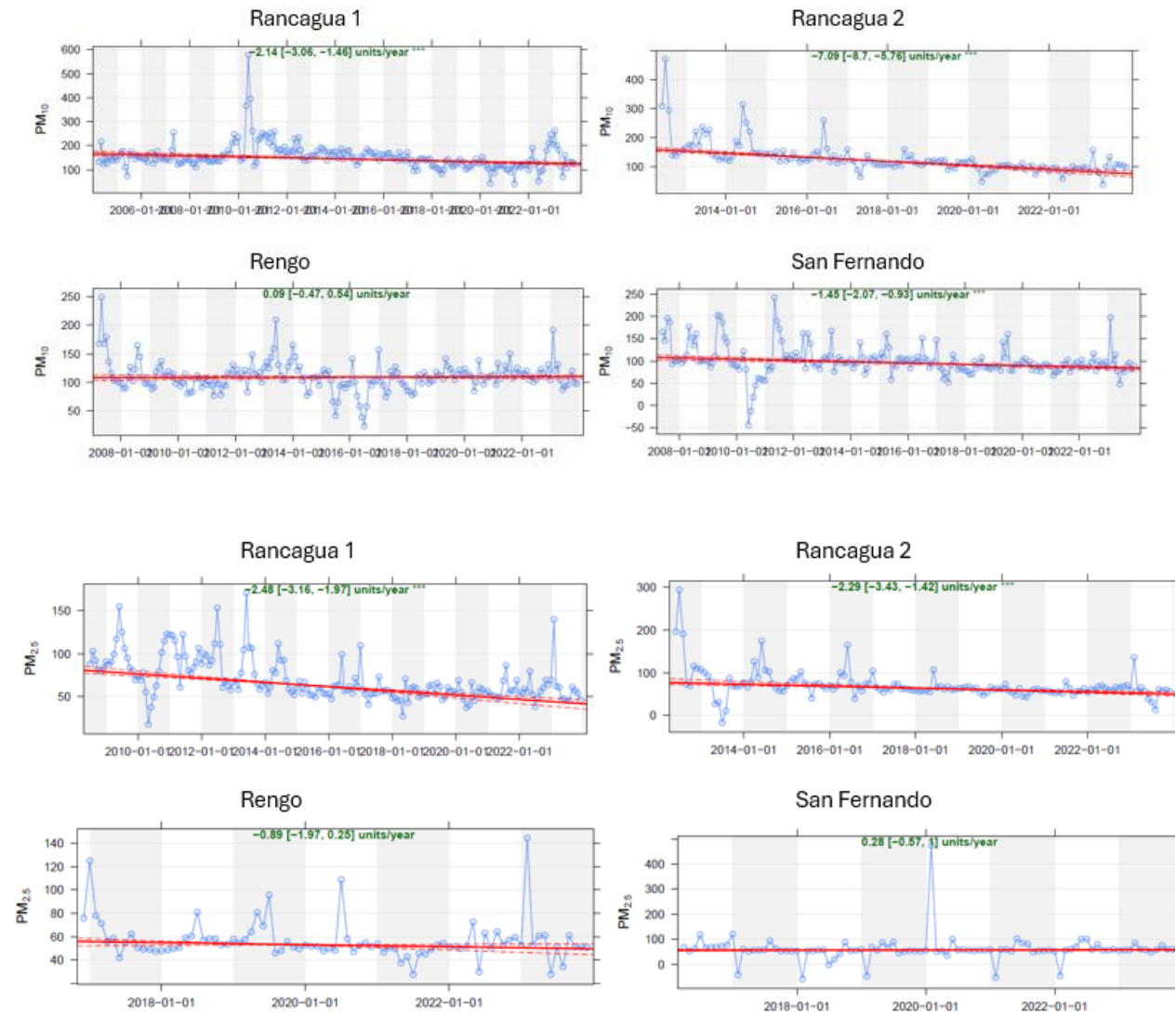
Antes PDA



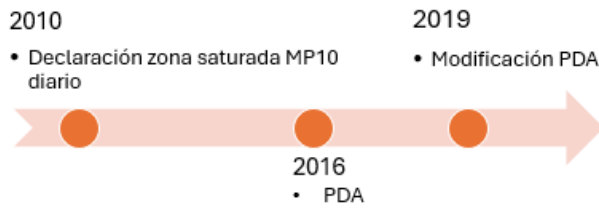
Después PDA



TENDENCIA PERCENTIL 95



Anexo VIII: PDA para comunas Talca y Maule

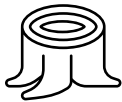


Población: 280 298 hab.

Área: 469,7 km³

Densidad poblacional: 596.8 hab/km²

PRINCIPALES MEDIDAS



Uso y mejoramiento de calidad de leña



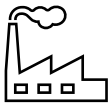
Uso y mejoramiento de artefactos



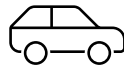
Mejoramiento eficiencia térmica de viviendas



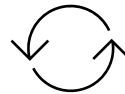
Control de emisiones a quemas agrícolas y domiciliarias



Control de emisiones a fuentes estacionarias



Control de emisiones a fuentes móviles



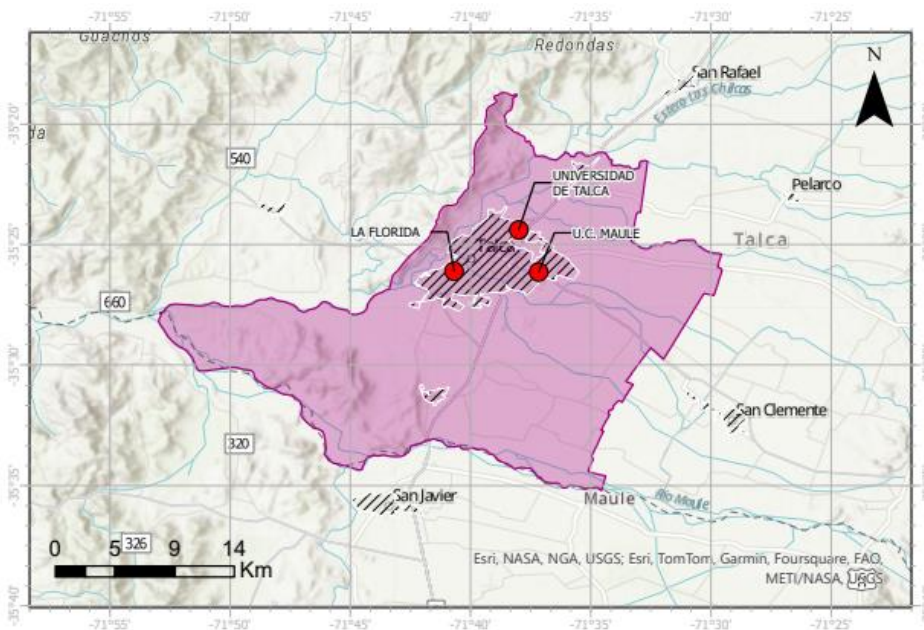
Compensación de emisiones



Educación ambiental



Gestión de episodios críticos

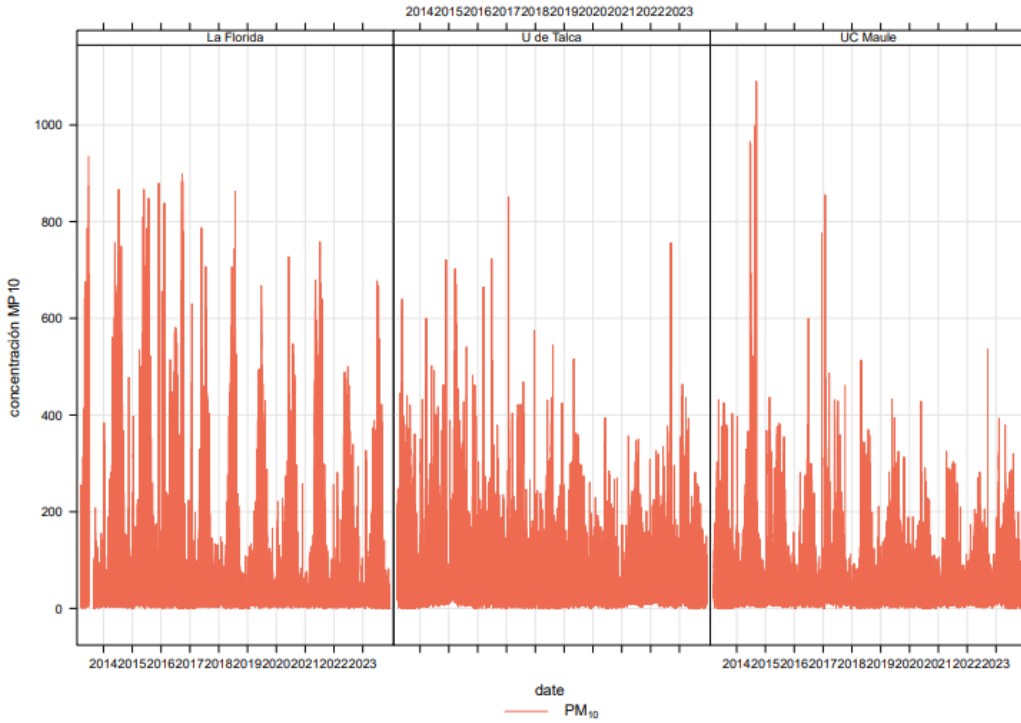


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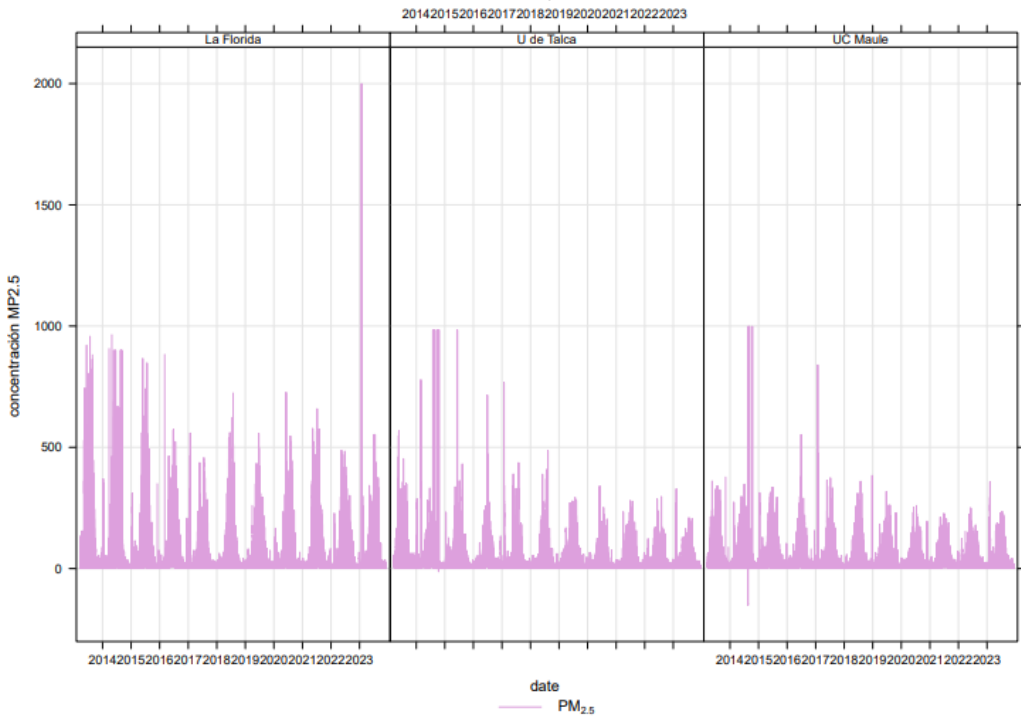
- La Florida
- UC Maule
- Universidad de Talca

SERIES DE TIEMPO

MP₁₀

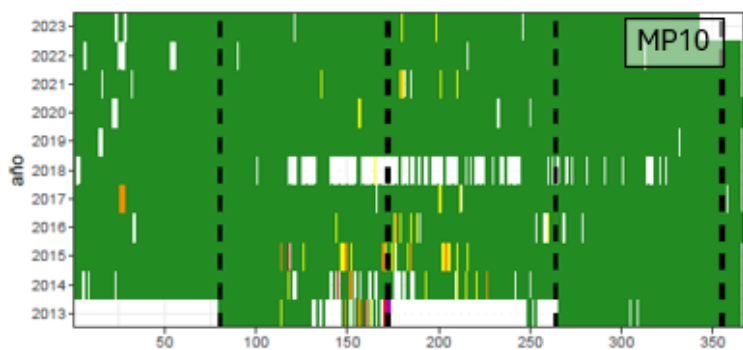


MP_{2.5}

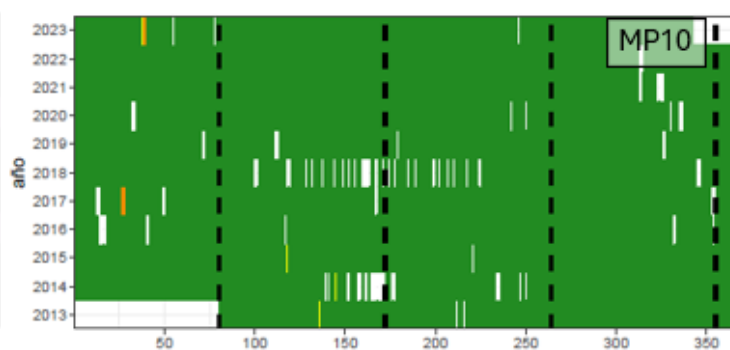


EPISODIOS CRÍTICOS

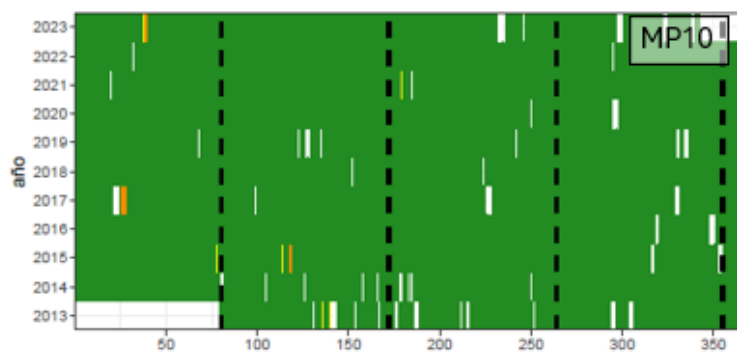
La Florida



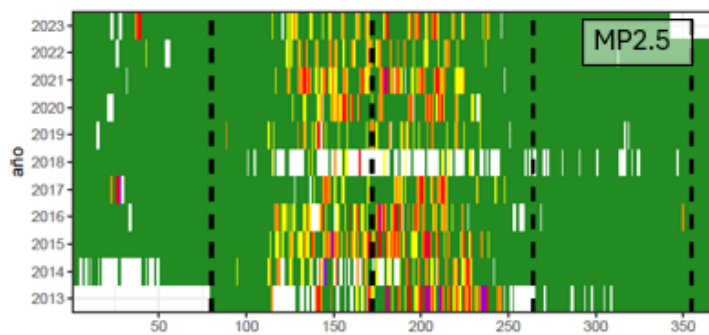
UC Maule



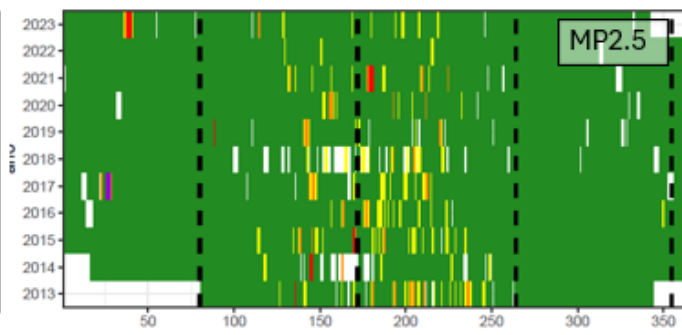
U de Talca



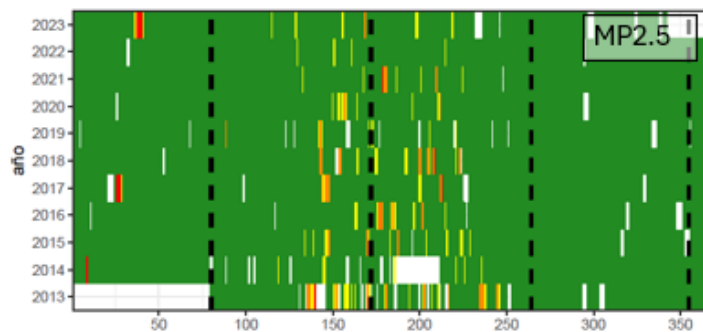
La Florida

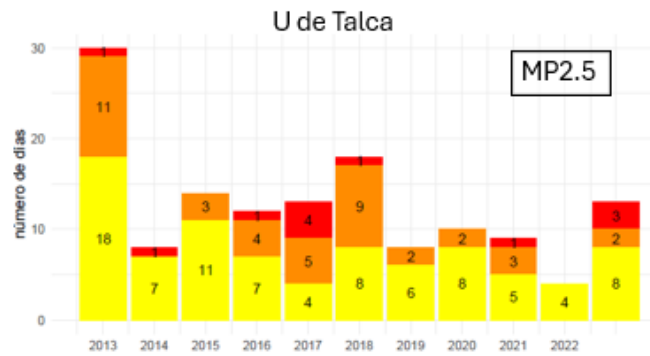
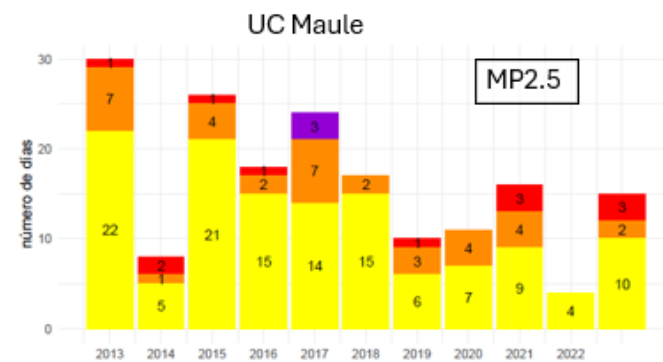
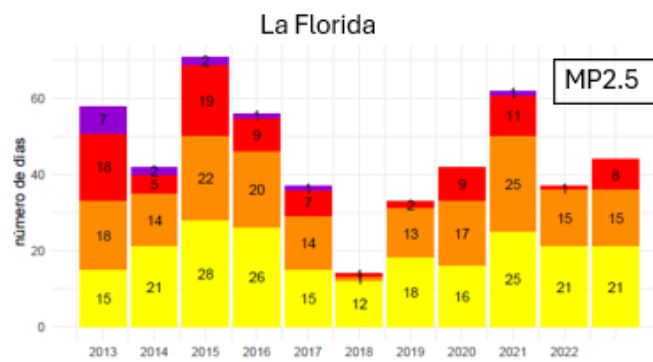
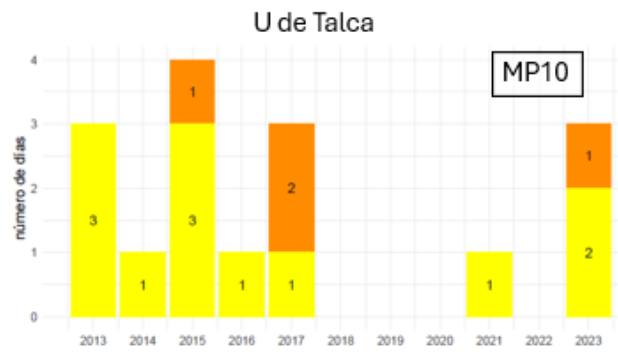
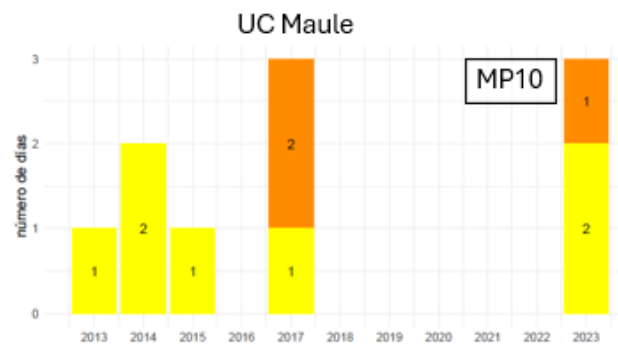
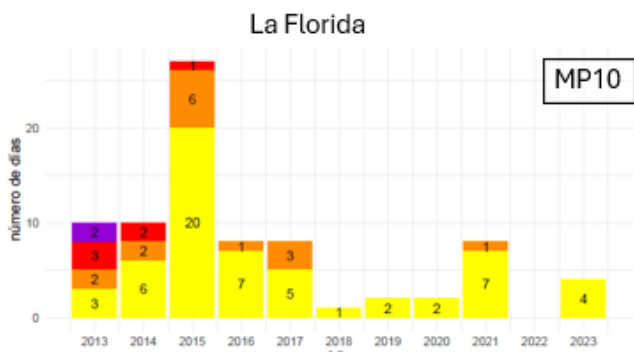


UC Maule

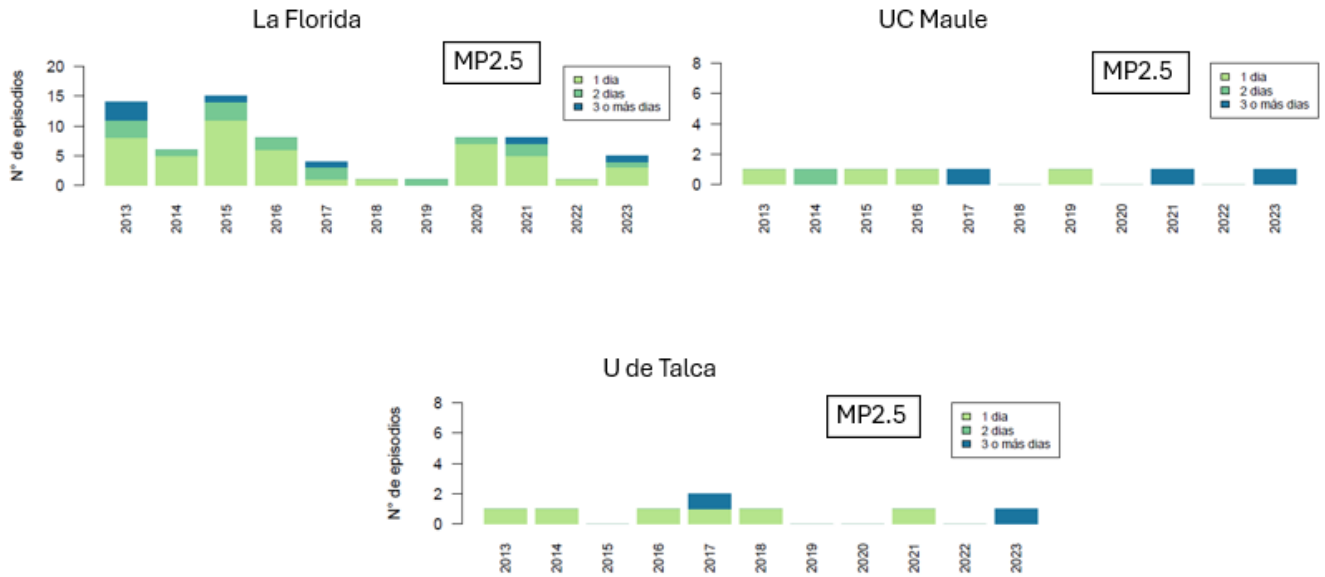


U de Talca



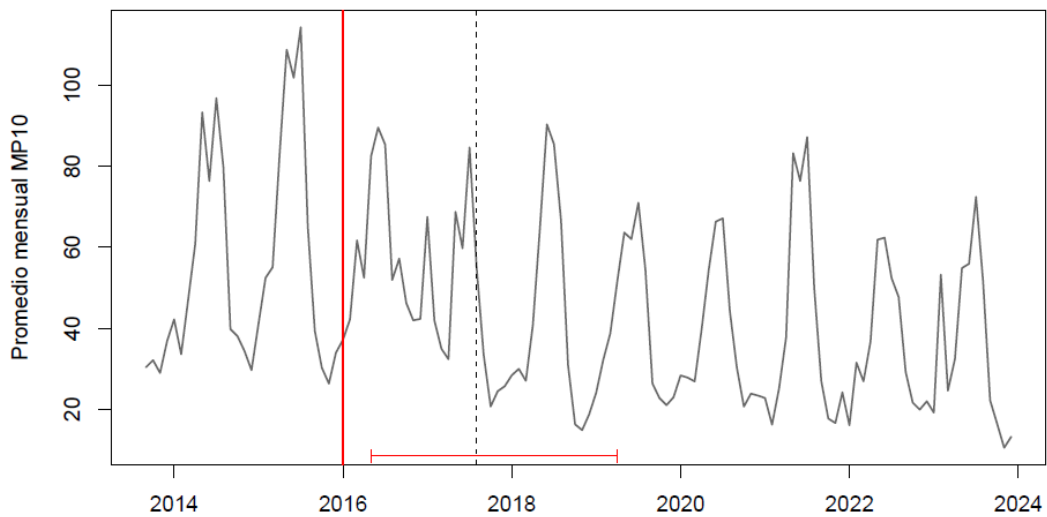


DURACIÓN EPISODIOS CRÍTICOS

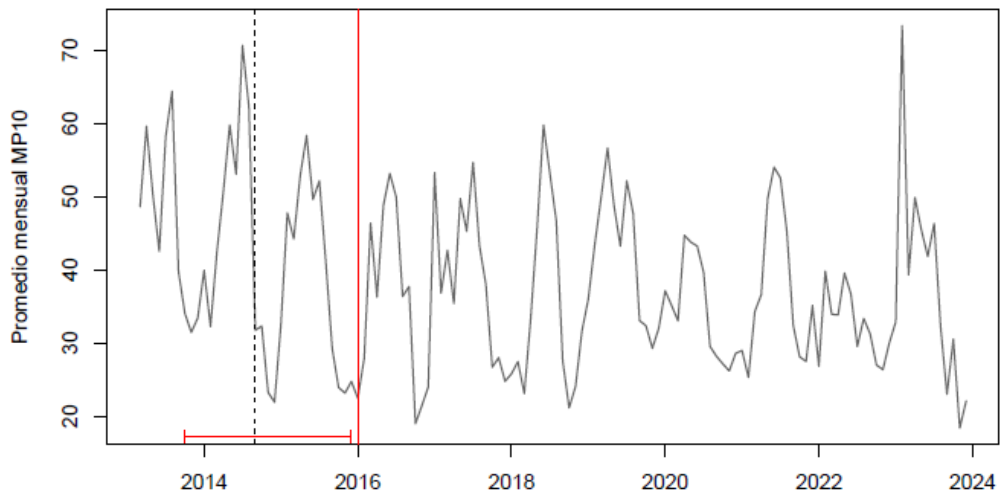


PUNTOS DE QUIEBRE

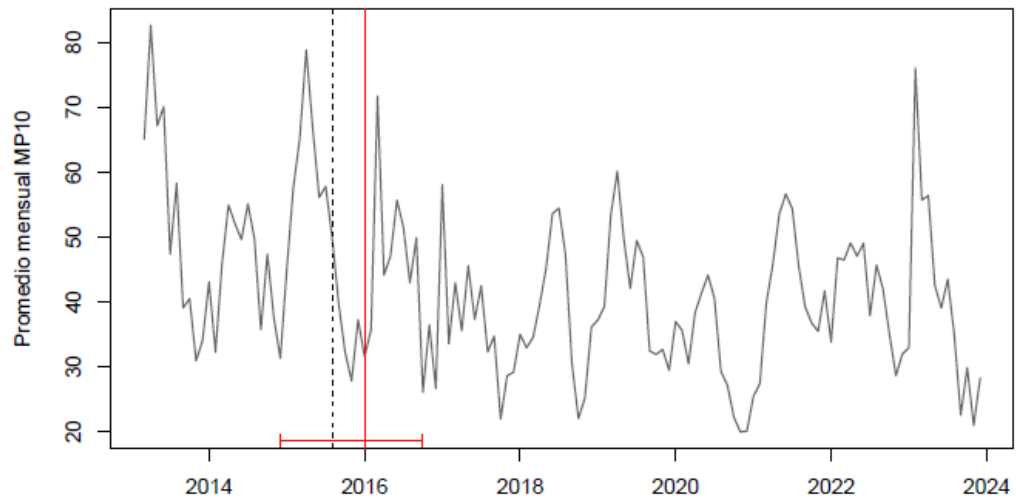
Maule - Estacion La Florida (MP10)



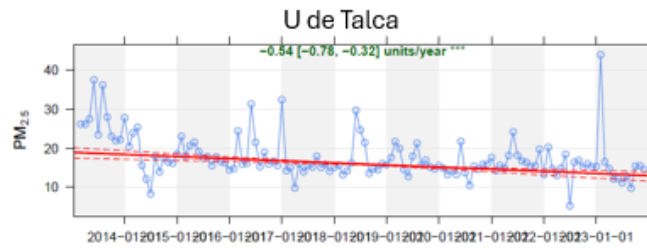
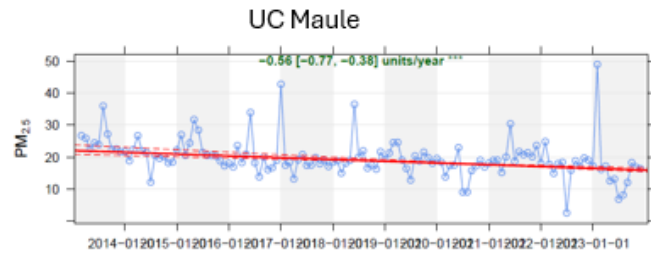
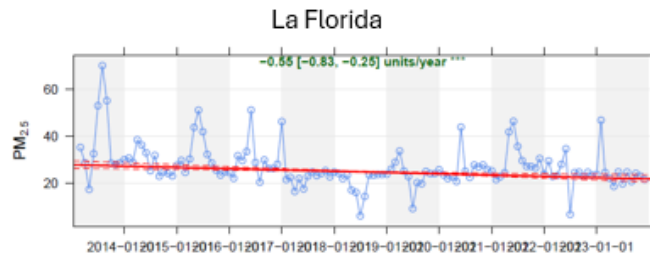
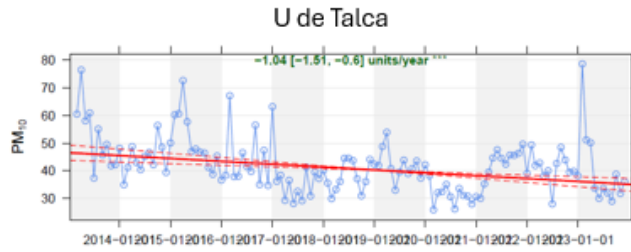
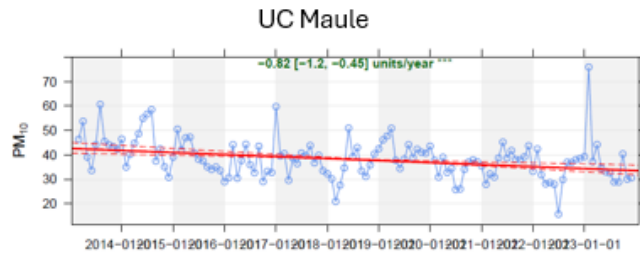
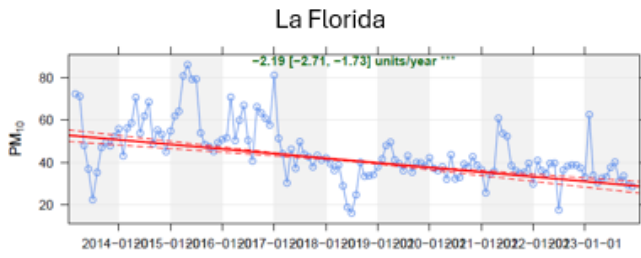
Maule - Estacion UC Maule (MP10)



Maule - Estacion U de Talca (MP10)

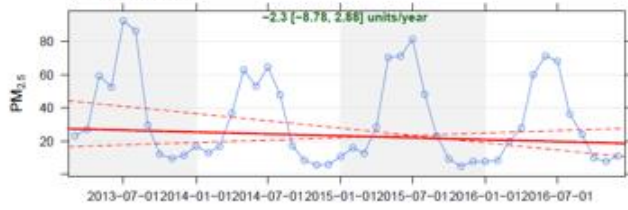


TENDENCIAS

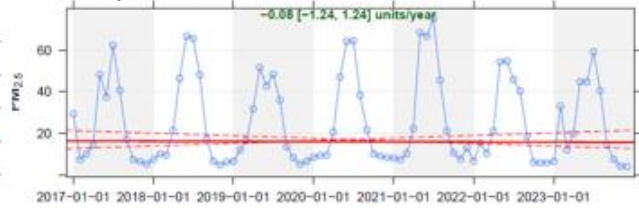


La Florida

Antes PDA



Después PDA

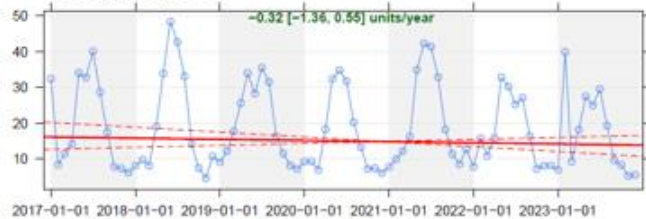


UC Maule

Antes PDA



Después PDA

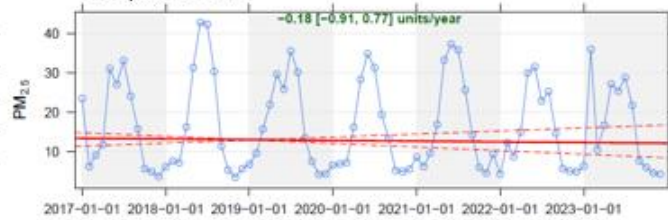


U de Talca

Antes PDA



Después PDA

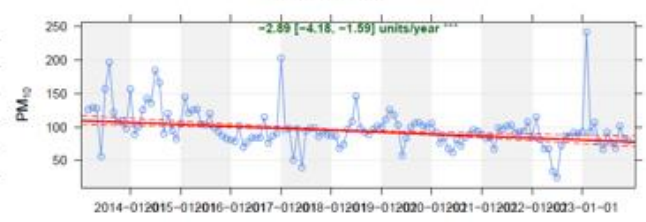


TENDENCIAS PERCENTIL 95

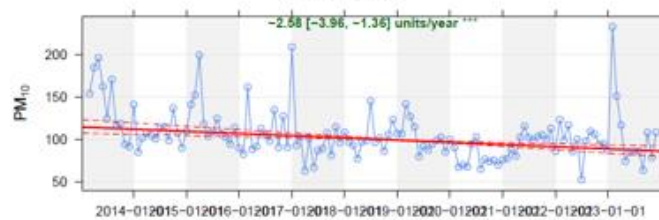
La Florida



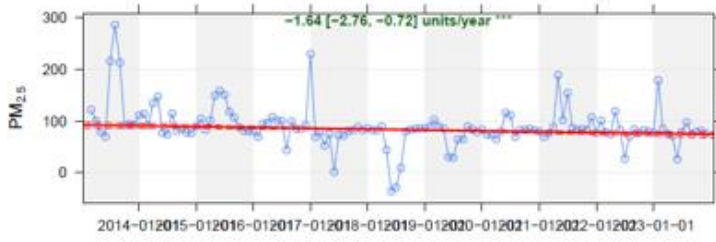
UC Maule



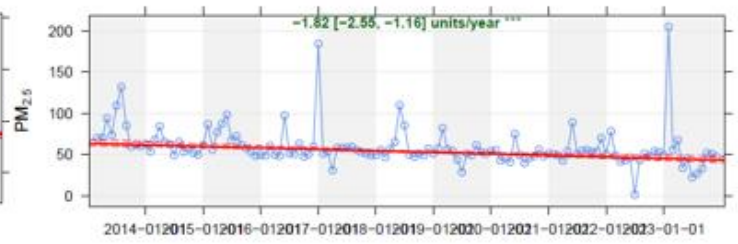
U de Talca



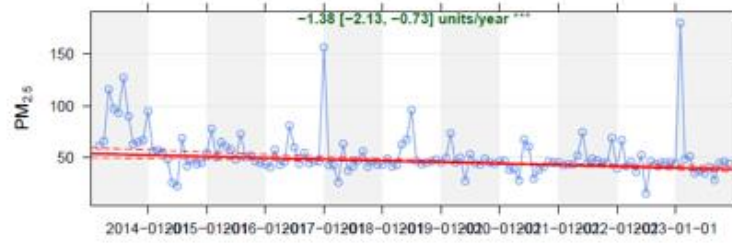
La Florida



UC Maule



U de Talca



Anexo IX: PDA para Valle Central de la Provincia de Curicó

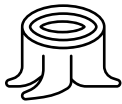


Población: 222 494 habitantes

Área:

Densidad poblacional:

PRINCIPALES MEDIDAS



Uso y mejoramiento de calidad de leña



Uso y mejoramiento de artefactos



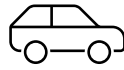
Mejoramiento eficiencia térmica de viviendas



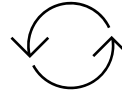
Control de emisiones a quemas agrícolas y domiciliarias



Control de emisiones a fuentes estacionarias



Control de emisiones a fuentes móviles



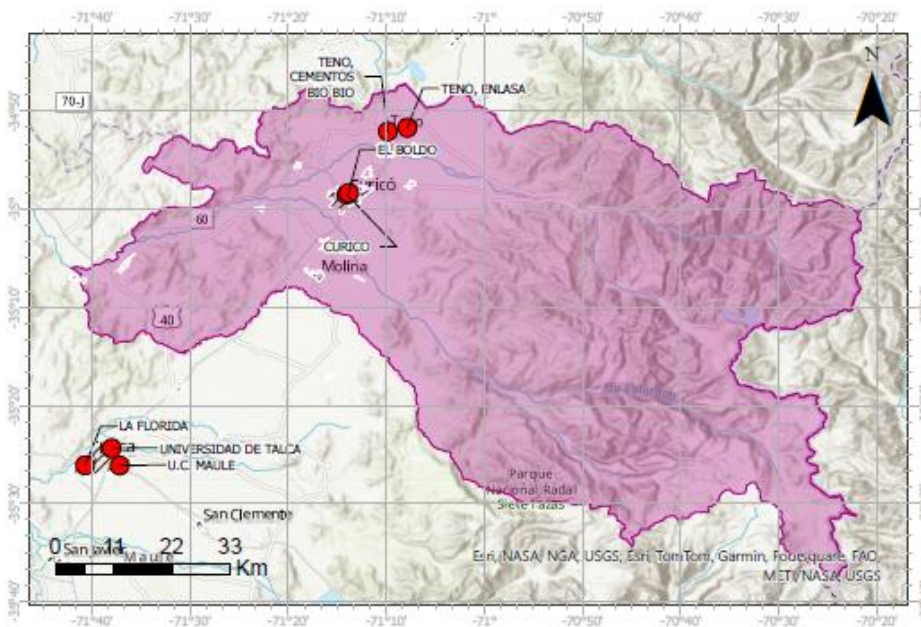
Compensación de emisiones



Educación ambiental



Gestión de episodios críticos

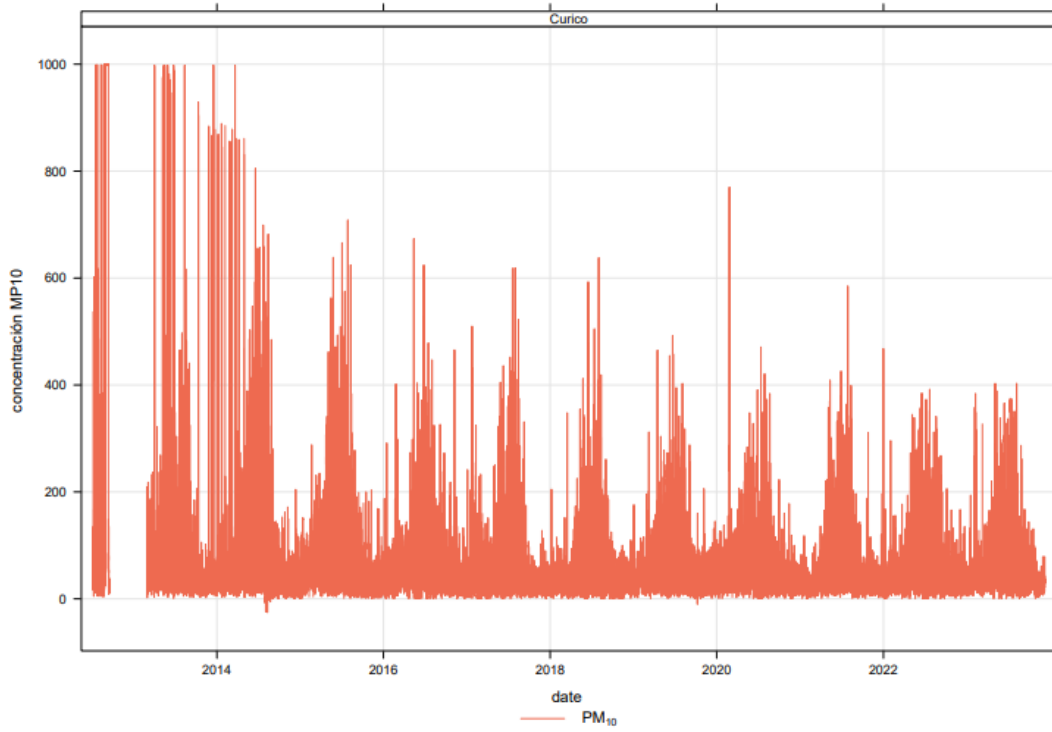


Estaciones consideradas:

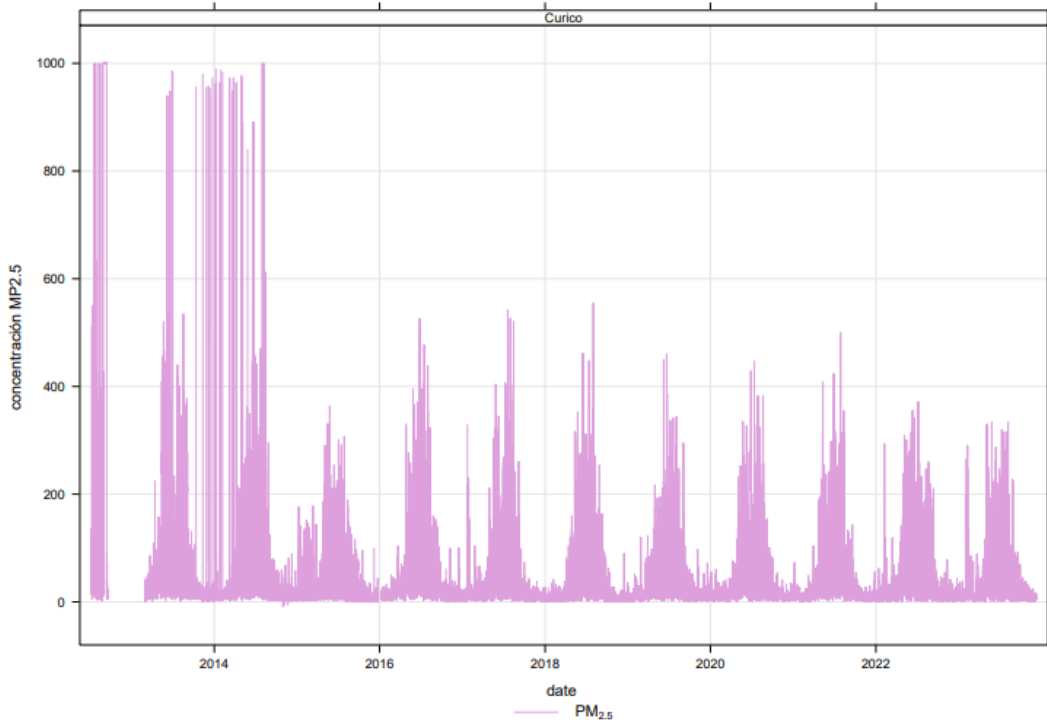
- Curicó

SERIES DE TIEMPO

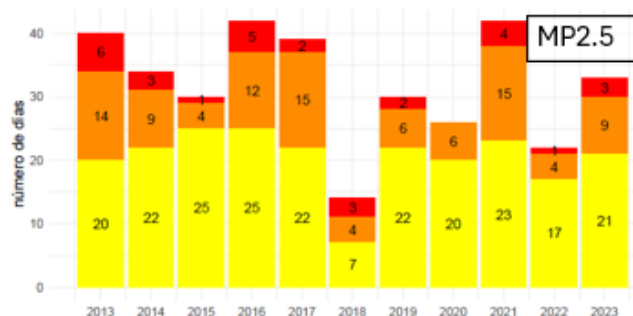
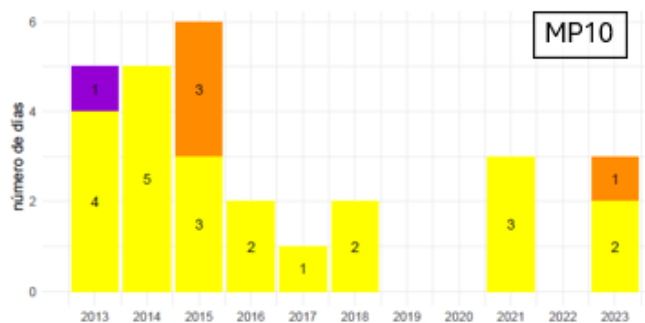
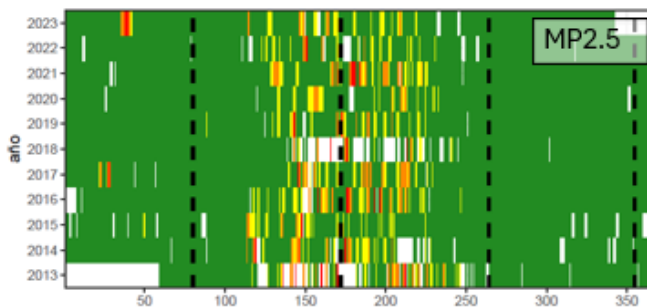
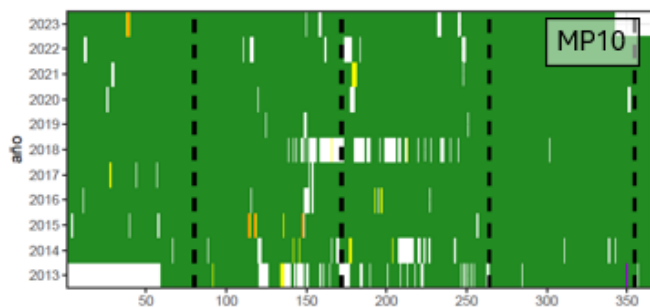
MP₁₀



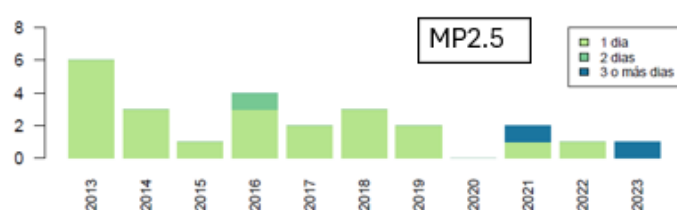
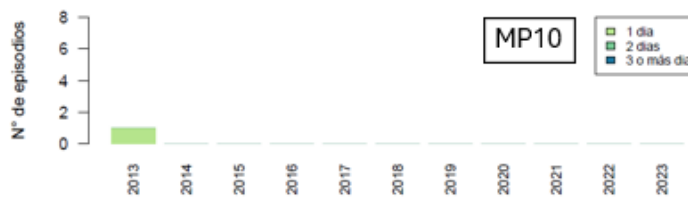
MP_{2.5}



EPISODIOS CRÍTICOS

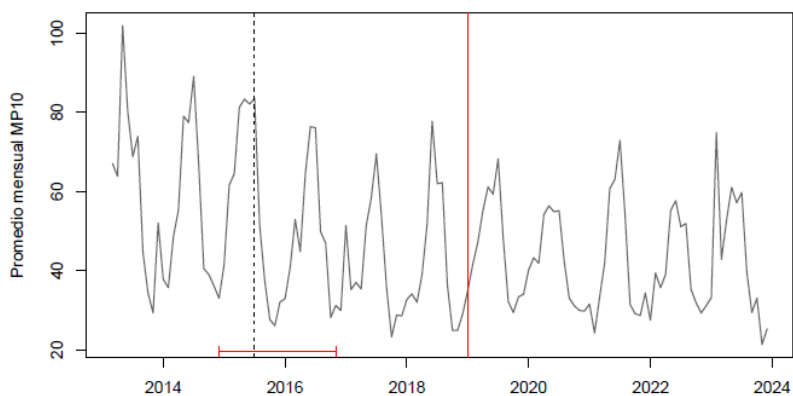


DURACIÓN EPISODIOS CRÍTICOS



PUNTO DE QUIEBRE

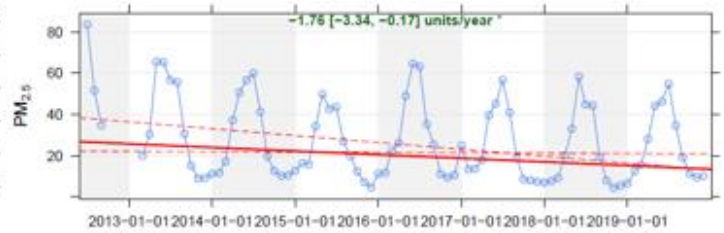
Curico - Estacion Curico (MP10)



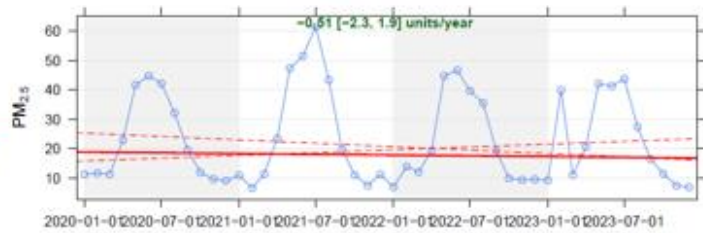
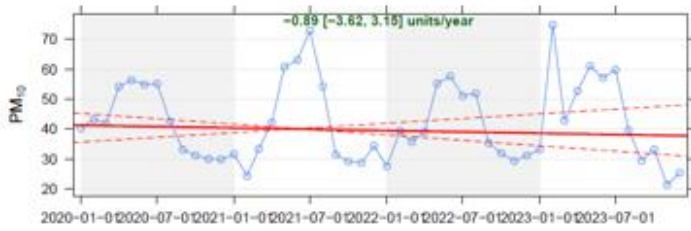
TENDENCIAS



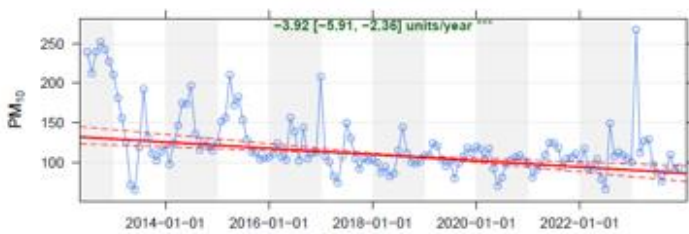
Antes PDA



Después PDA



TENDENCIAS PERCENTIL 95



Anexo X: PDA para las Comunas de Chillán y Chillán Viejo



Población: 184 037 habitantes

Área: 803 km²

Densidad poblacional: 229,2 hab/km²

PRINCIPALES MEDIDAS



Uso y mejoramiento de calidad de leña



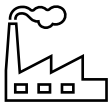
Uso y mejoramiento de artefactos



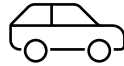
Mejoramiento eficiencia térmica de viviendas



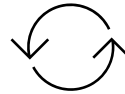
Control de emisiones a quemas agrícolas y domiciliarias



Control de emisiones a fuentes estacionarias



Control de emisiones a fuentes móviles



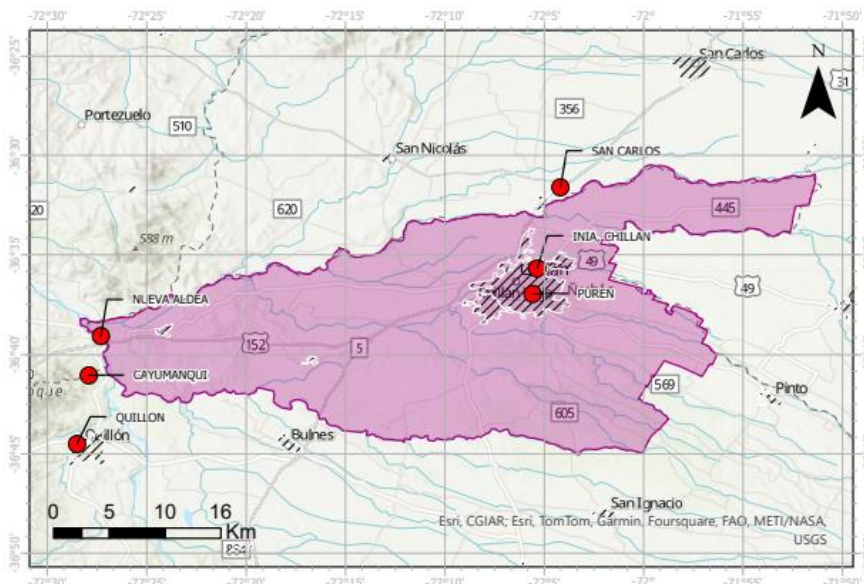
Compensación de emisiones



Educación ambiental



Gestión de episodios críticos

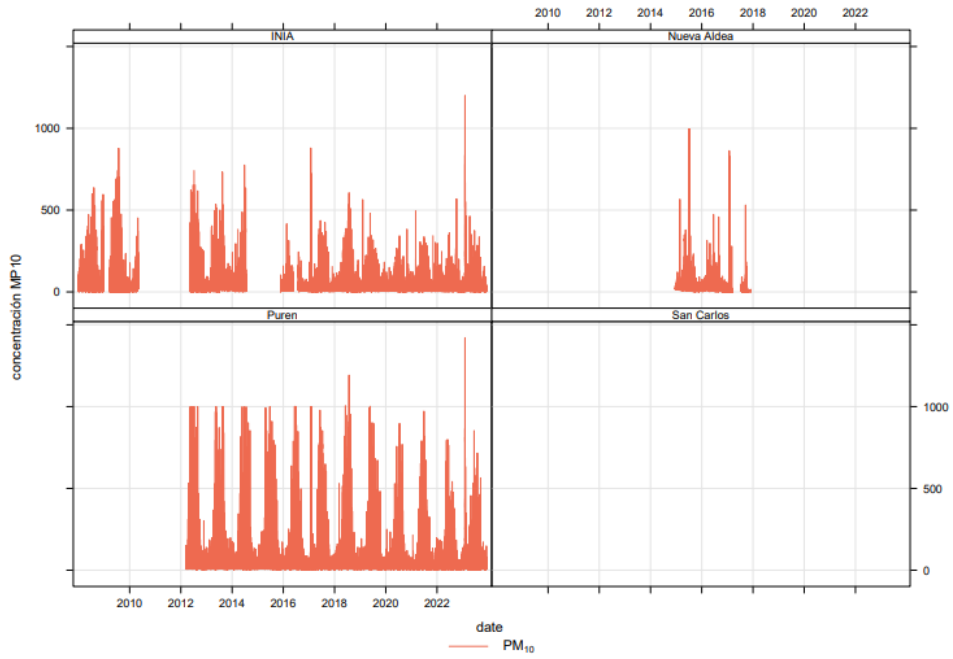


Estaciones consideradas:

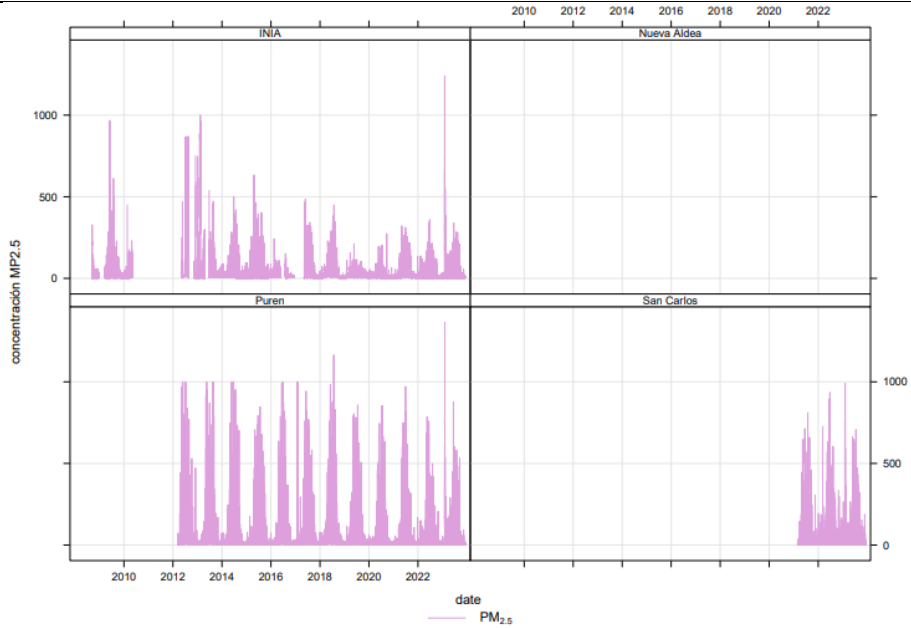
- INIA
- Puren

SERIES DE TIEMPO

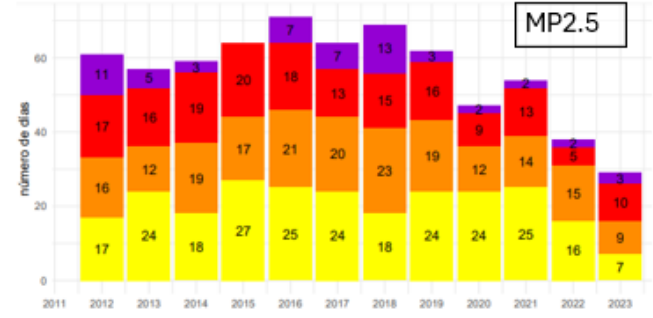
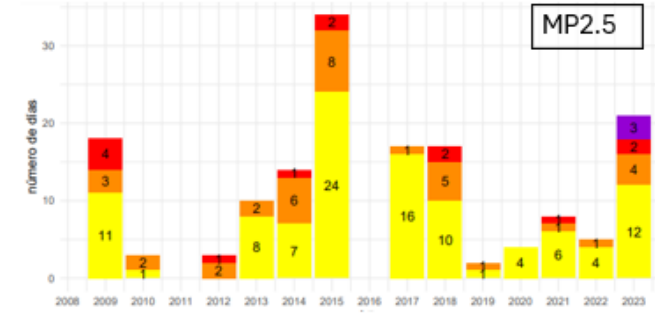
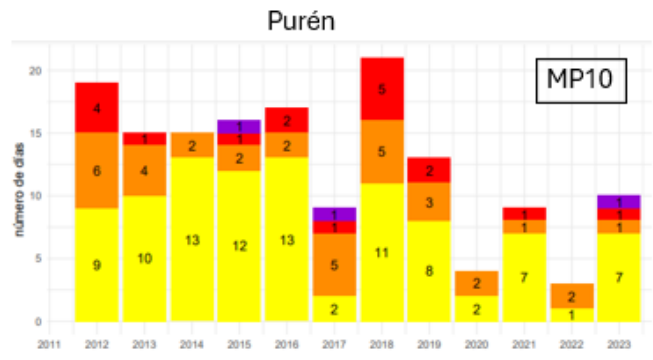
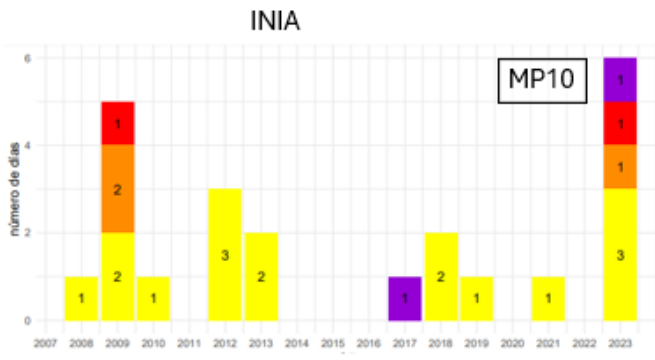
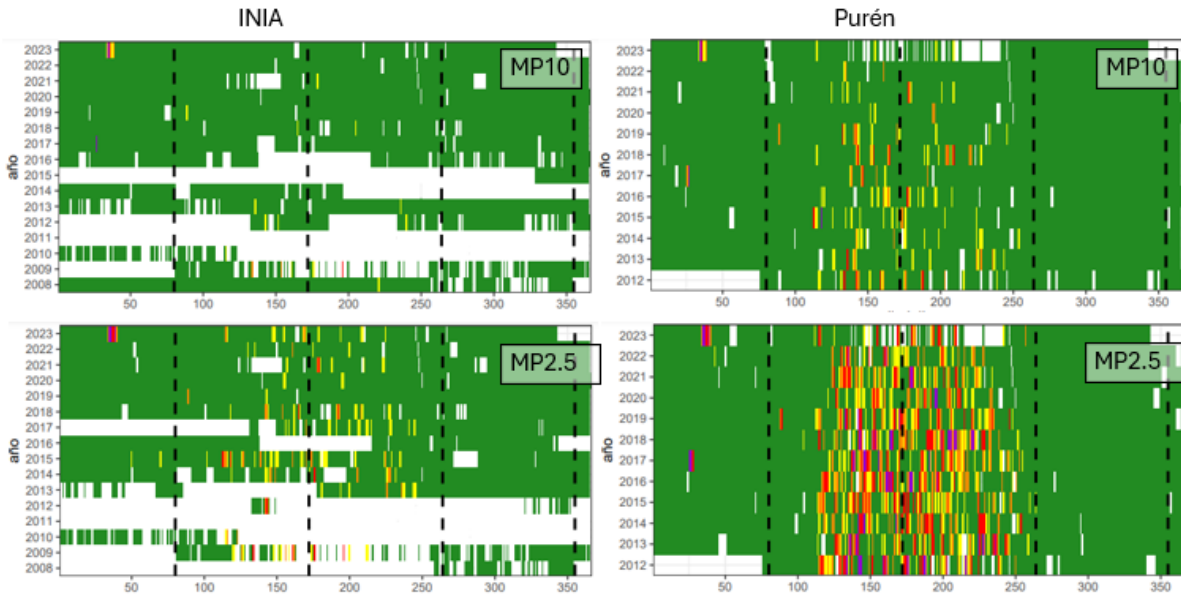
MP₁₀



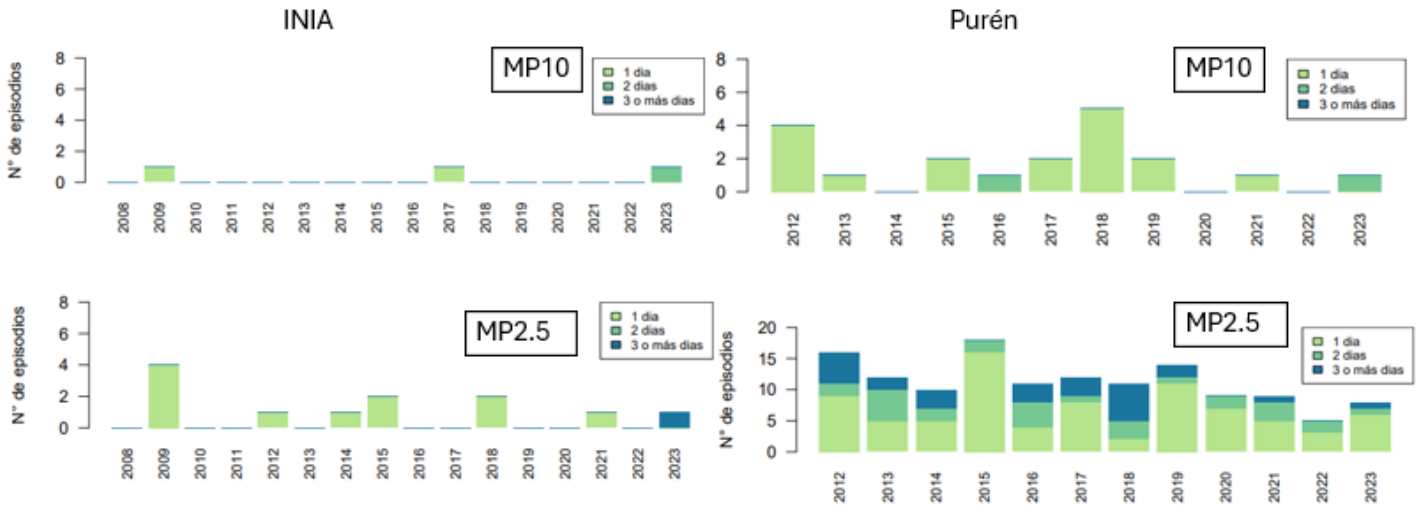
MP_{2.5}



EPISODIOS CRÍTICOS

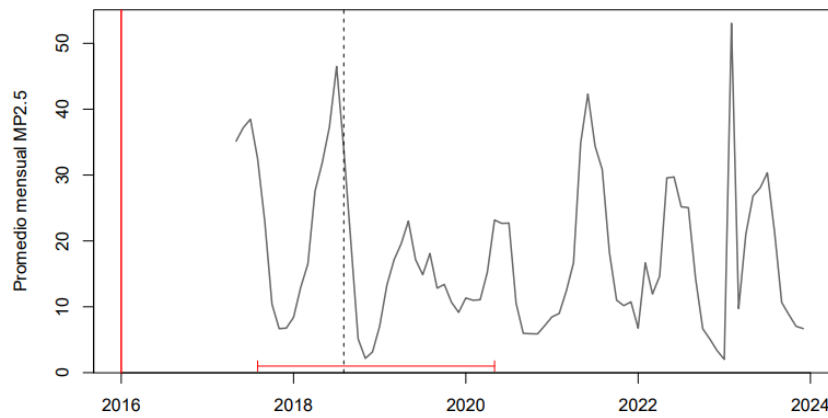


DURACIÓN EPISODIOS

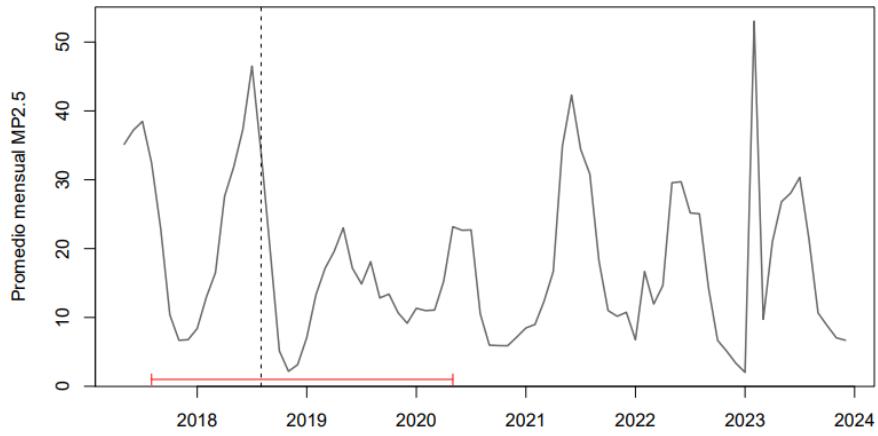


PUNTO DE QUIEBRE

Chillán - Estacion INIA (MP2.5)

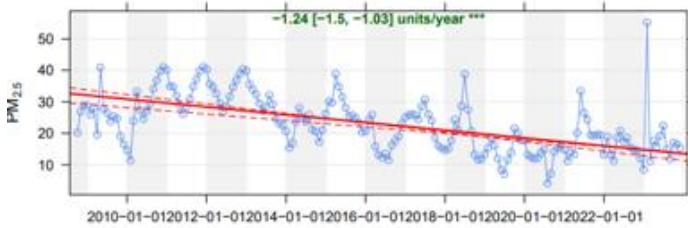
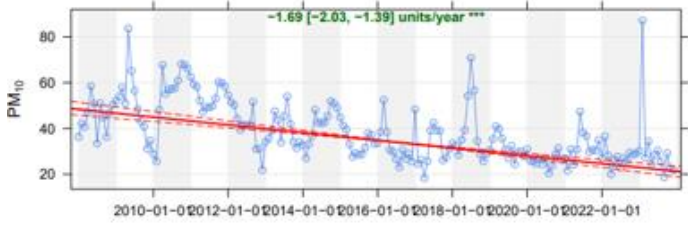


Chillán - Estacion INIA (MP2.5)

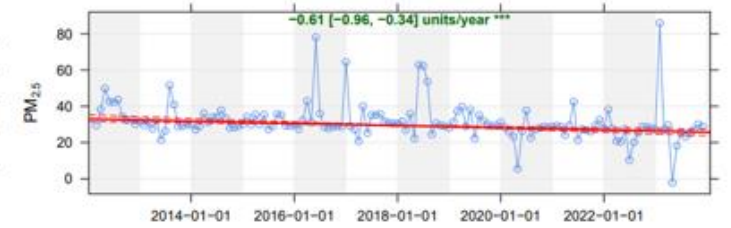


TENDENCIAS

INIA



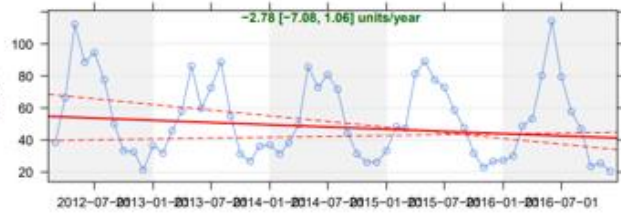
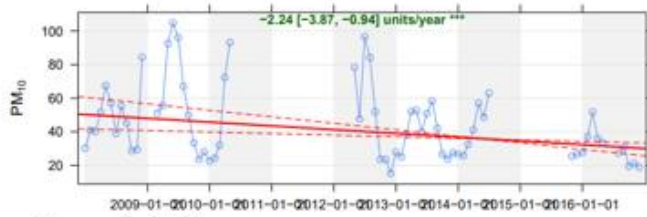
Purén



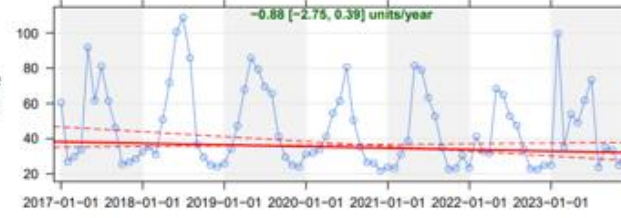
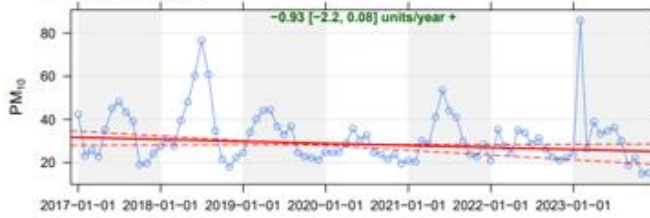
INIA

Purén

Antes PDA



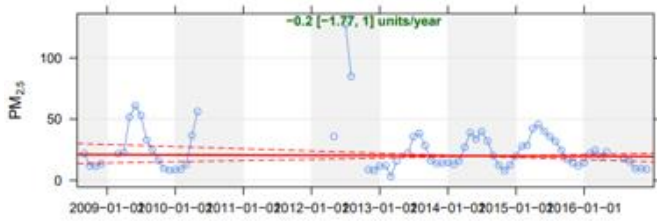
Después PDA



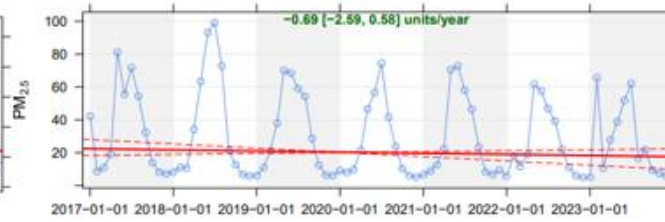
INIA

Purén

Antes PDA



Después PDA

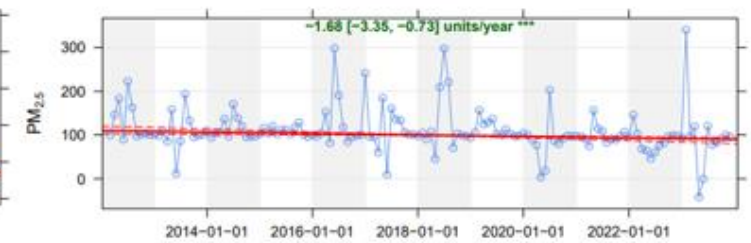


TENDENCIAS PERCENTIL 95

INIA



Purén



Anexo XI: PDA para la comuna de Los Ángeles



Población: 190 030 habitantes

Área: 1 748 km²

Densidad poblacional: 108,7 hab/km²

PRINCIPALES MEDIDAS



Uso y mejoramiento de calidad de leña



Uso y mejoramiento de artefactos



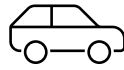
Mejoramiento eficiencia térmica de viviendas



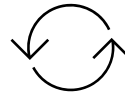
Control de emisiones a quemas agrícolas y domiciliarias



Control de emisiones a fuentes estacionarias



Control de emisiones a fuentes móviles



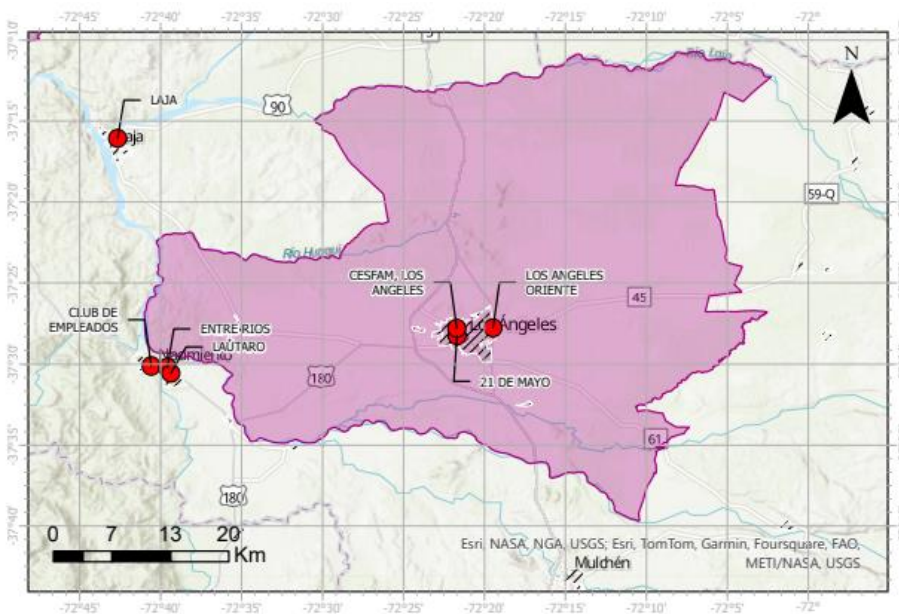
Compensación de emisiones



Educación ambiental



Gestión de episodios críticos

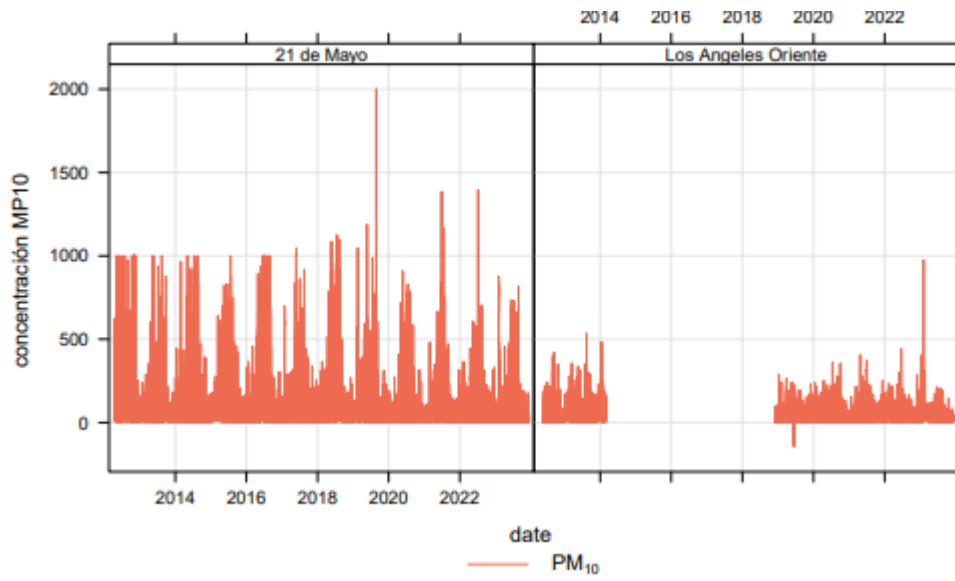


Estaciones consideradas:

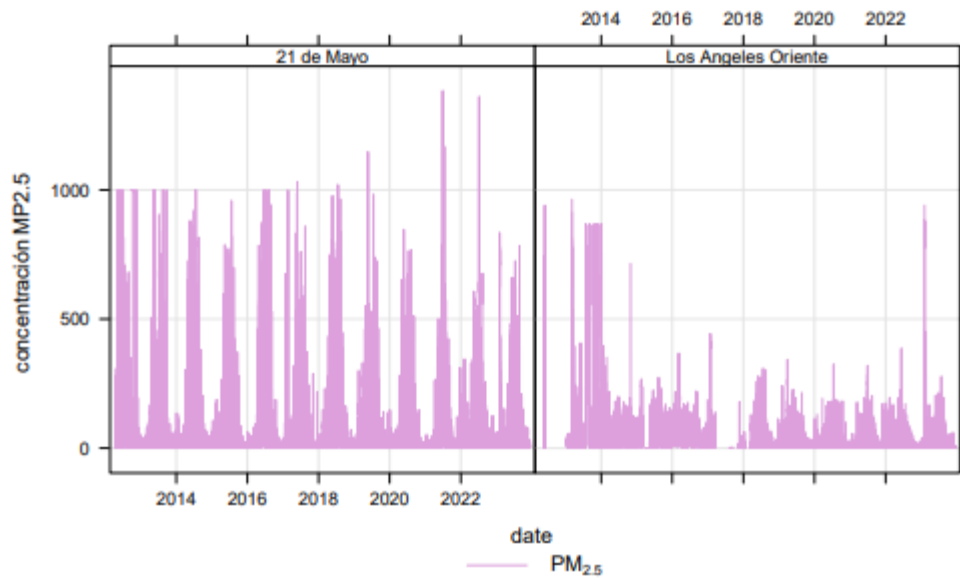
- 21 de mayo

SERIES DE TIEMPO

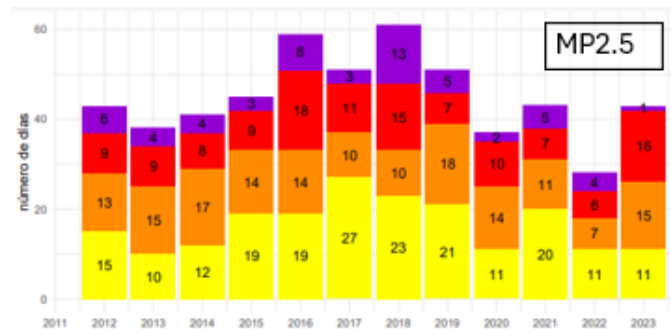
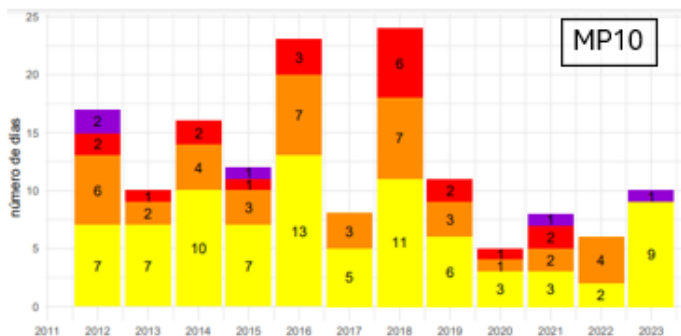
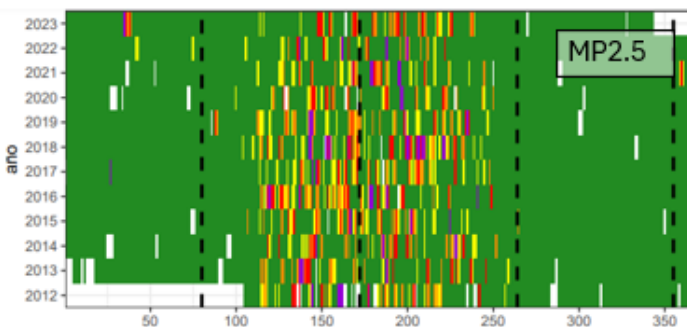
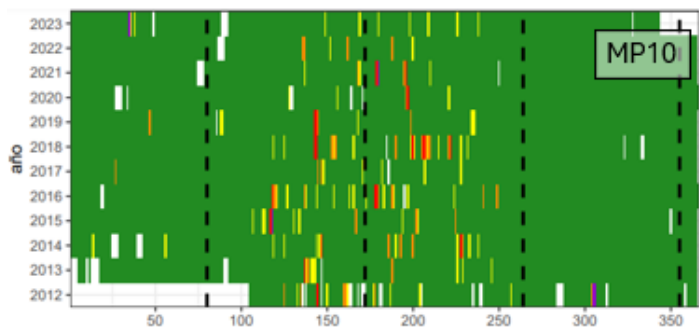
MP₁₀



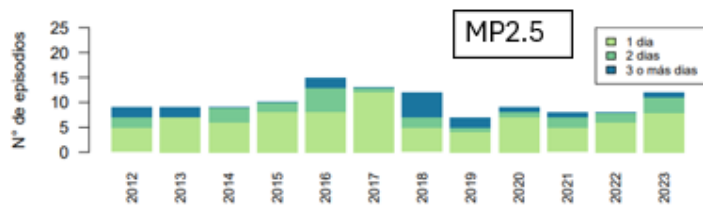
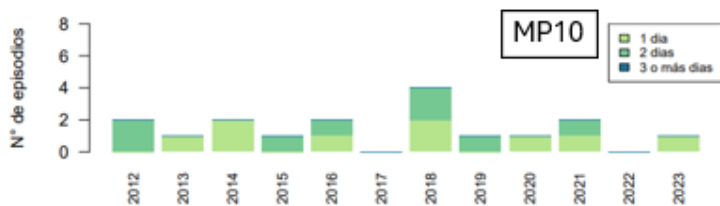
MP_{2.5}



EPISODIOS CRÍTICOS

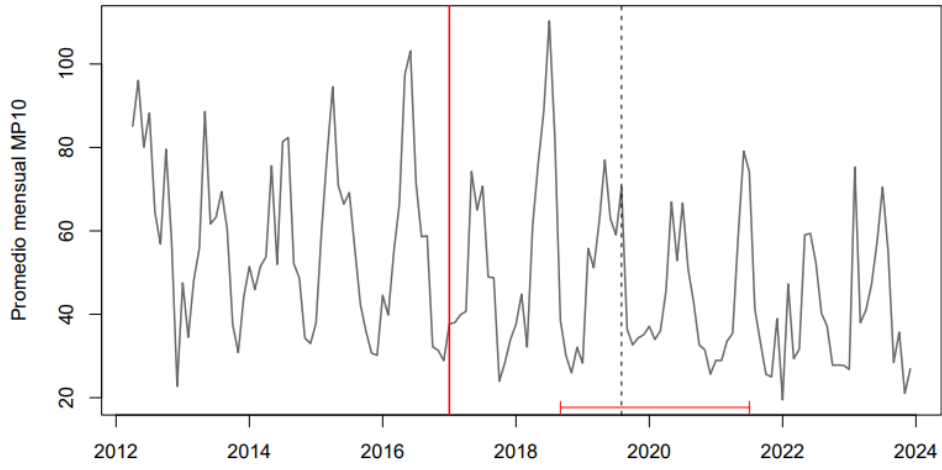


DURACIÓN EPISODIOS CRÍTICOS

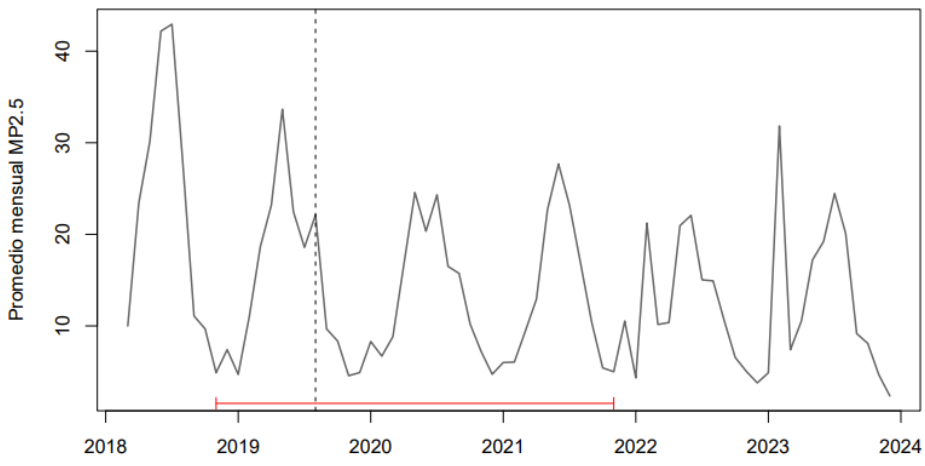


PUNTO DE QUIEBRE

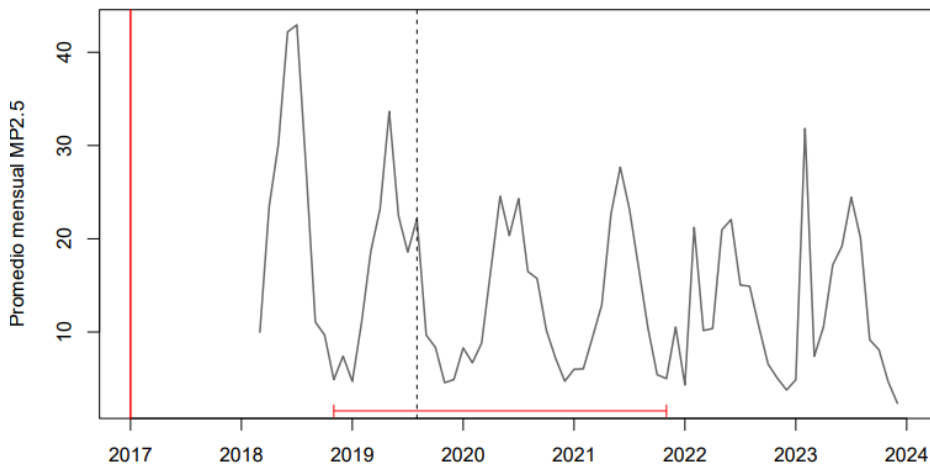
Los Angeles – Estacion 21 de Mayo (MP10)



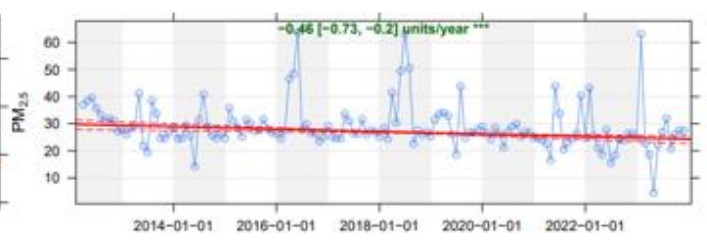
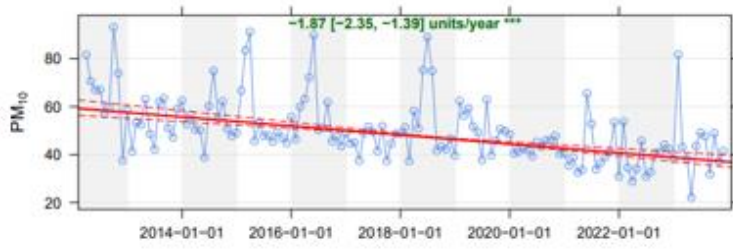
Los Angeles – Estacion Los Angeles Oriente (MP2.5)



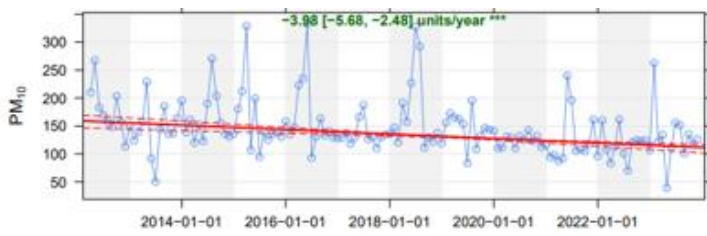
Los Angeles – Estacion Los Angeles Oriente (MP2.5)



TENDENCIAS



TENDENCIA PERCENTIL 95



Anexo XII: PDA para las comunas de Concepción Metropolitana

2006

- Declaración zona latente MP10 diario

2019

- PDA

2015

- Declaración zona saturada MP2.5 diario

Población: 889 999 habitantes

Área: 2 102 km²

Densidad poblacional: 423,4 hab/km²

PRINCIPALES MEDIDAS



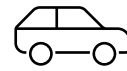
Uso y mejoramiento de la leña



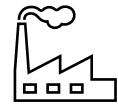
Uso y mejoramiento de artefactos



Mejoramiento de la eficiencia térmica de las viviendas



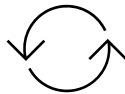
Control de emisiones de fuentes móviles



Control de emisiones de fuentes fijas



Control de emisiones de quemas agrícolas, forestales y domiciliarias



Compensación de emisiones



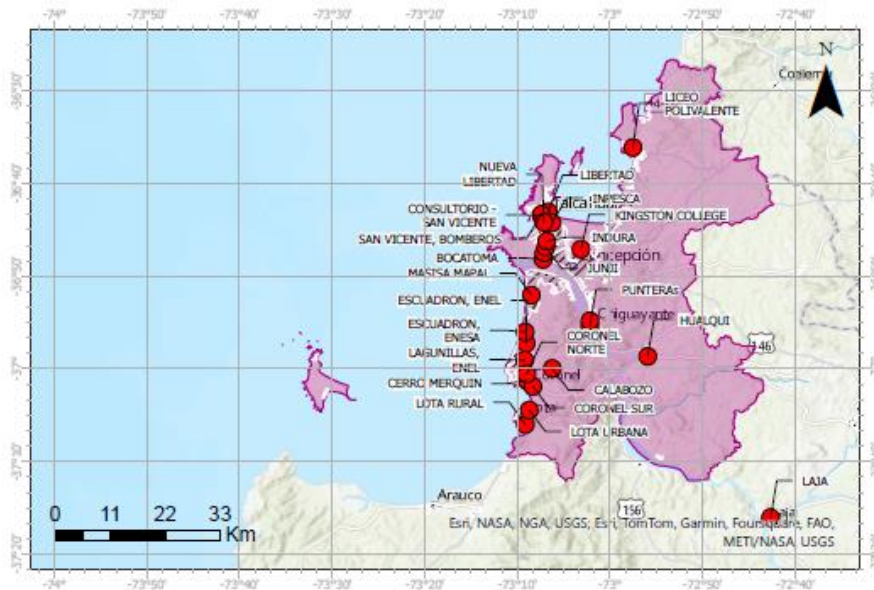
Gestión de episodios críticos



Educación Ambiental



Generación de áreas verdes y ciclovías

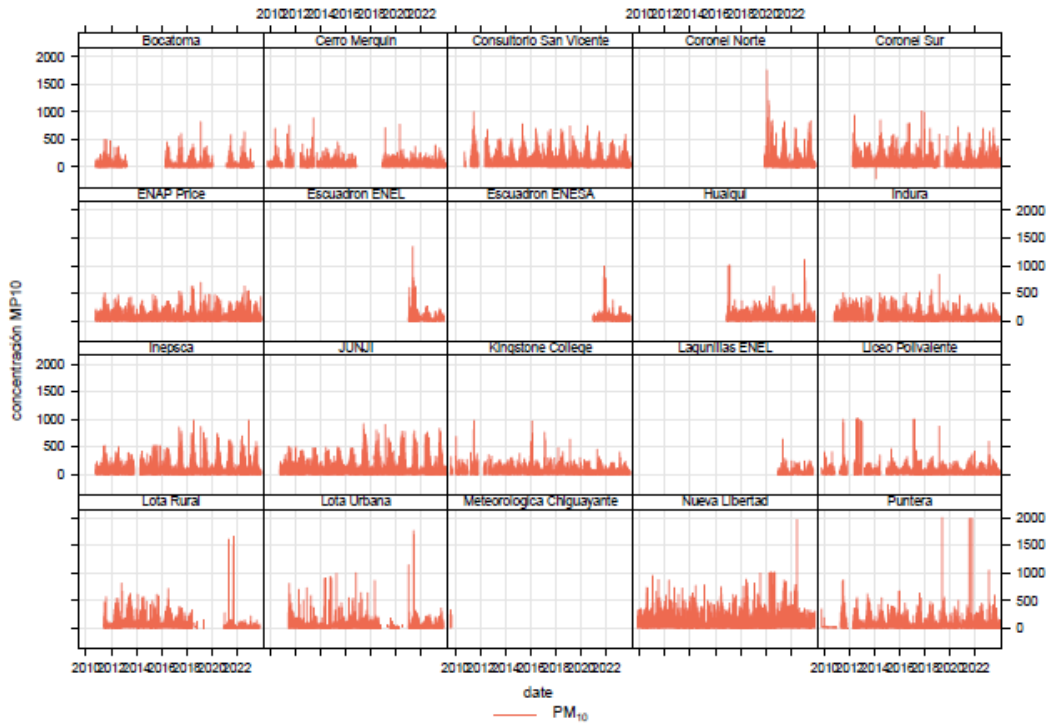


Estaciones consideradas:

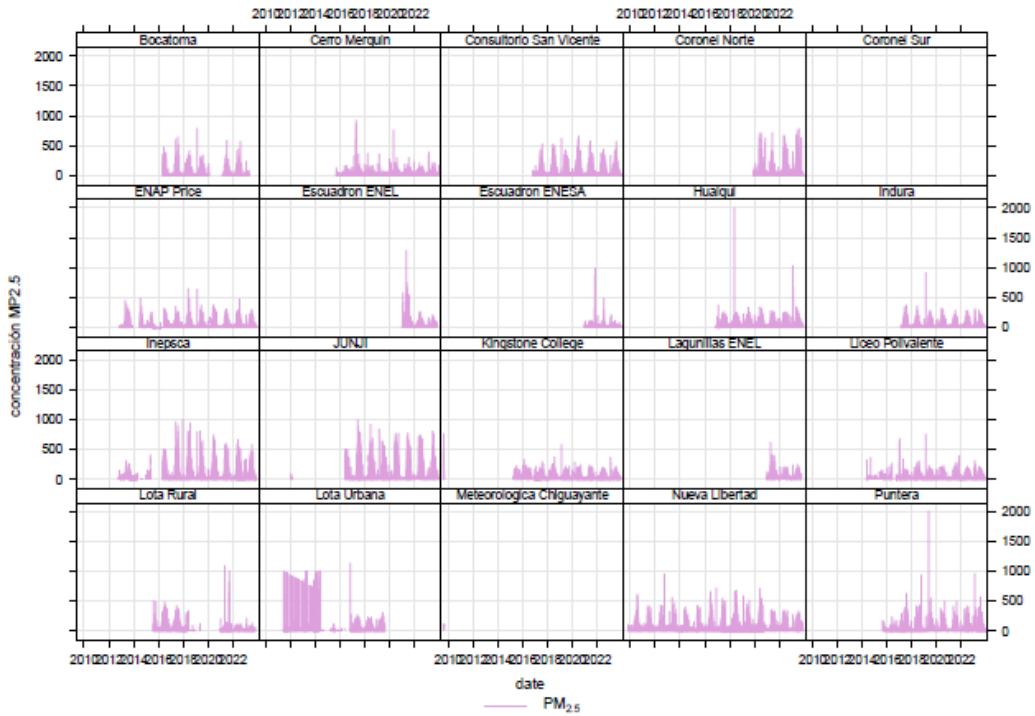
- Cerro Merquín
- Consultorio San Vicente
- Coronel Sur
- ENAP Price
- Hualqui
- INDURA
- INPESCA
- JUNJI
- Kingstone College
- Liceo Polivalente
- Lota Urbana
- Nueva Libertad
- Puntera

SERIES DE TIEMPO

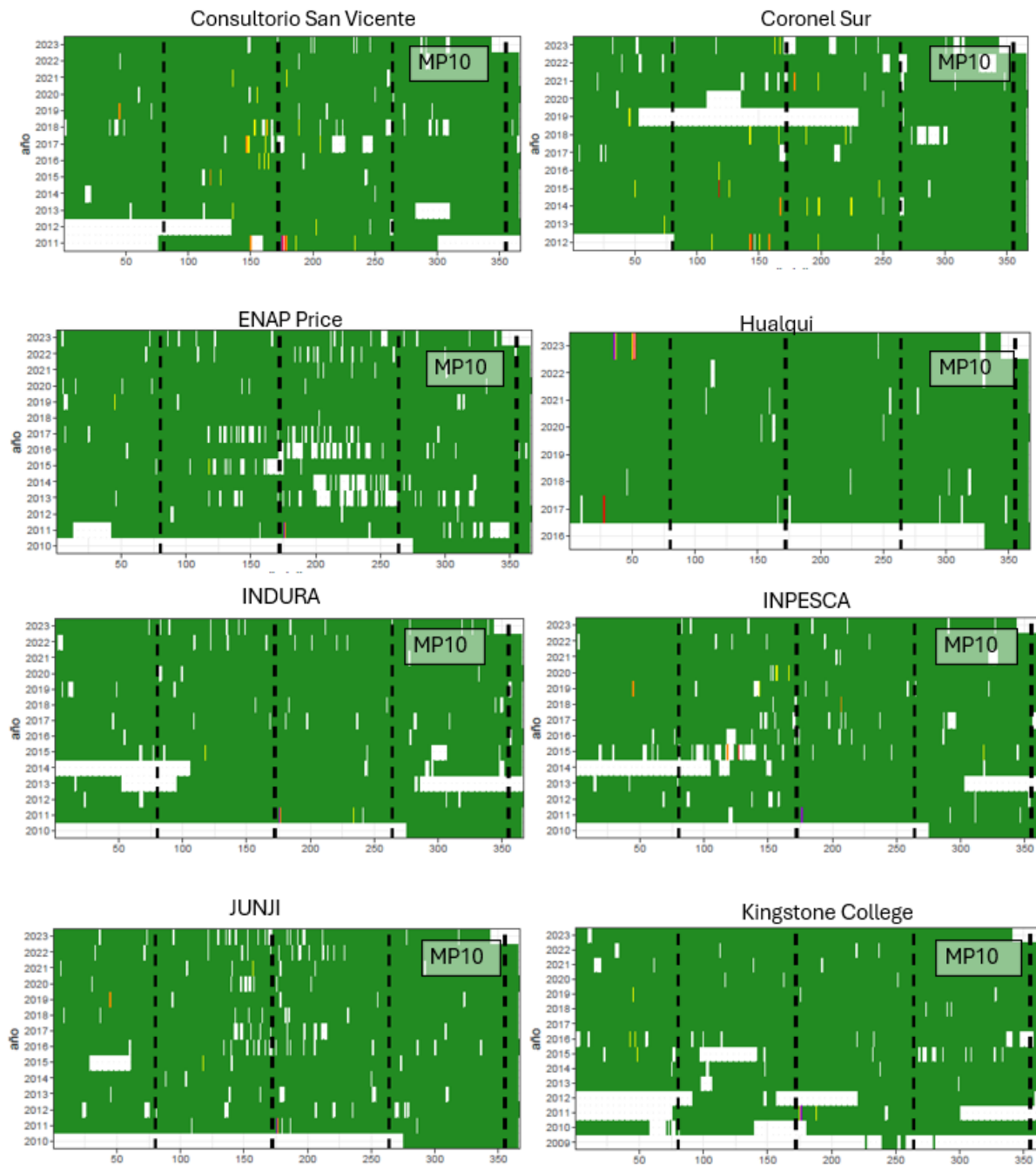
MP₁₀



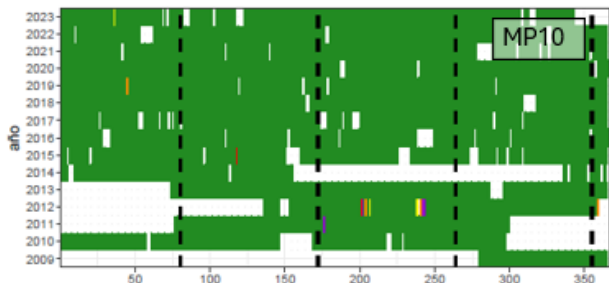
MP_{2.5}



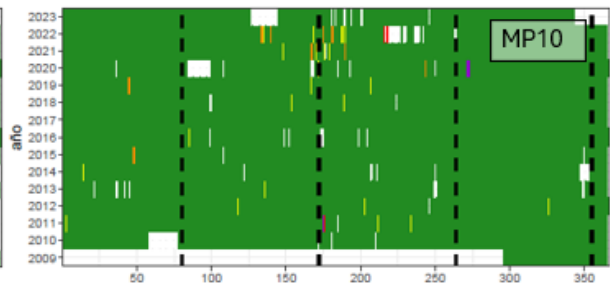
EPISODIOS CRÍTICOS



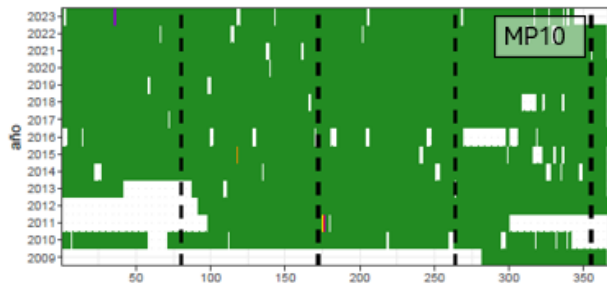
Liceo Polivalente



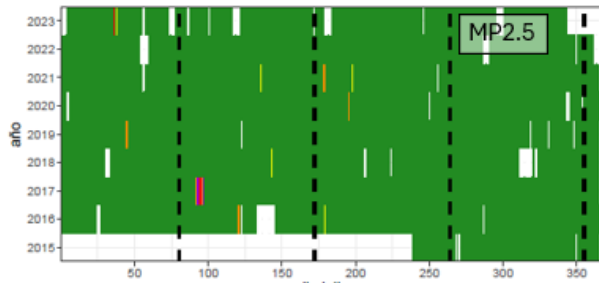
Nueva Libertad



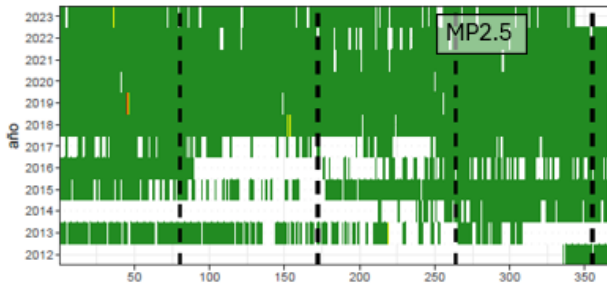
Puntera



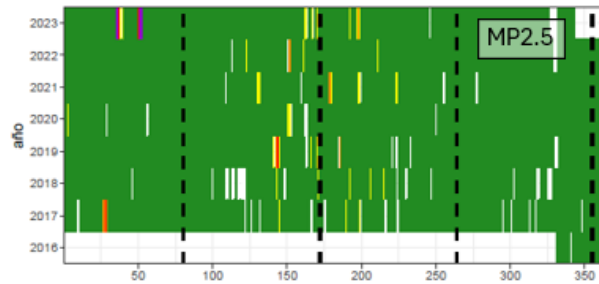
Cerro Merquin



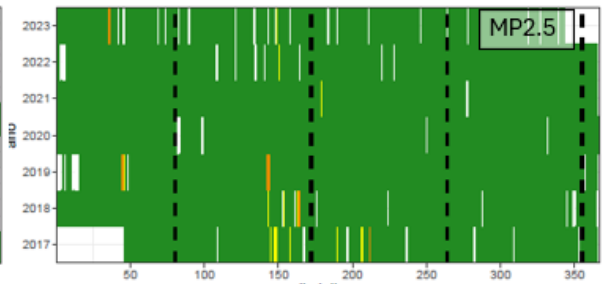
ENAP Price

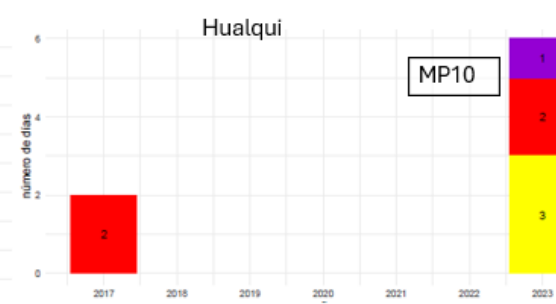
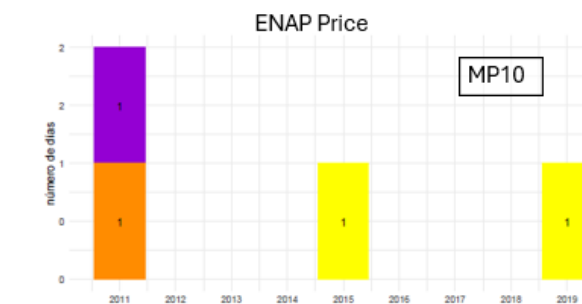
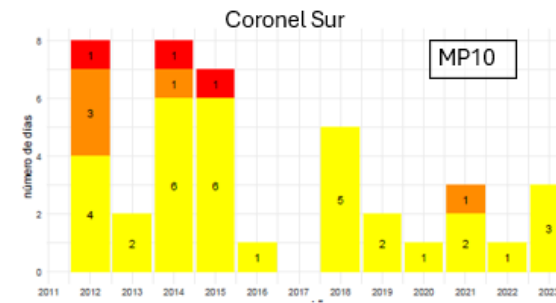
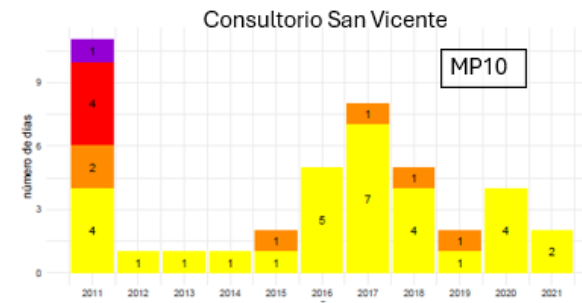
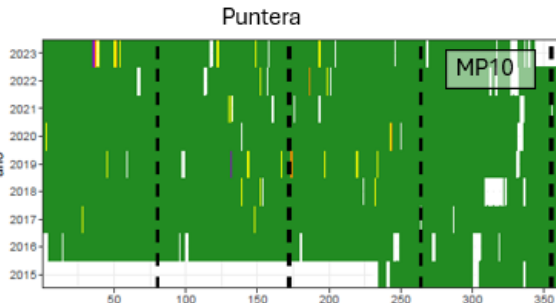
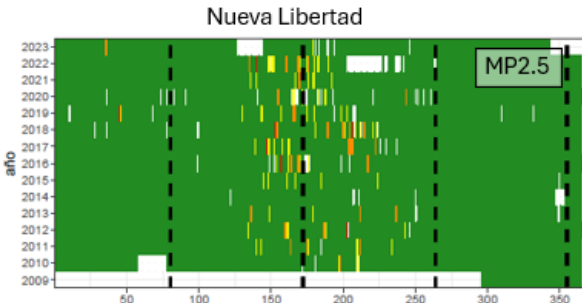
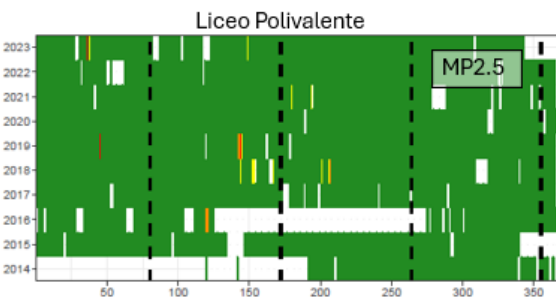
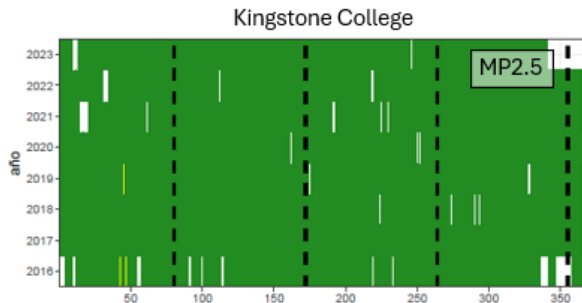
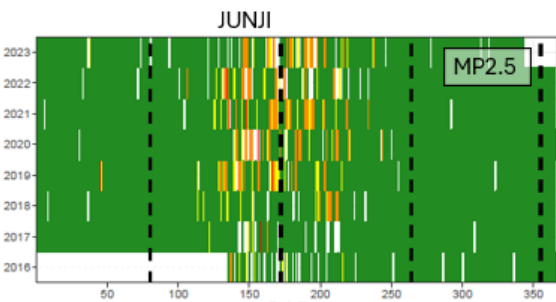
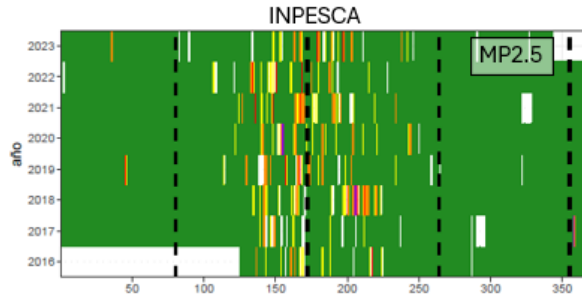


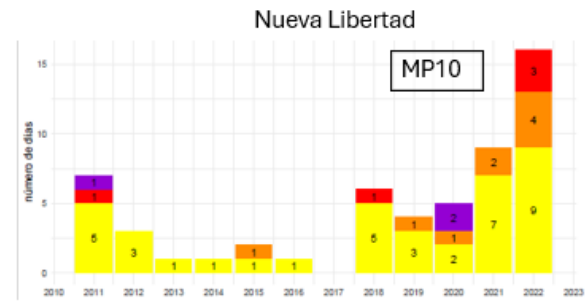
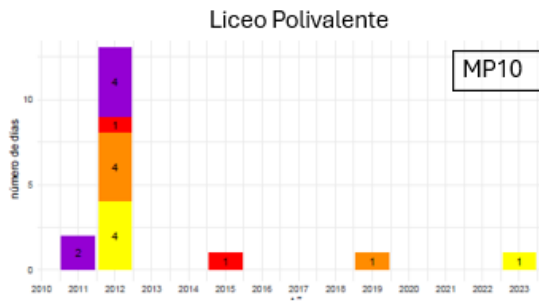
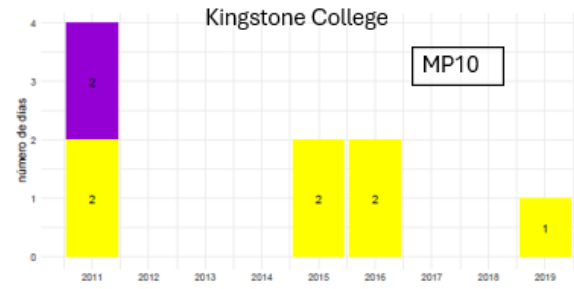
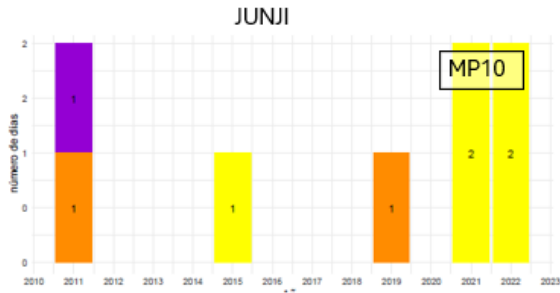
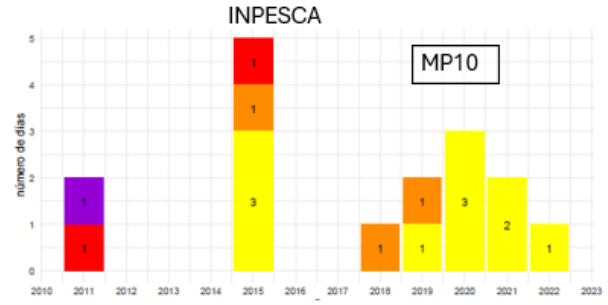
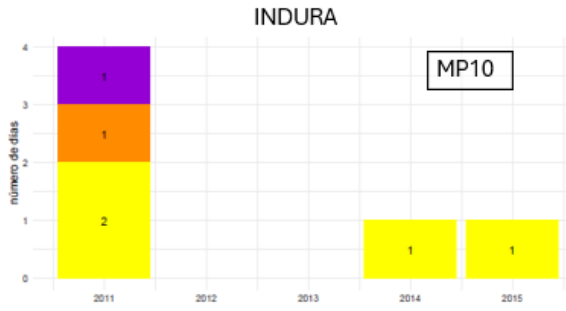
Hualqui

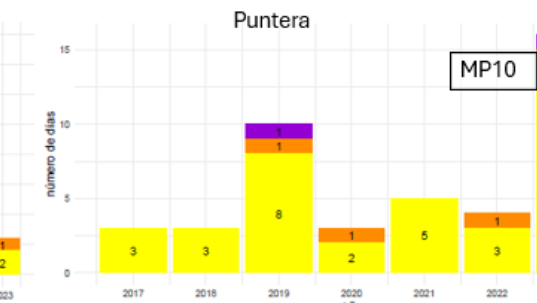
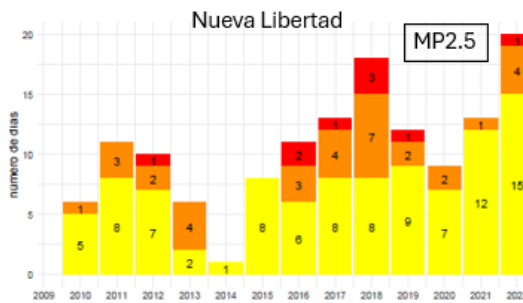
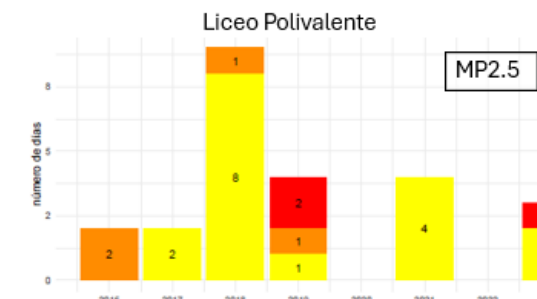
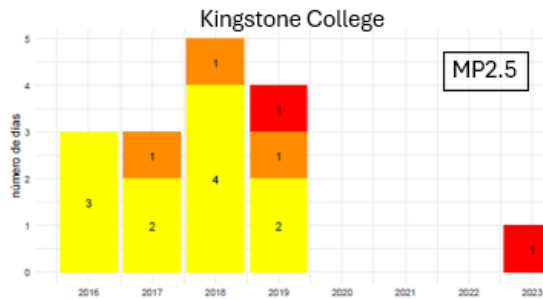
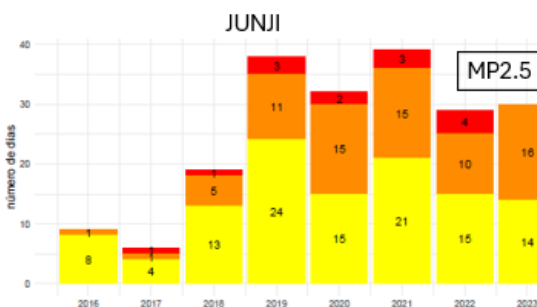
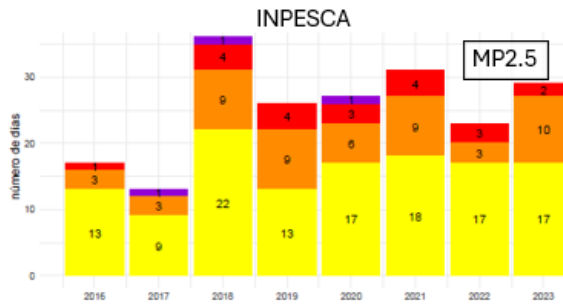
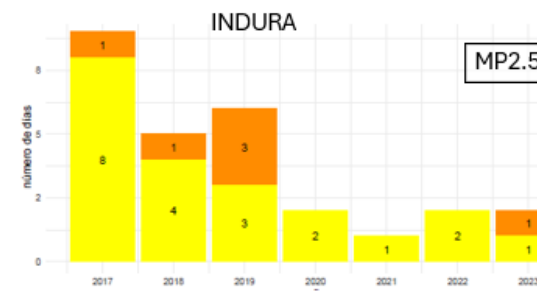
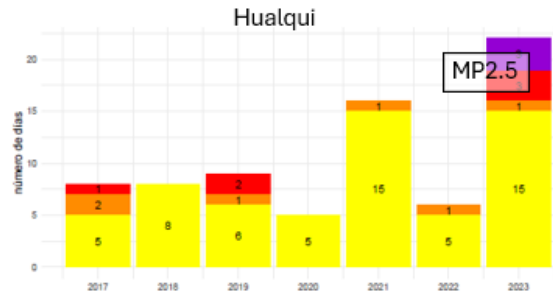
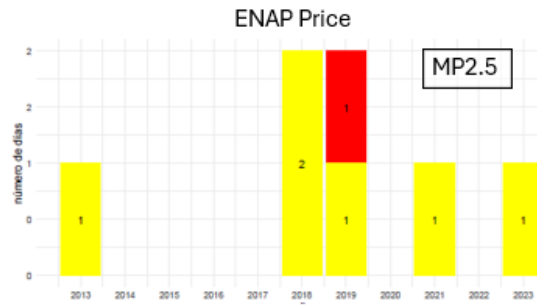
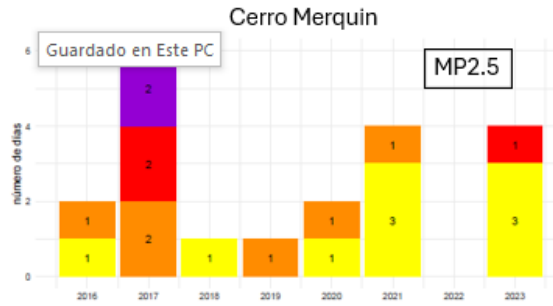


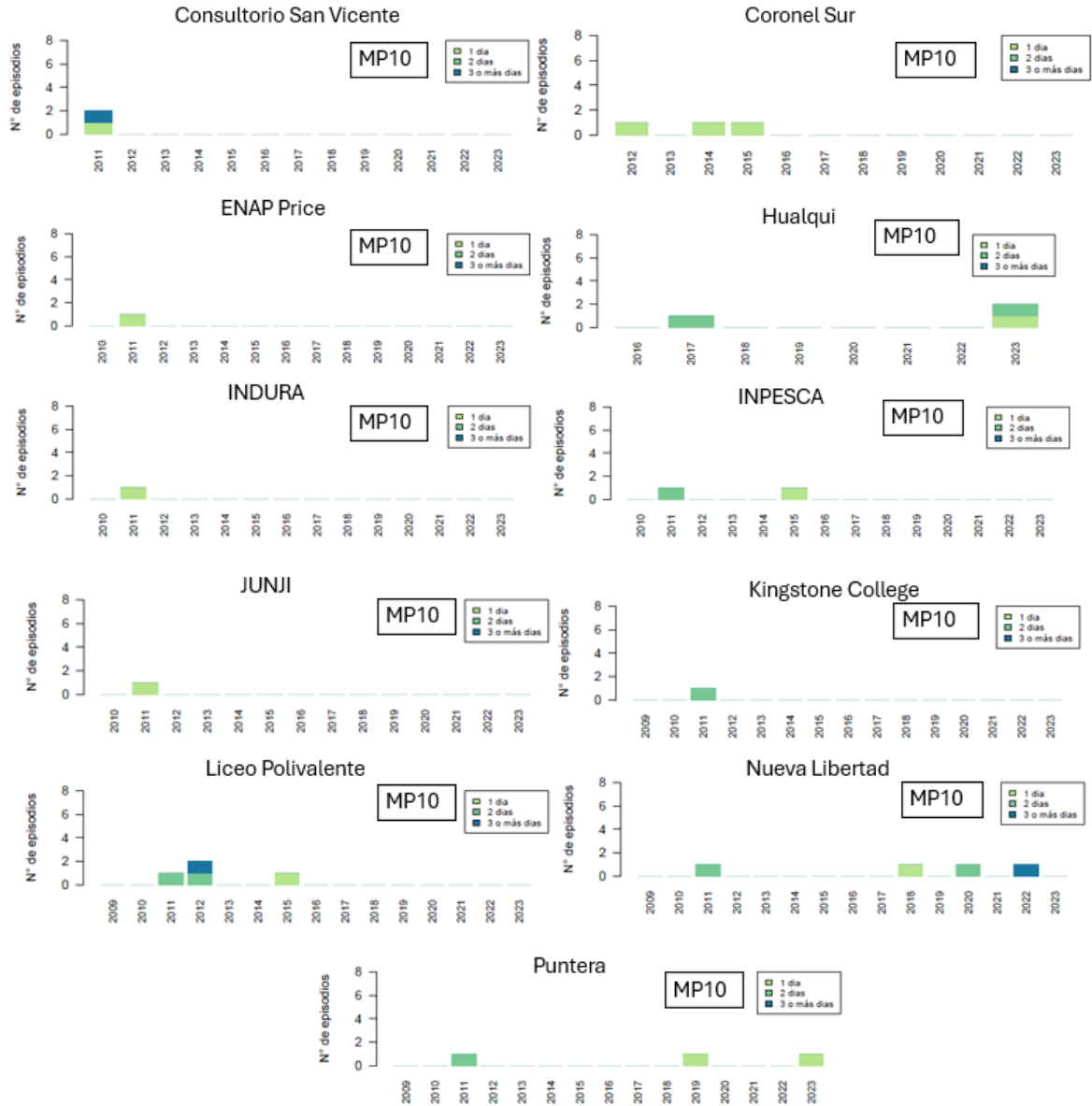
INDURA

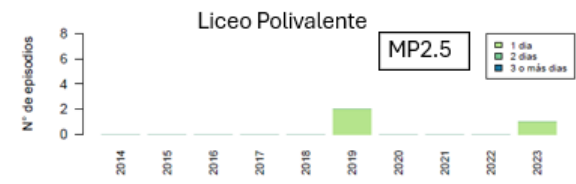
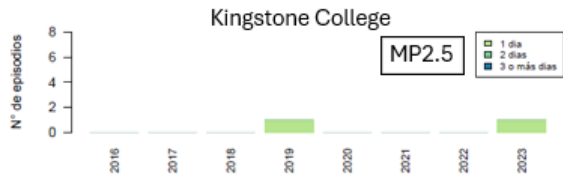
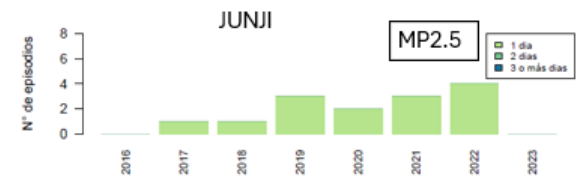
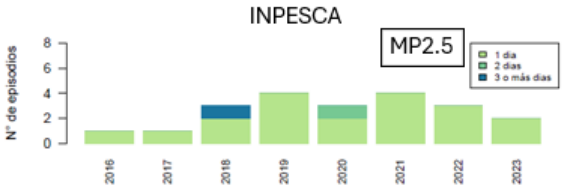
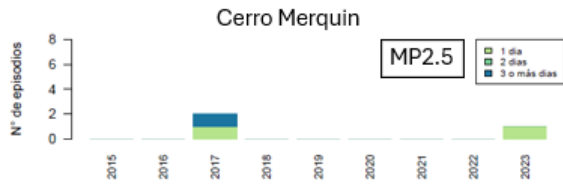






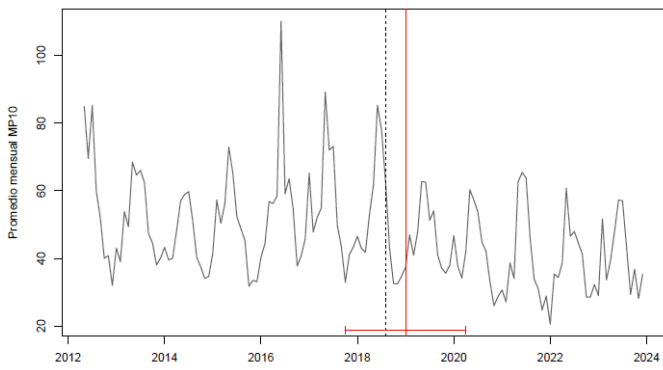




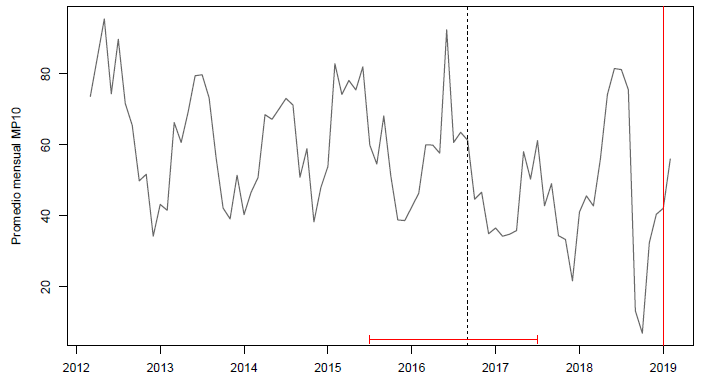


PUNTOS DE QUIEBRE

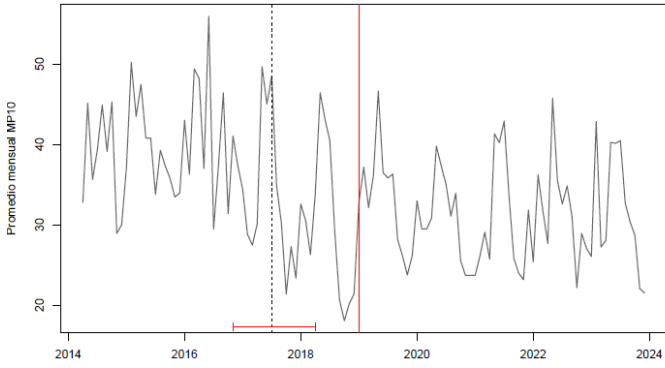
Concepcion – Estacion Consultorio San Vicente (MP10)



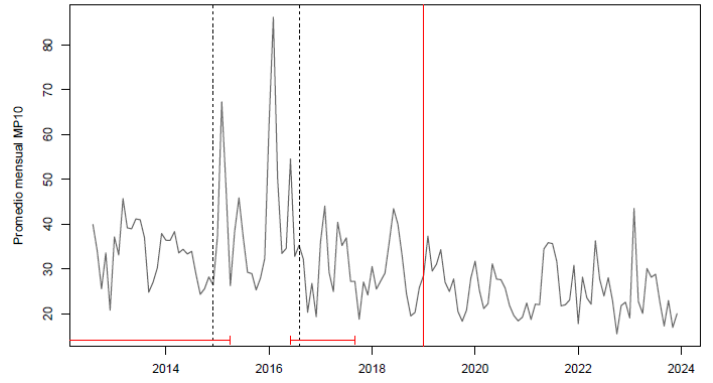
Concepcion – Estacion Coronel Sur (MP10)



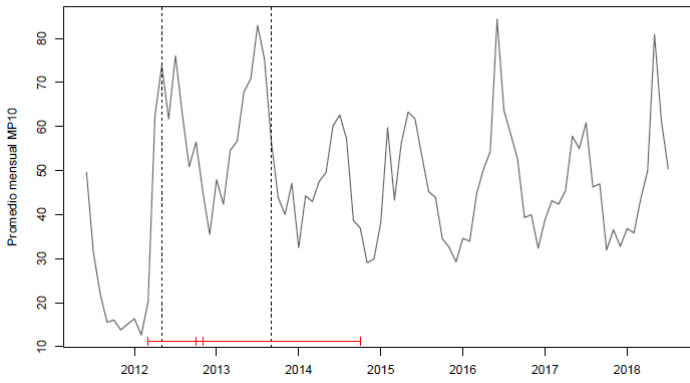
Concepcion – Estacion INDURA (MP10)



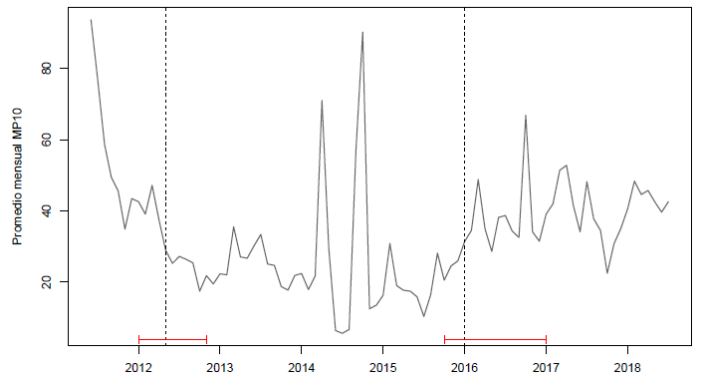
Concepcion – Estacion Kingstone College (MP10)



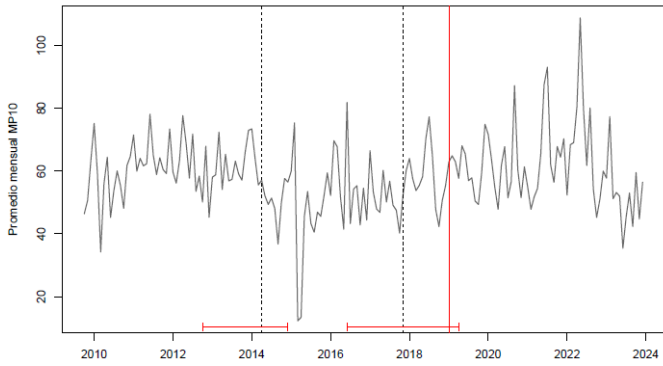
Concepcion – Estacion Lota Rural (MP10)



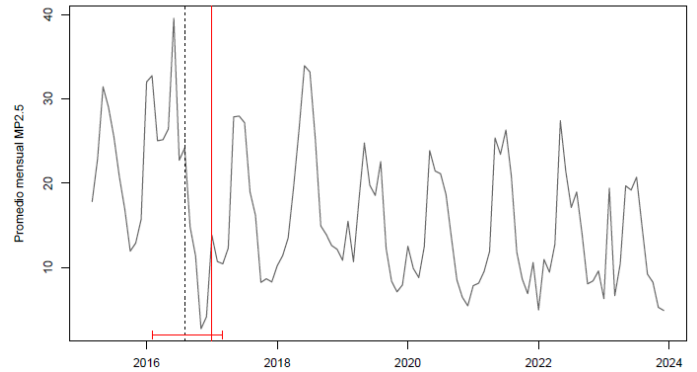
Concepcion – Estacion Lota Urbana (MP10)



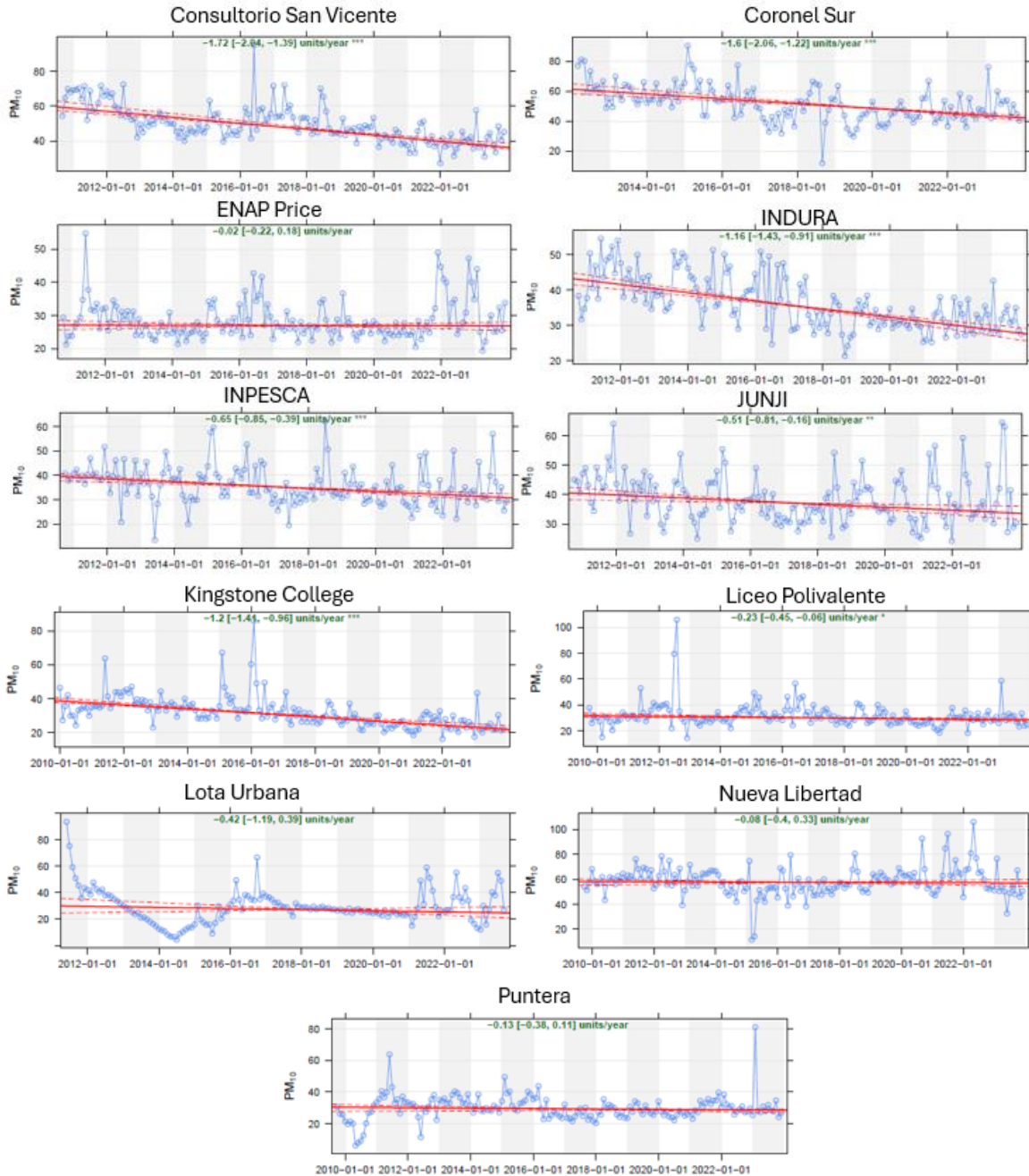
Concepcion – Estacion Nueva Libertad (MP10)

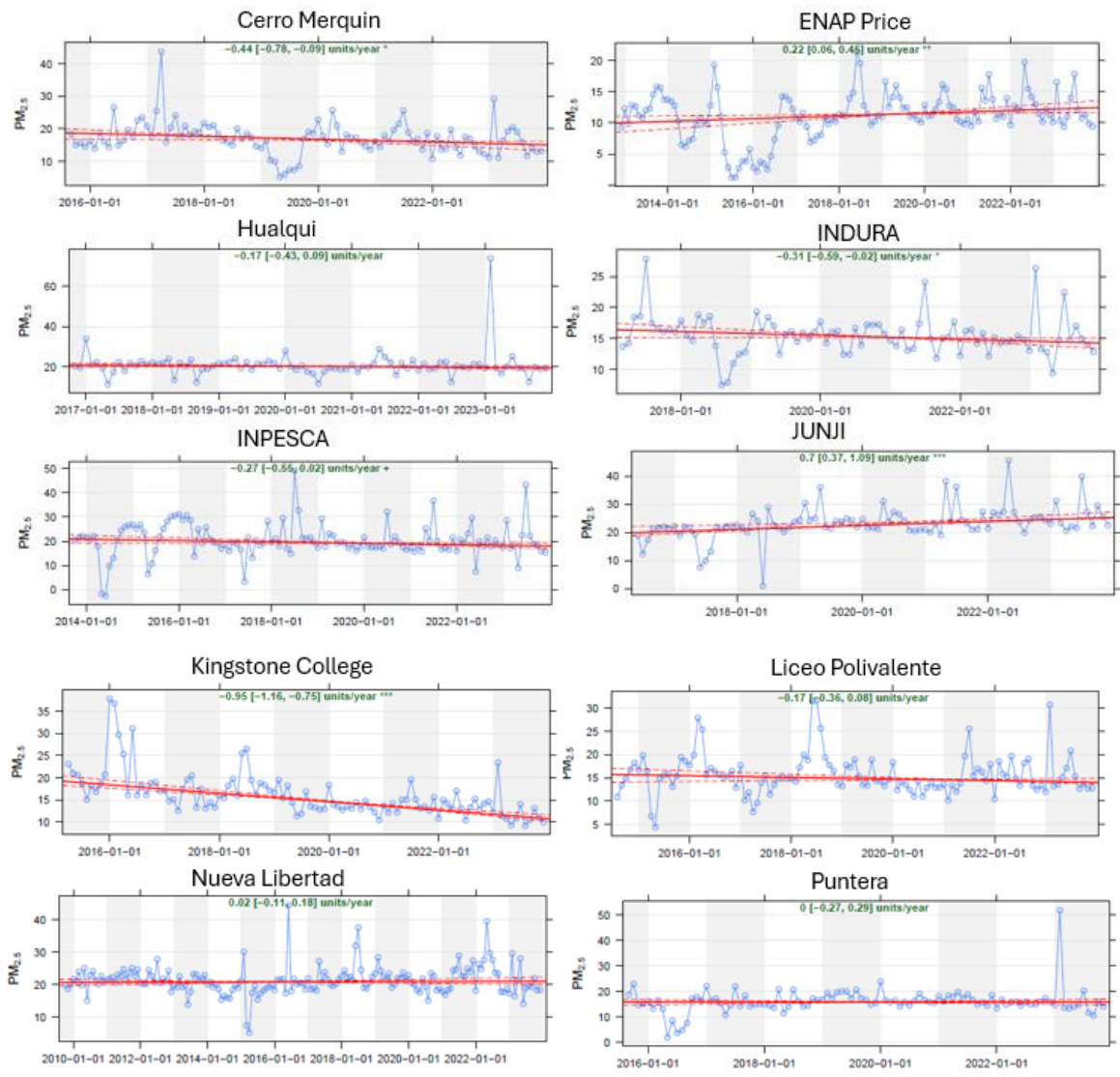


Concepcion – Estacion Kingstone College (MP2.5)

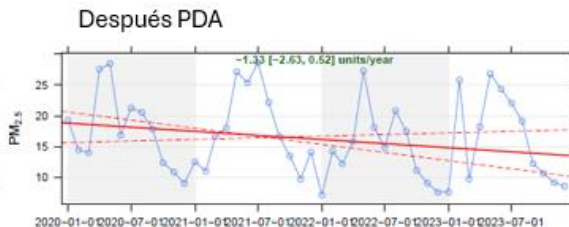
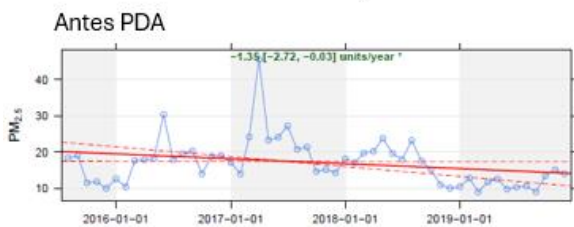


TENDENCIAS

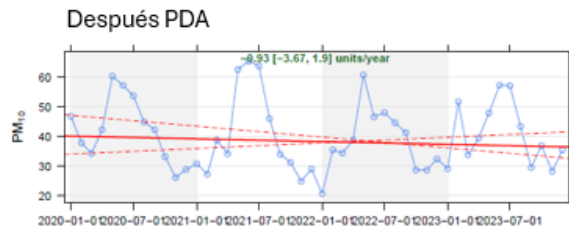
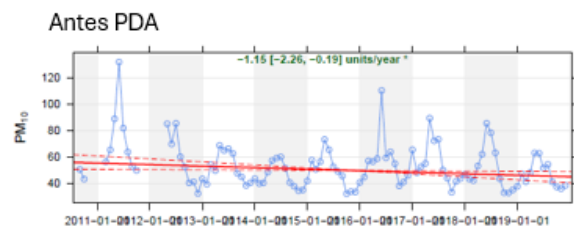




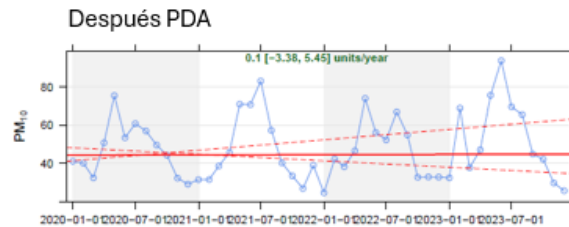
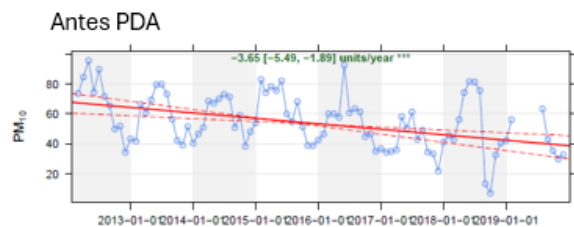
Cerro Merquin



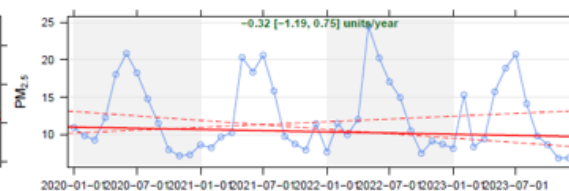
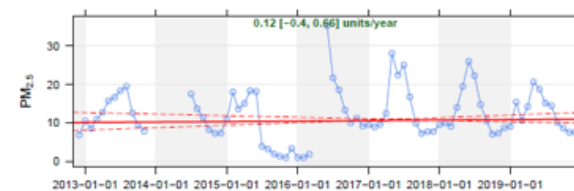
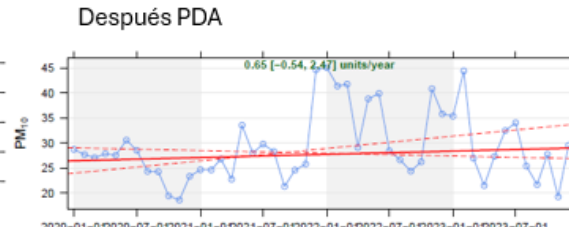
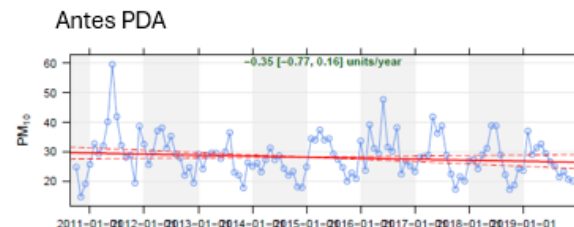
Consultorio San Vicente



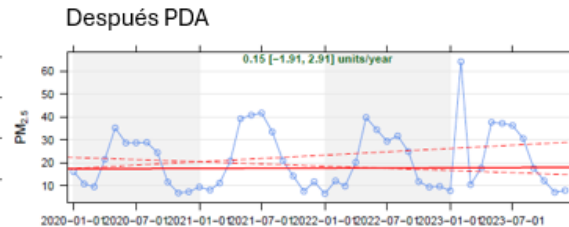
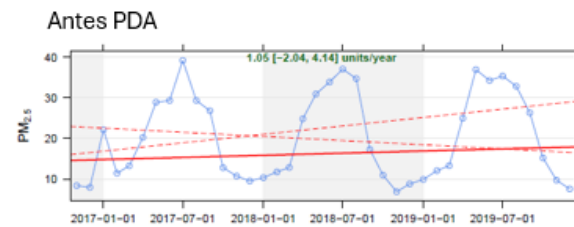
Coronel Sur



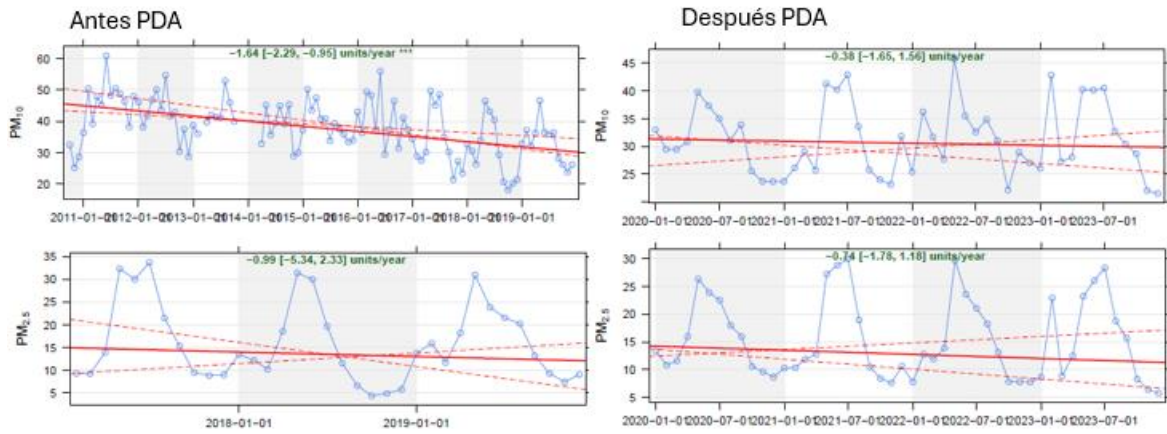
ENAP Price



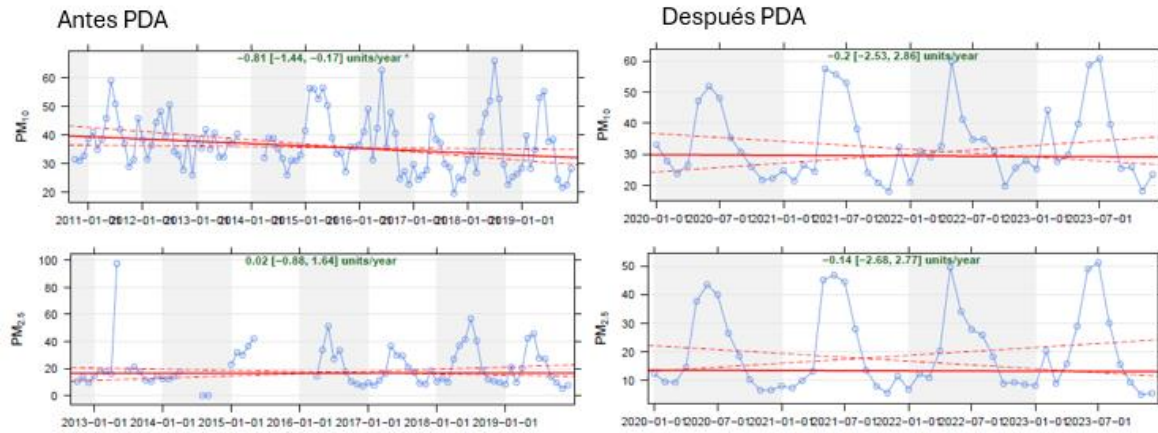
Hualqui



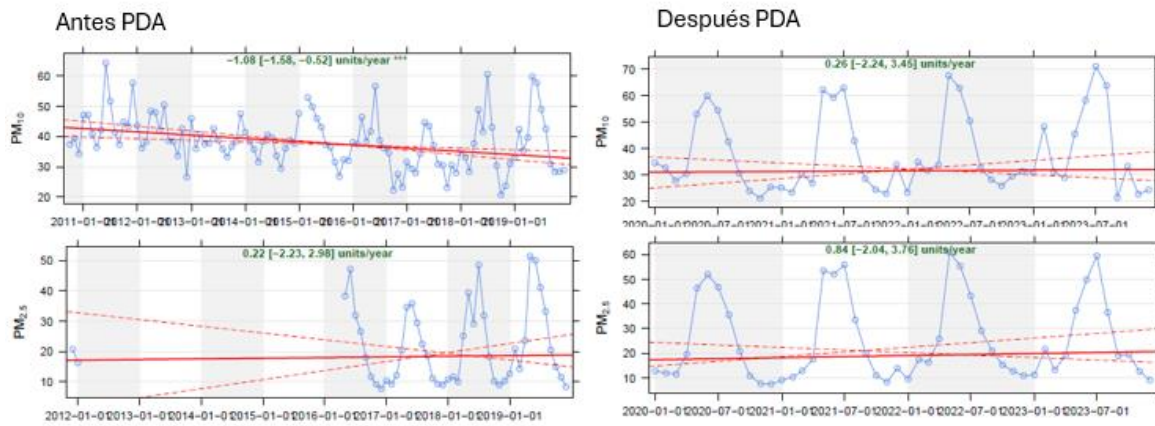
INDURA



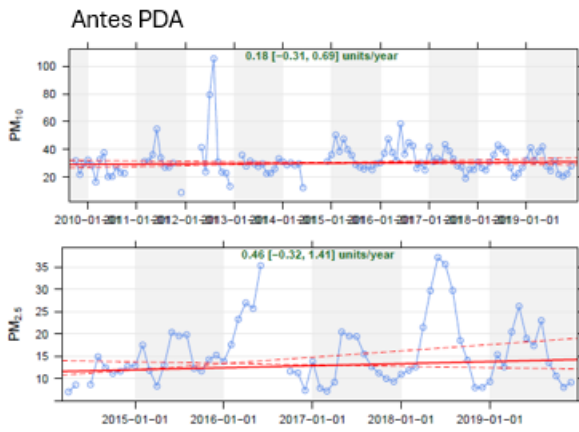
INPESCA



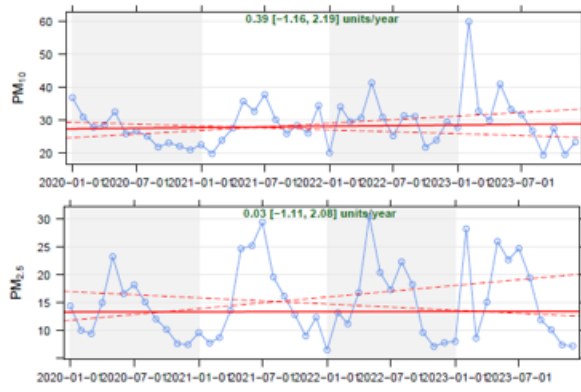
JUNJI



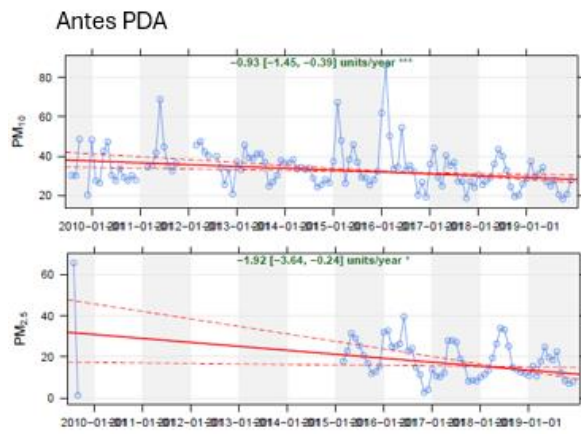
Liceo Polivalente



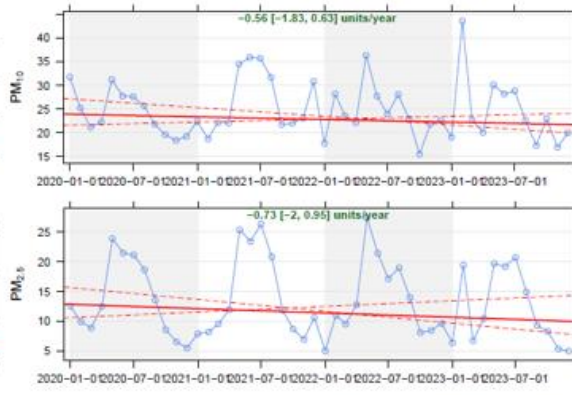
Después PDA



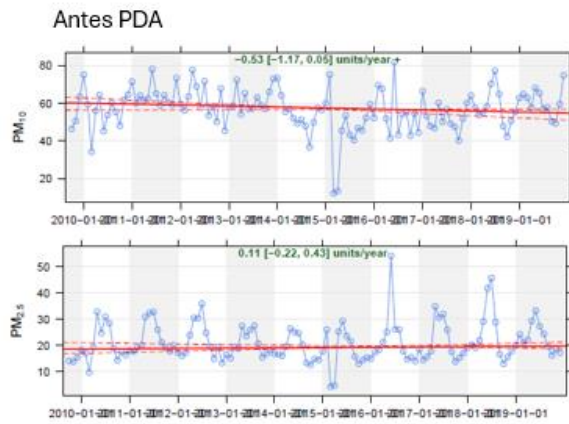
Kingstone College



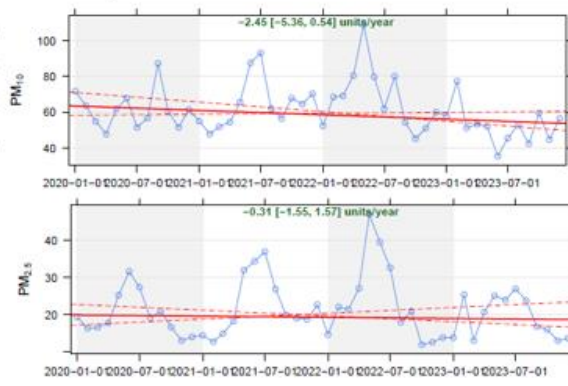
Después PDA



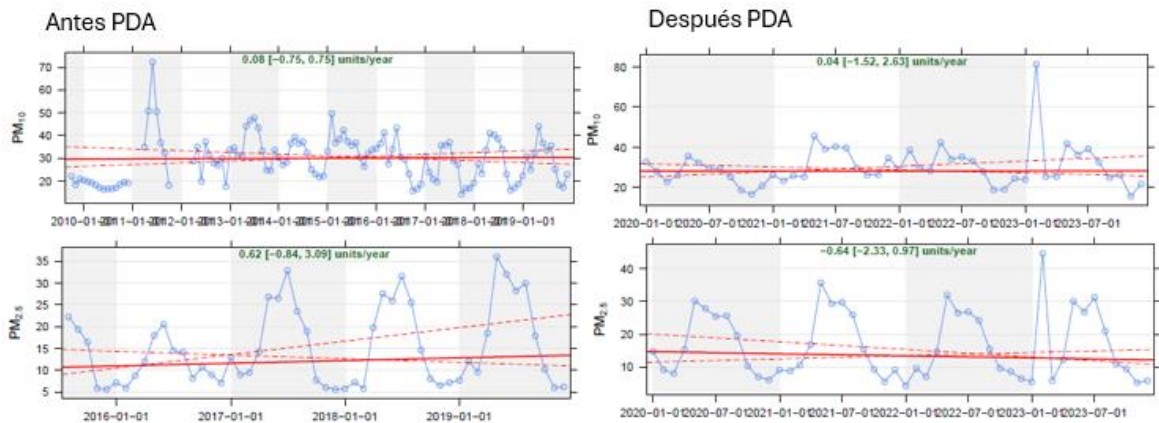
Nueva Libertad



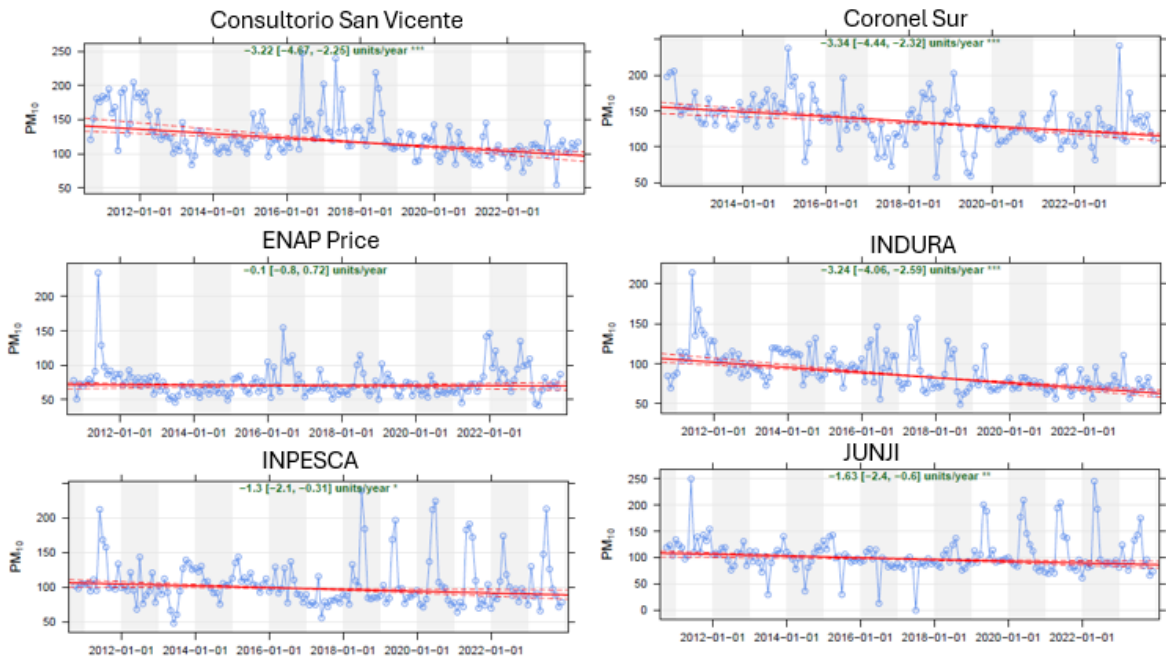
Después PDA

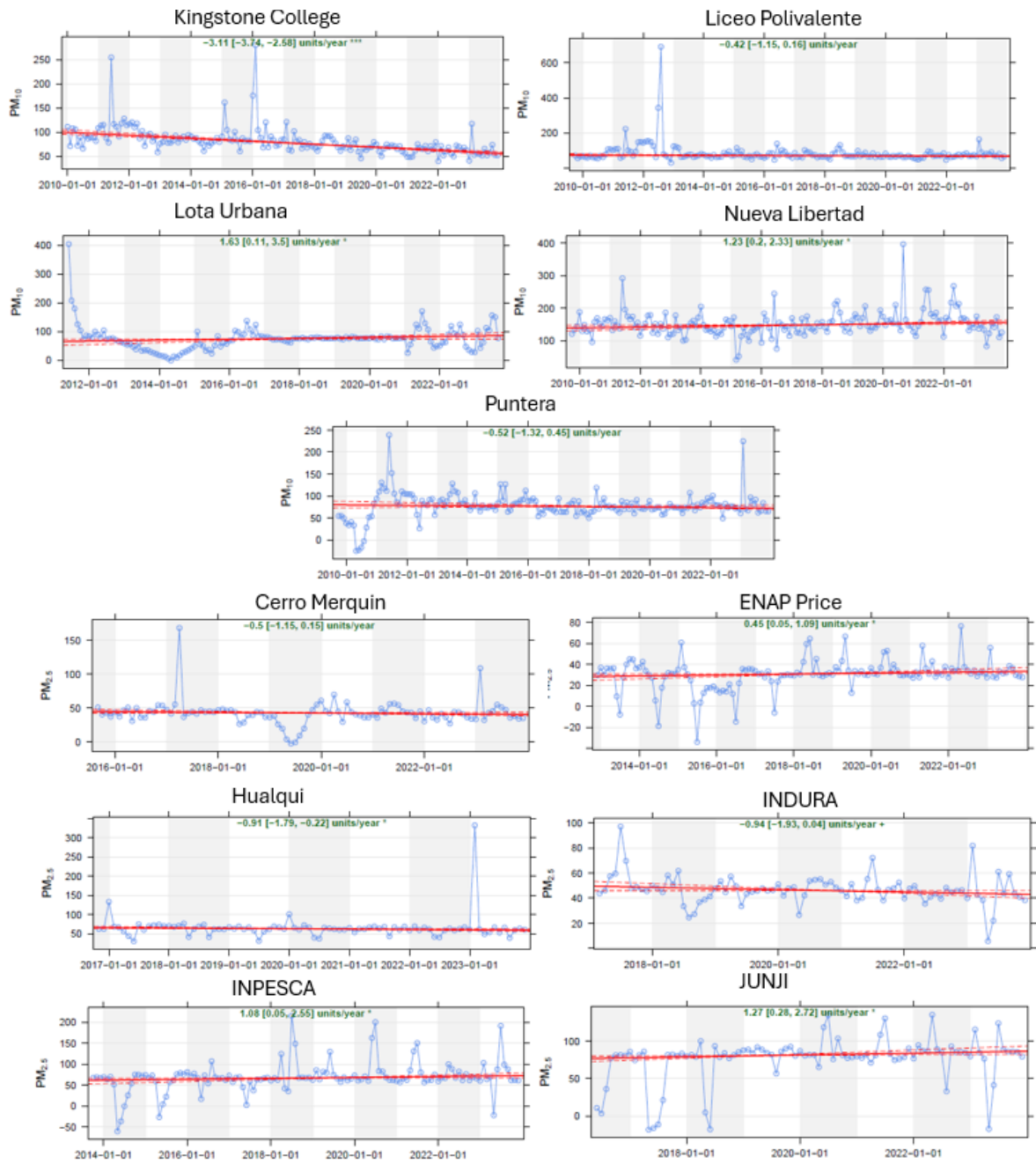


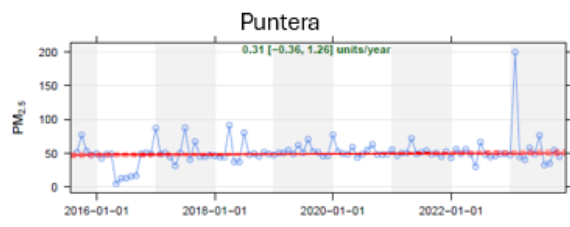
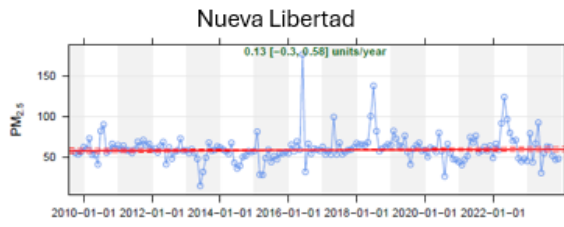
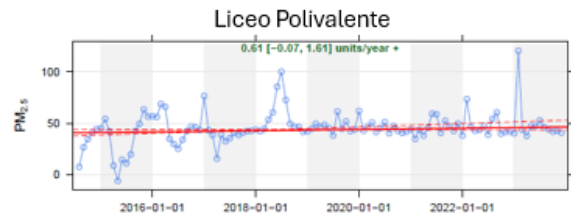
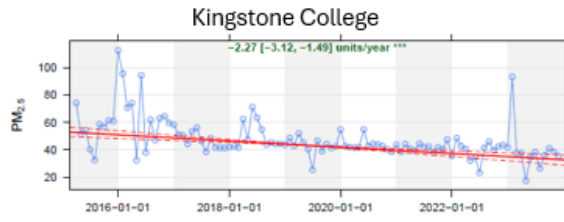
Puntera



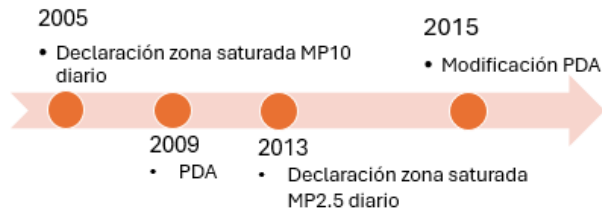
TENDENCIA PERCENTIL 95







Anexo XIII: PDA para las comunas de Temuco y Padre de las Casas

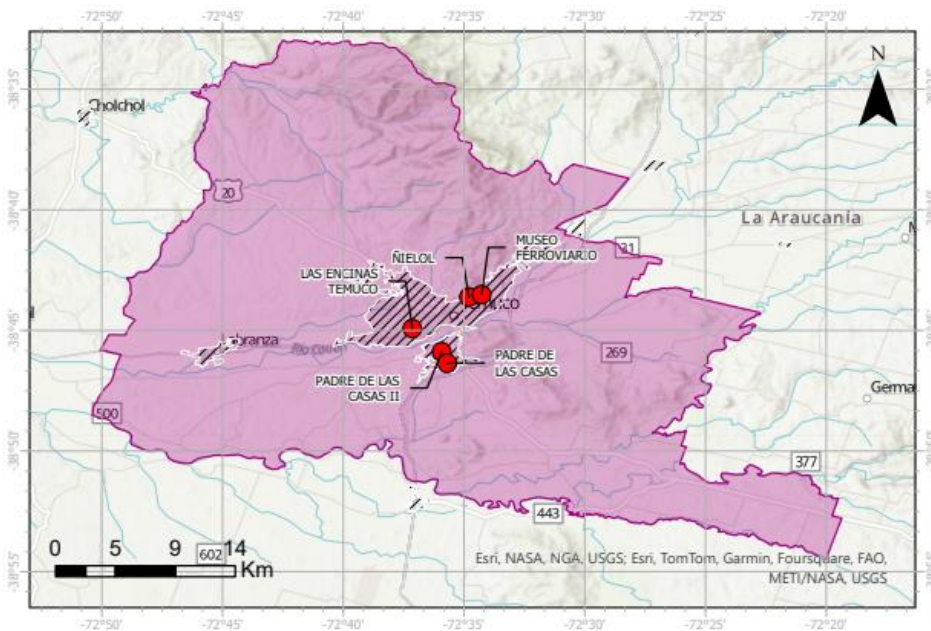


Población: 608 394 habitantes

Área: 929,5 km²

Densidad poblacional: 654,5 hab/km²

PRINCIPALES MEDIDAS

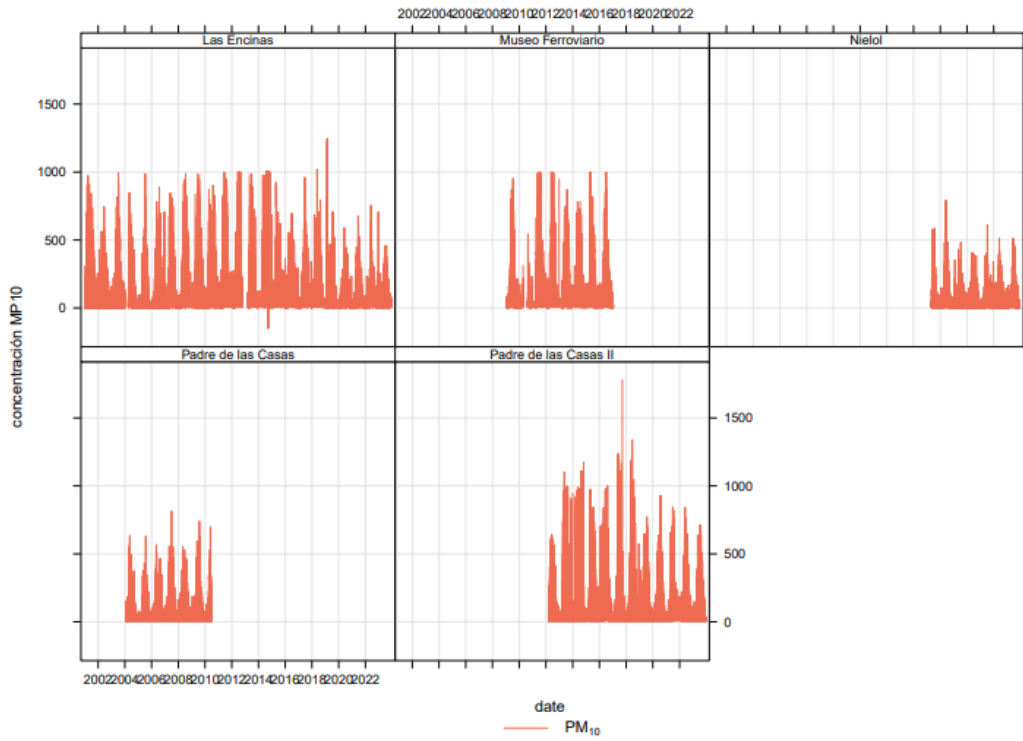


Estaciones consideradas:

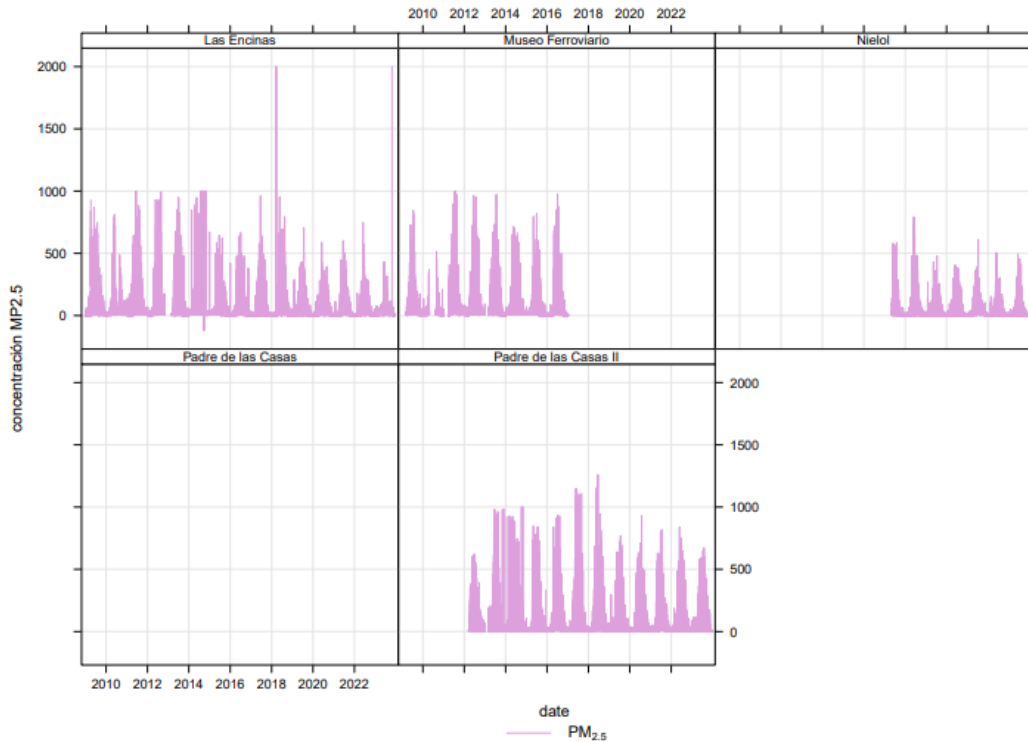
- Las Encinas

SERIES DE TIEMPO

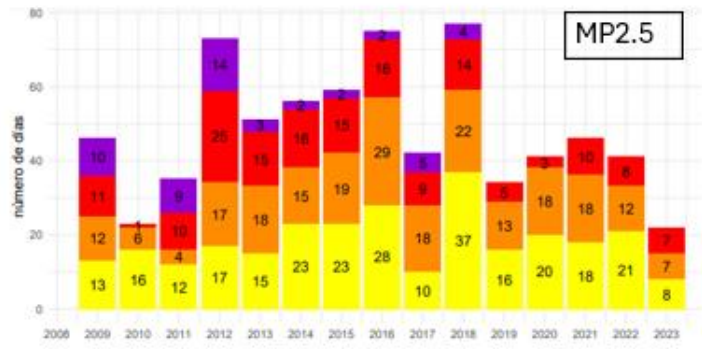
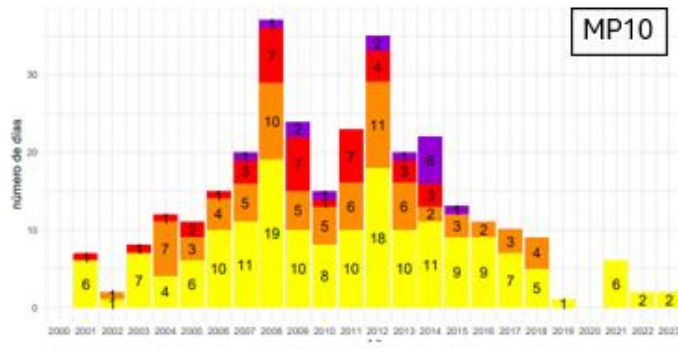
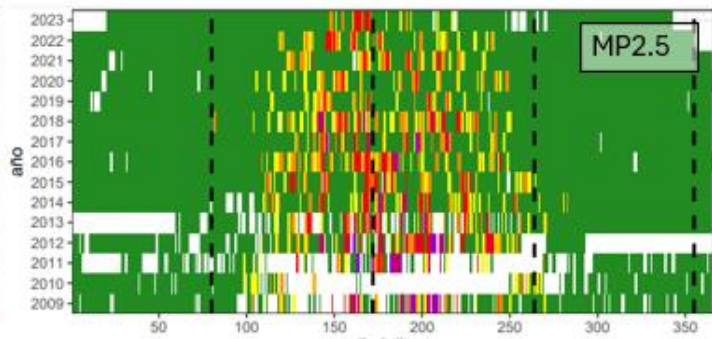
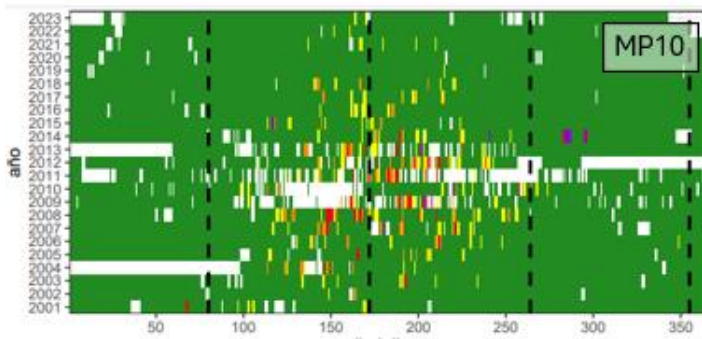
MP₁₀



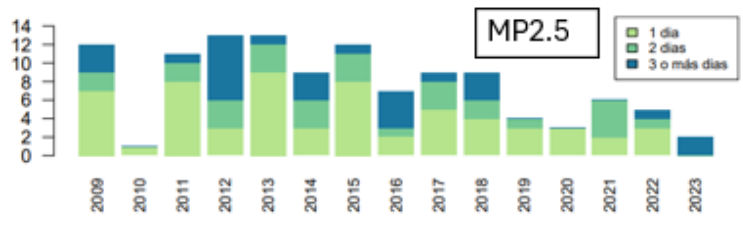
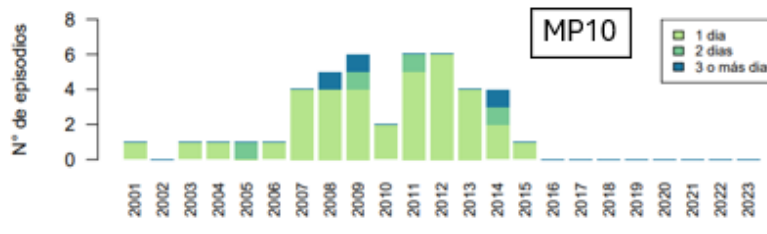
MP_{2.5}



EPISODIOS CRÍTICOS

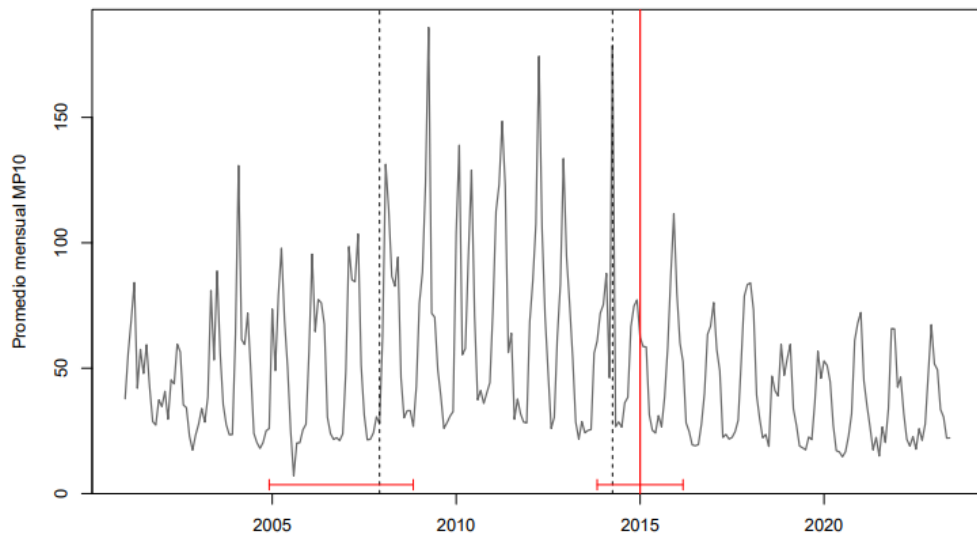


DURACIÓN DE EPISODIOS

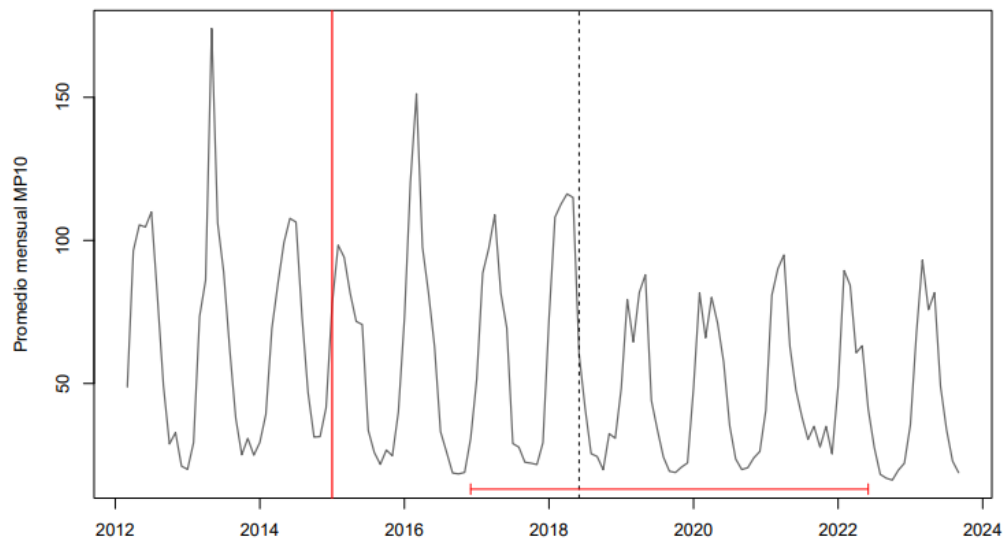


PUNTO DE QUIEBRE

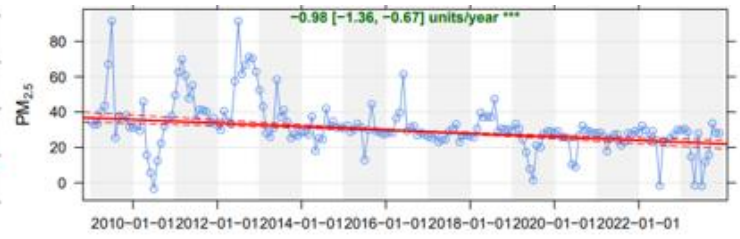
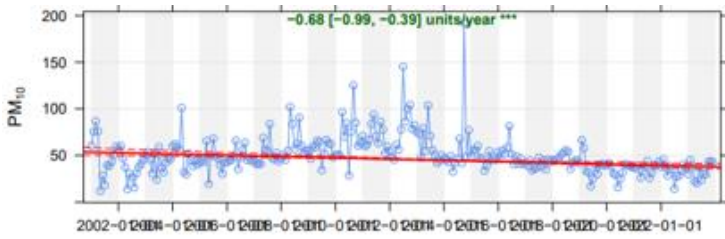
Temuco - Estacion Las Encinas (MP10)



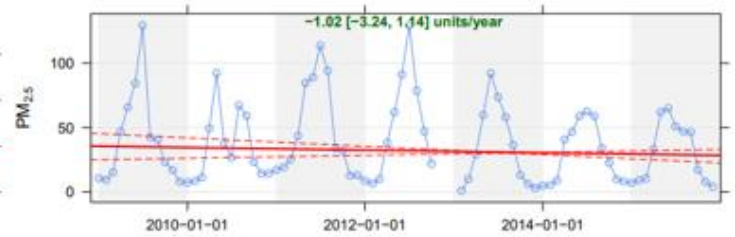
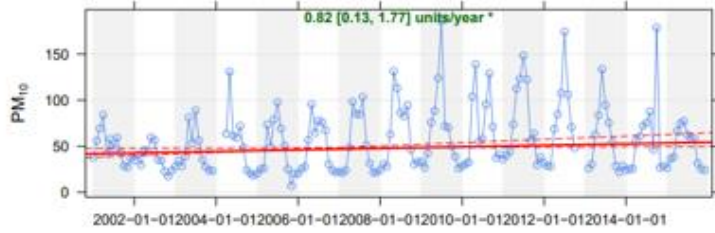
Temuco - Estacion Padre de las Casas II (MP10)



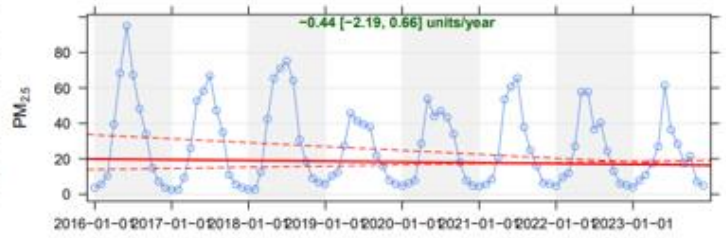
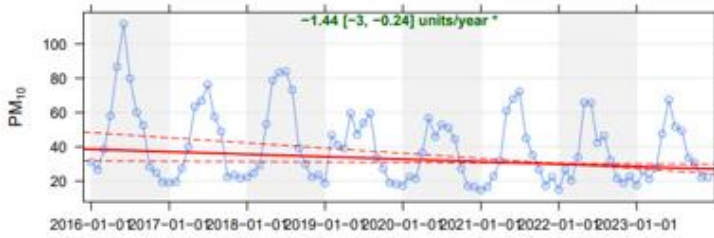
TENDENCIAS



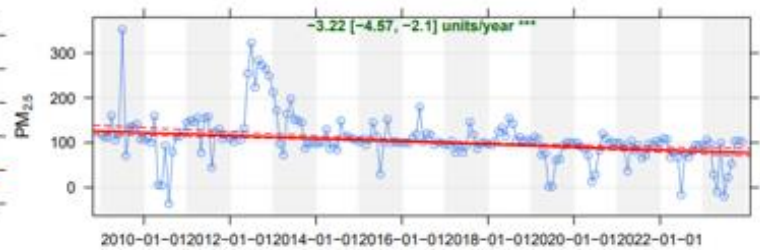
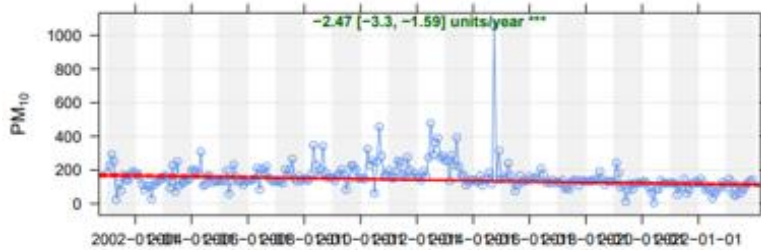
Antes PDA



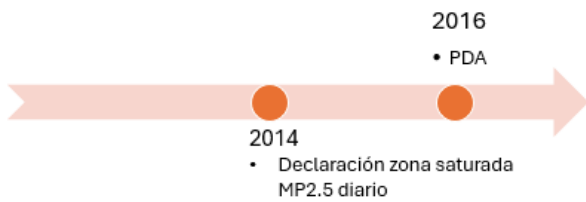
Después PDA



TENDENCIA PERCENTIL 95



Anexo IV: PDA para la comuna de Valdivia



Población: 154 097 habitantes

Área: 1015,6 km²

Densidad poblacional: 151.7 hab/km²

PRINCIPALES MEDIDAS



Uso y mejoramiento de calidad de leña



Uso y mejoramiento de artefactos



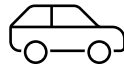
Mejoramiento eficiencia térmica de viviendas



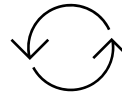
Control de emisiones a quemas agrícolas y domiciliarias



Control de emisiones a fuentes estacionarias



Control de emisiones a fuentes móviles



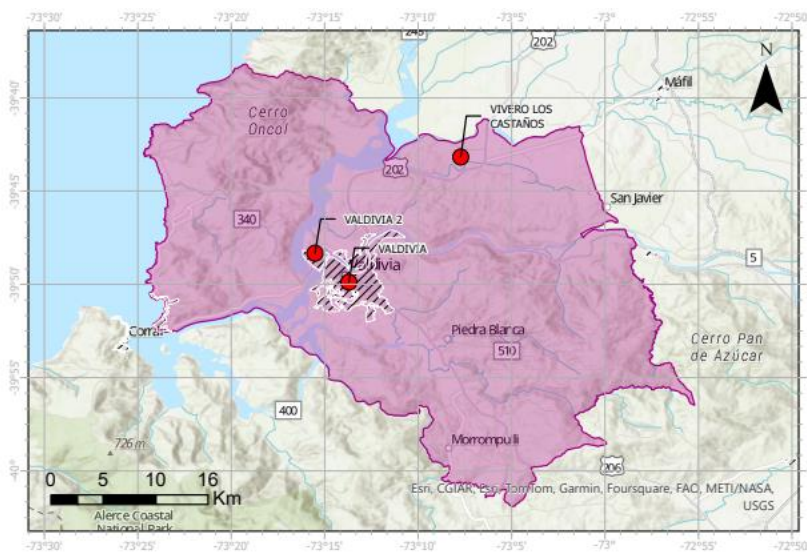
Compensación de emisiones



Educación ambiental



Gestión de episodios críticos

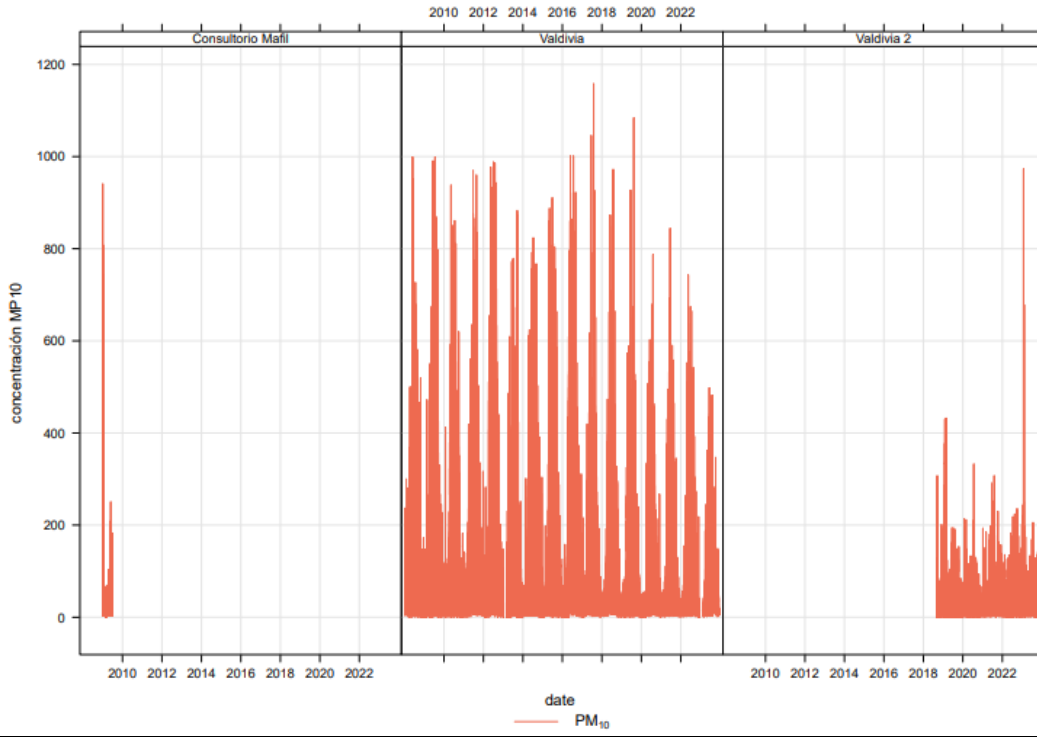


Estaciones consideradas:

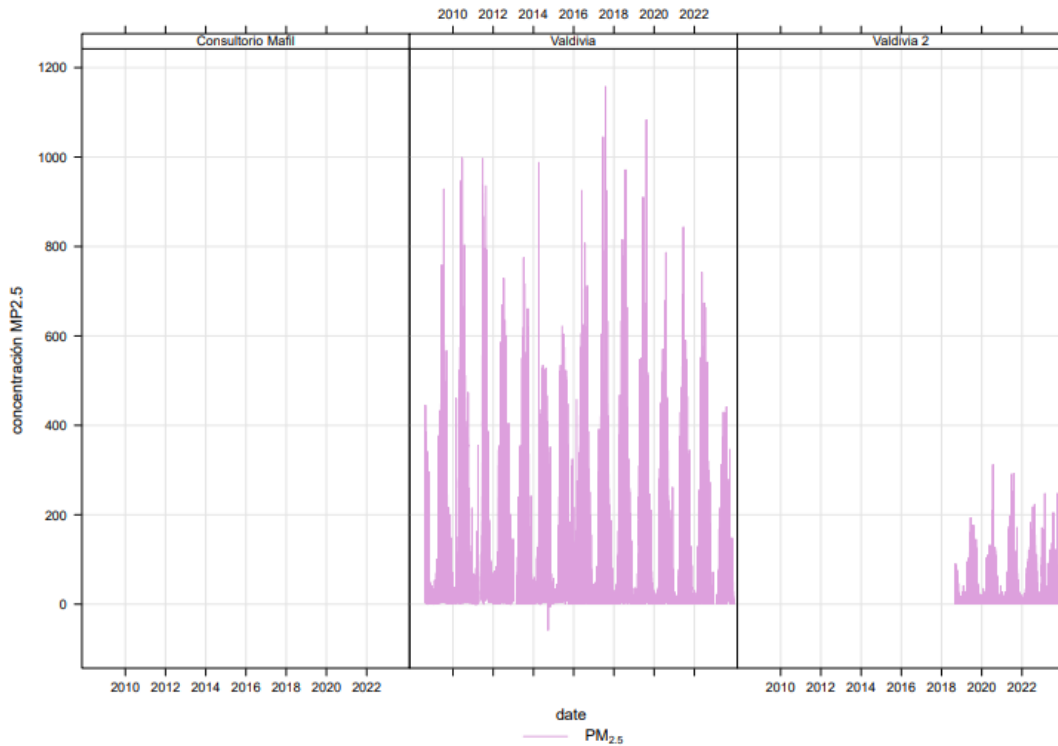
- Valdivia
- Valdivia 2

SERIES DE TIEMPO

MP₁₀

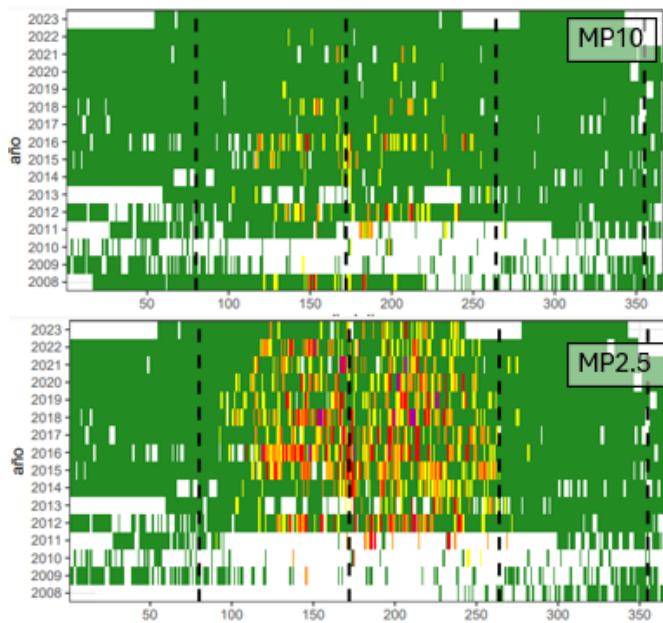


MP_{2.5}

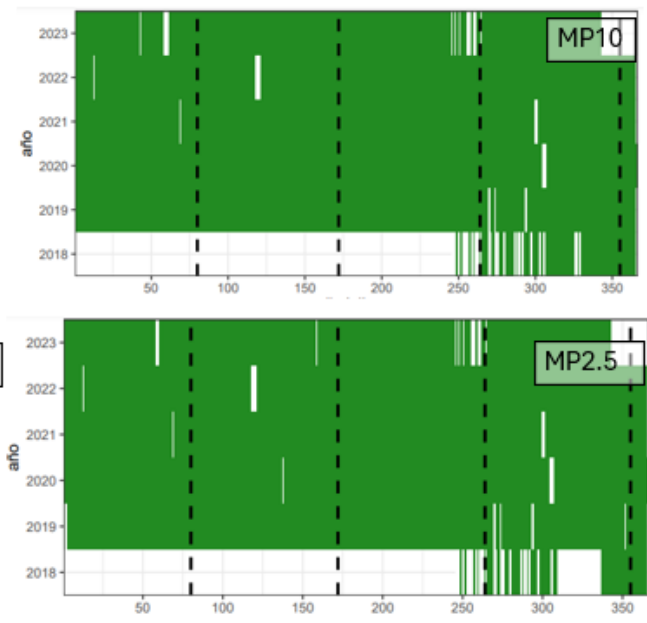


EPISODIOS CRÍTICOS

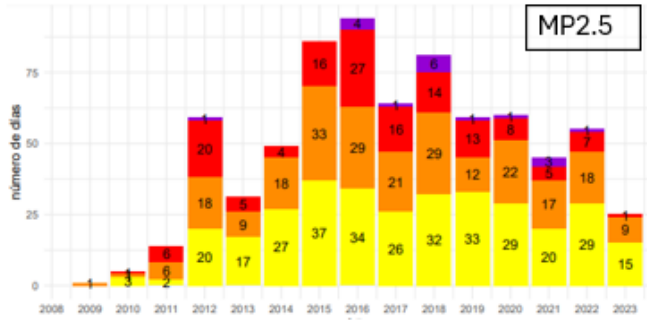
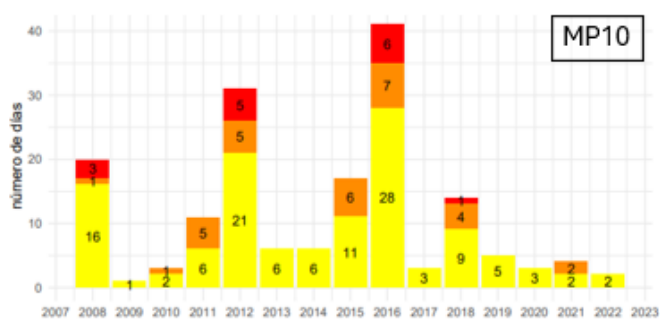
Valdivia



Valdivia 2

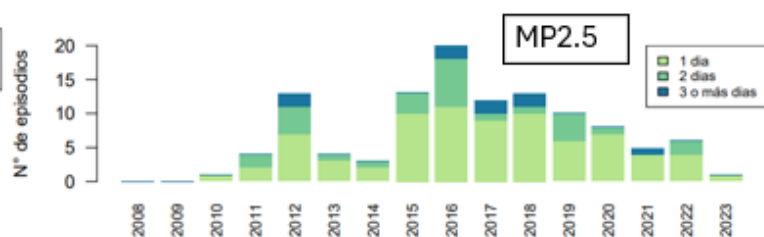
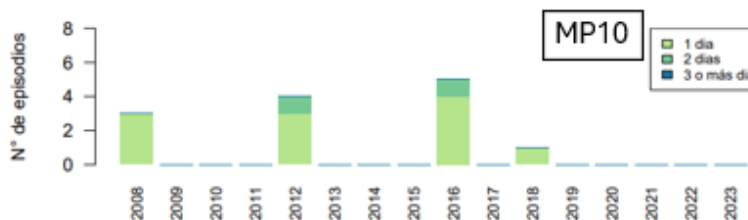


Valdivia



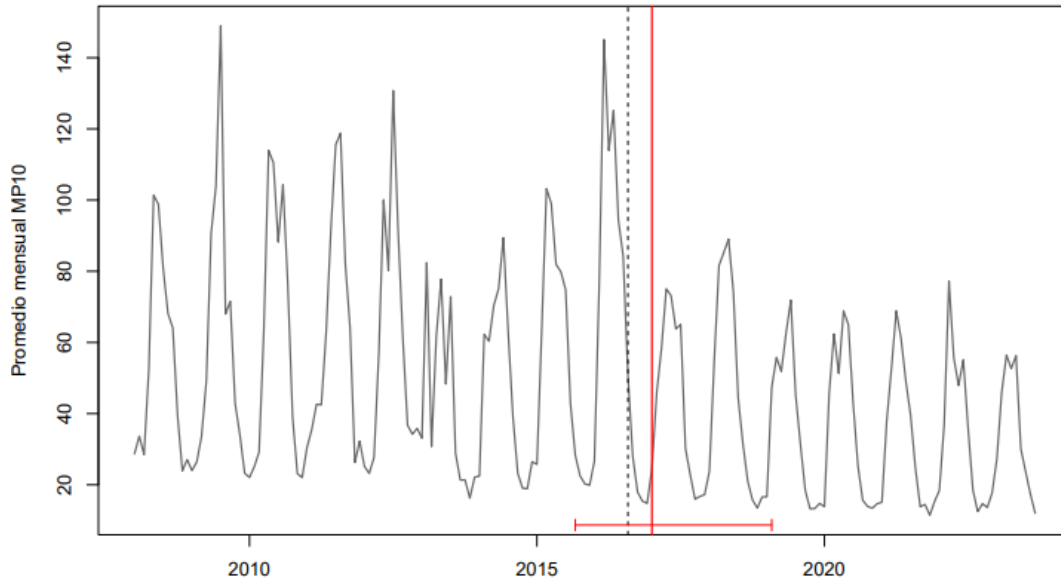
DURACIÓN EPISODIOS

Valdivia

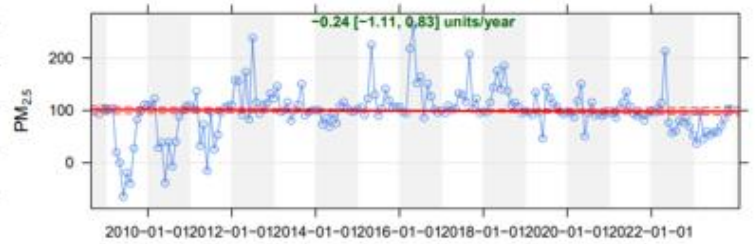
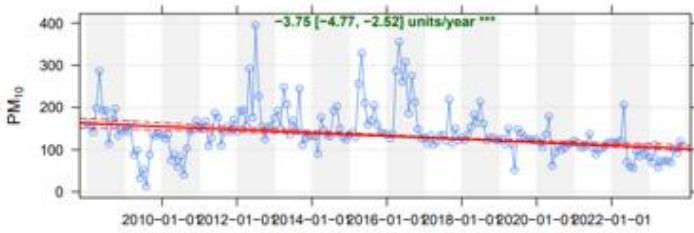


PUNTO DE QUIEBRE

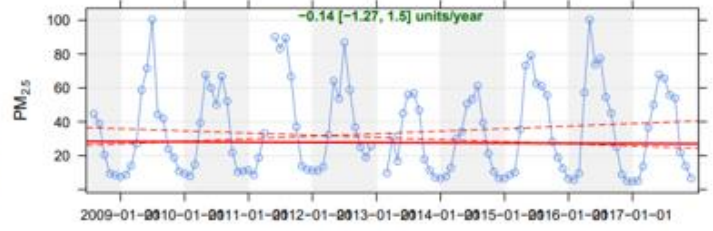
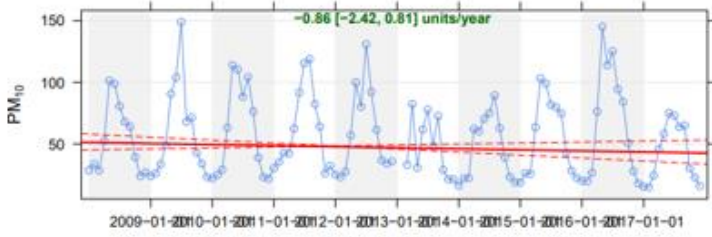
Valdivia - Estacion Valdivia (MP10)



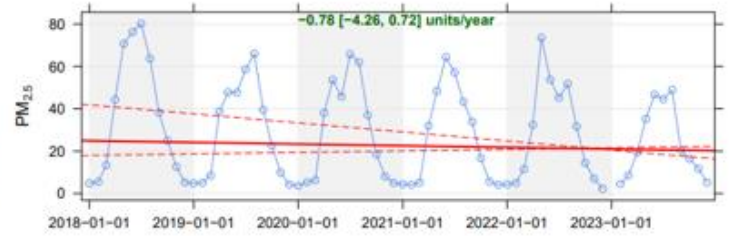
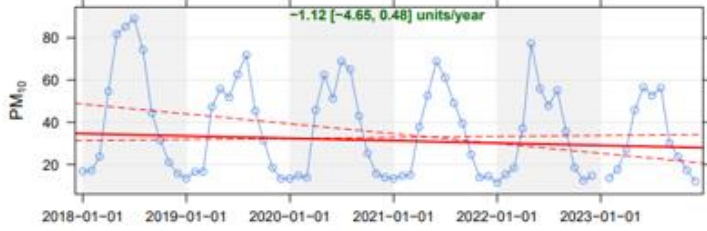
TENDENCIAS



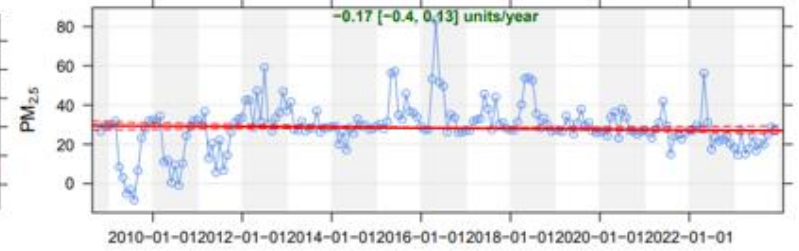
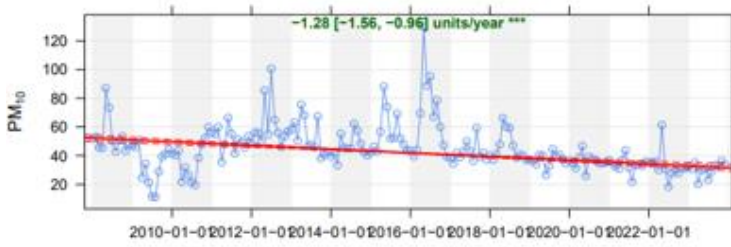
Antes PDA



Después PDA



TENDENCIA PERCENTIL 95



Anexo XV: PDA para la comuna de Osorno



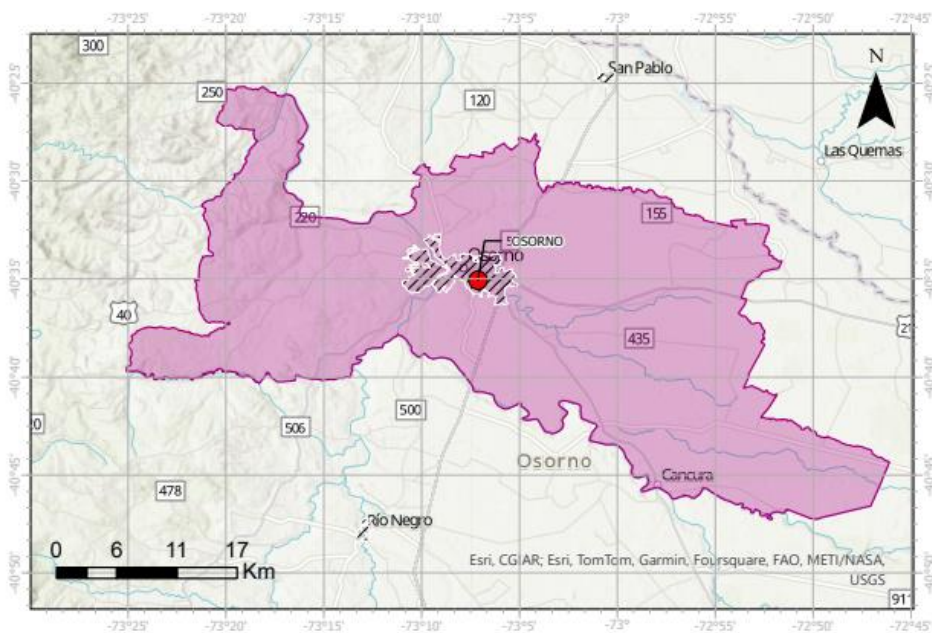
Población: 145 475 habitantes

Área: 6 805 km²

Densidad poblacional: 21,4 hab/km²

PRINCIPALES MEDIDAS

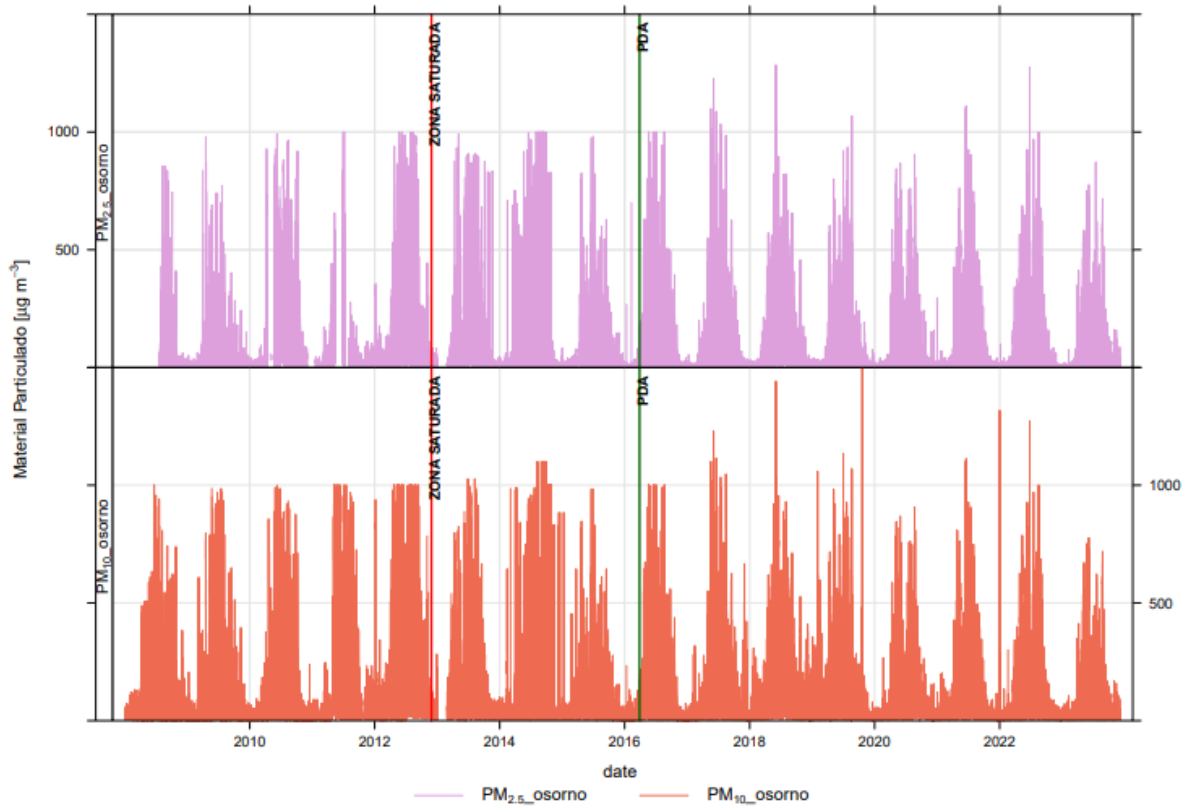
- 
 Uso y mejoramiento de calidad de leña
 - 
 Uso y mejoramiento de artefactos
 - 
 Mejoramiento eficiencia térmica de viviendas
 - 
 Control de emisiones a quemas agrícolas y domiciliarias
 - 
 Control de emisiones a fuentes estacionarias
 - 
 Control de emisiones a fuentes móviles
 - 
 Compensación de emisiones
 - 
 Educación ambiental
- 
 Gestión de episodios críticos



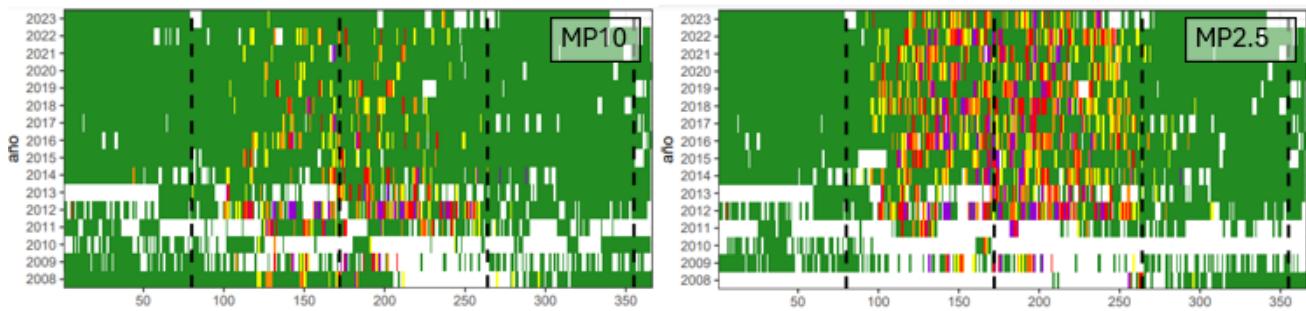
Estaciones consideradas:

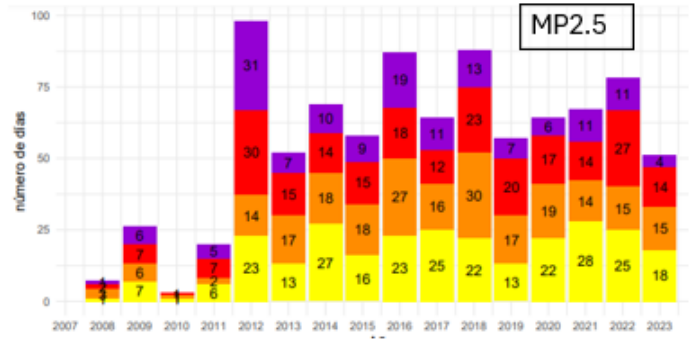
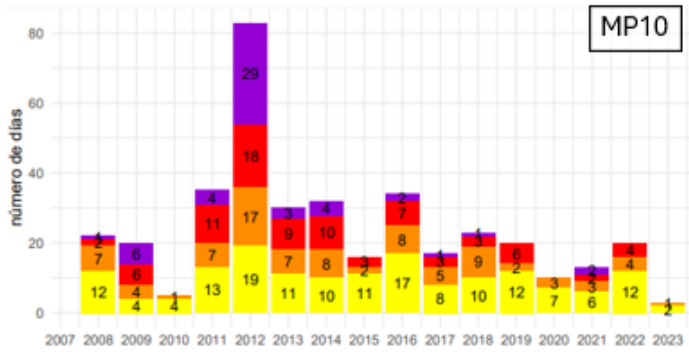
- Osorno

SERIES DE TIEMPO

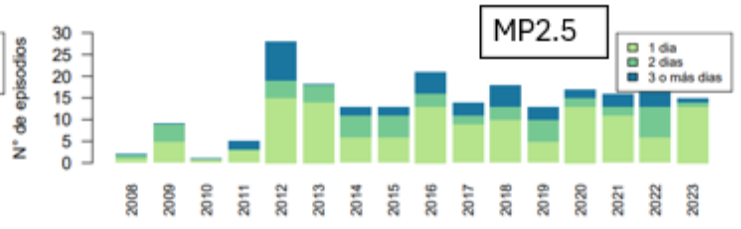
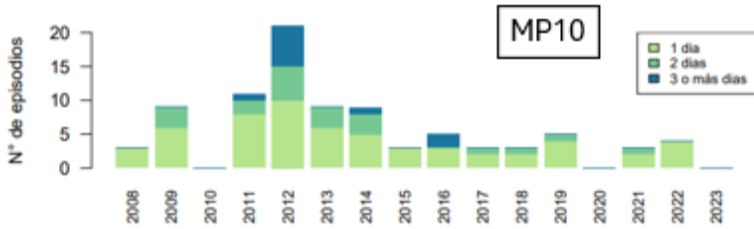


EPISODIOS CRÍTICOS



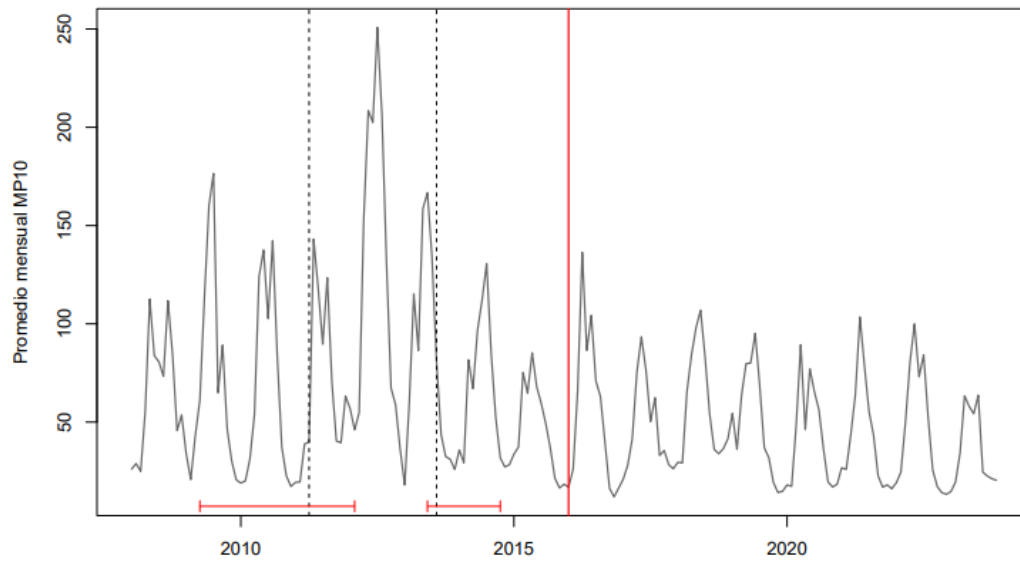


DURACIÓN EPISODIOS

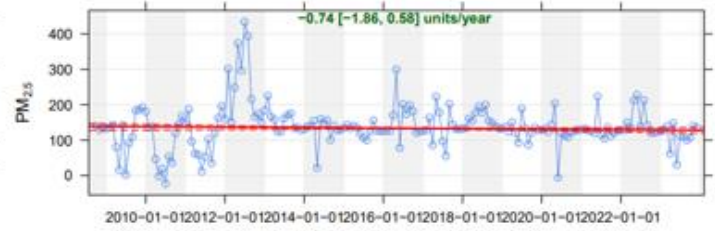
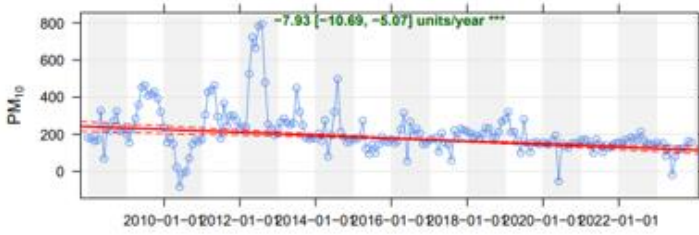


PUNTO DE QUIEBRE

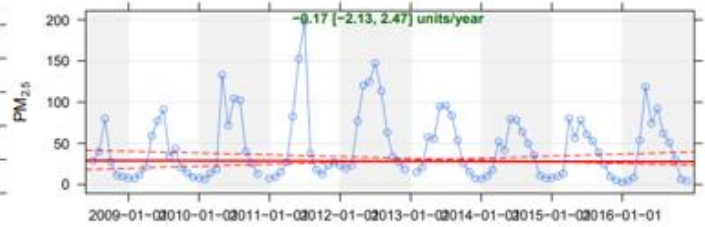
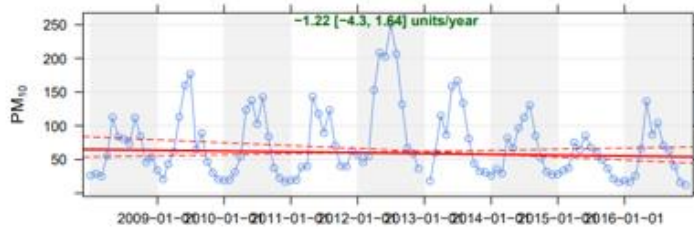
Osorno – Estacion Osorno (MP10)



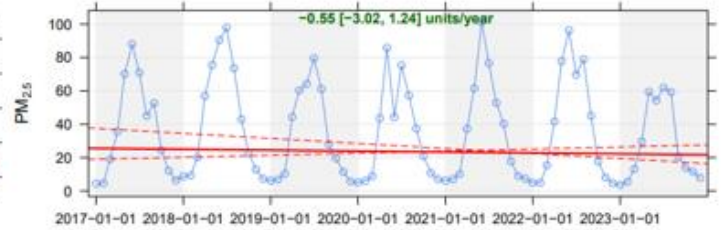
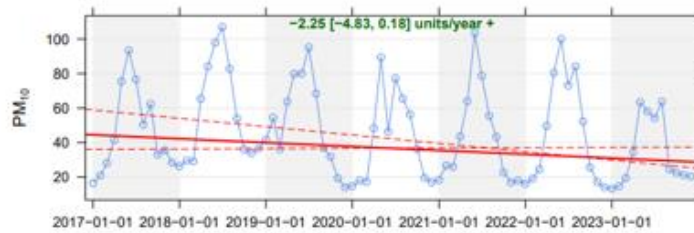
TENDENCIAS



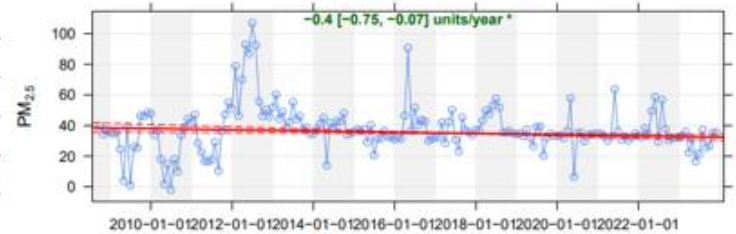
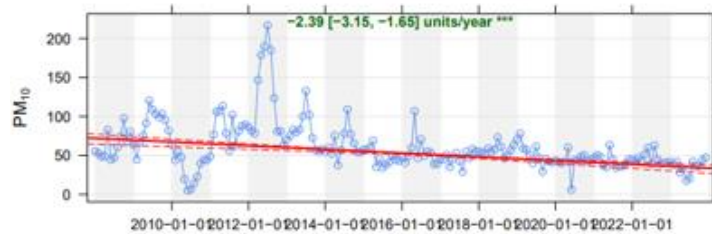
Antes PDA



Después PDA



TENDENCIAS PRCENTIL 95



Anexo XVI: PDA para la ciudad de Coyhaique y su zona circundante



Población: 57 818 habitantes

Área: 111,57 km²

Densidad poblacional: 518.2 hab/km²

PRINCIPALES MEDIDAS



Uso y mejoramiento de calidad de leña



Uso y mejoramiento de artefactos



Mejoramiento eficiencia térmica de viviendas



Control de emisiones a quemas agrícolas y domiciliarias



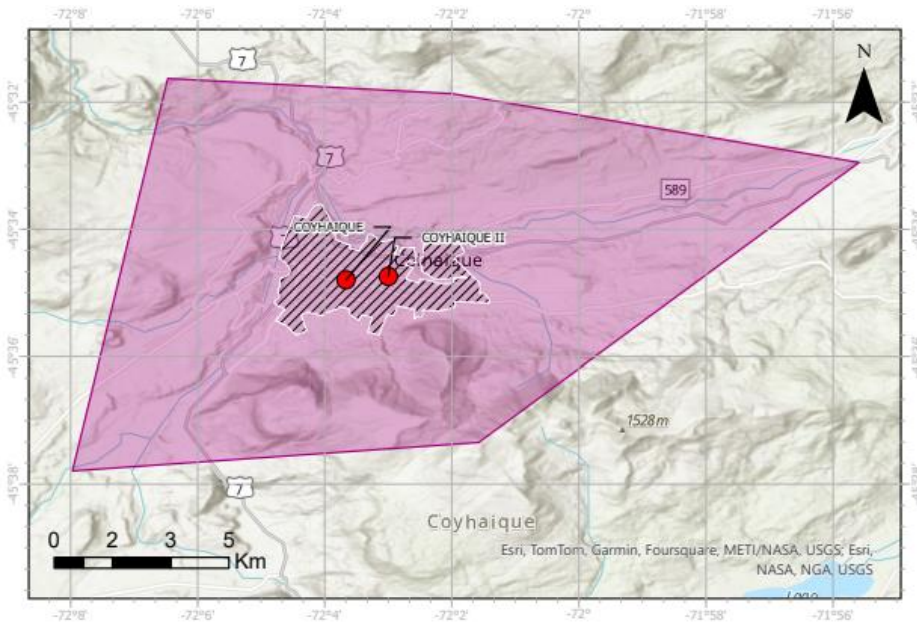
Control de emisiones a fuentes estacionarias



Gestión de episodios críticos



Educación ambiental

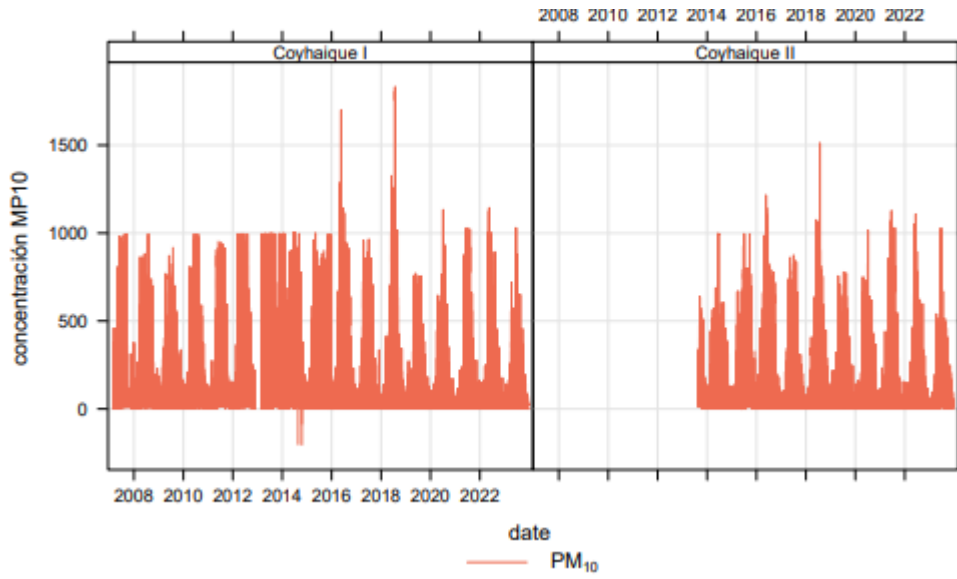


Estaciones consideradas:

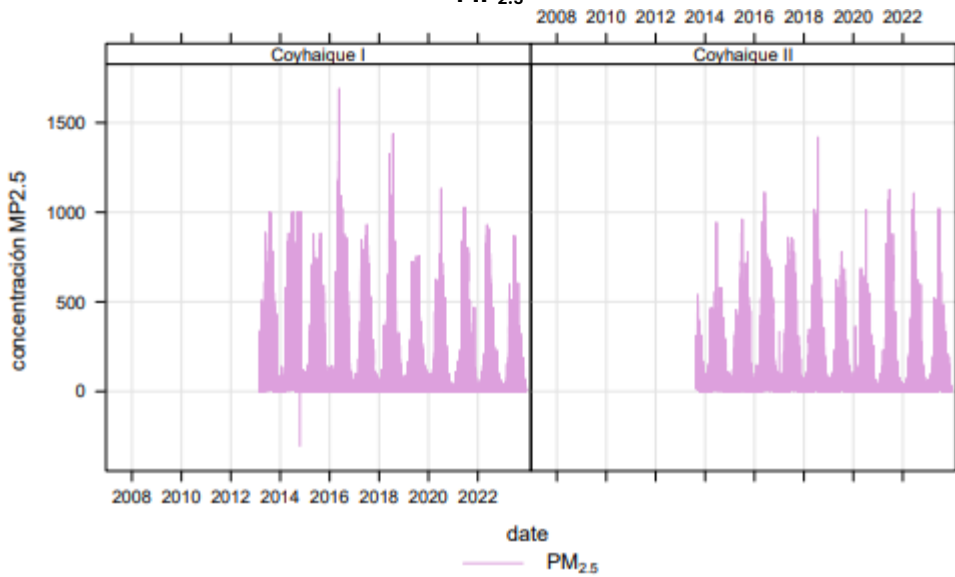
- Coyhaique I
- Coyhaique II

SERIES DE TIEMPO

MP₁₀

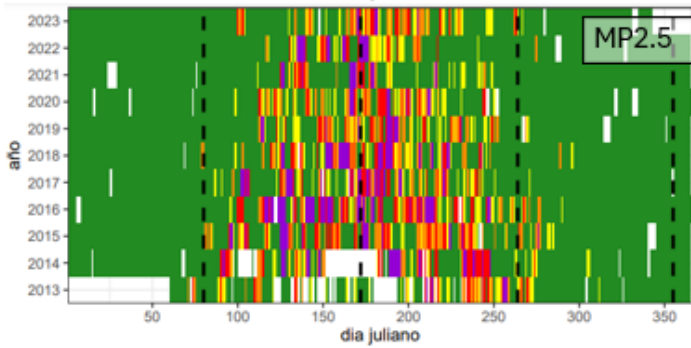
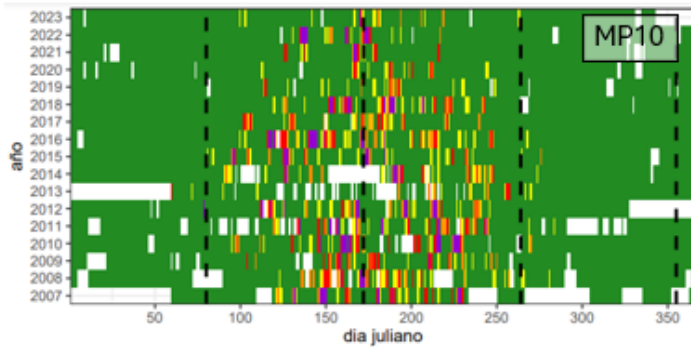


MP_{2.5}

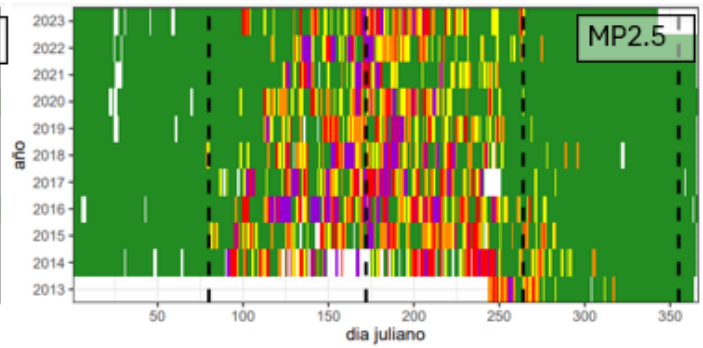
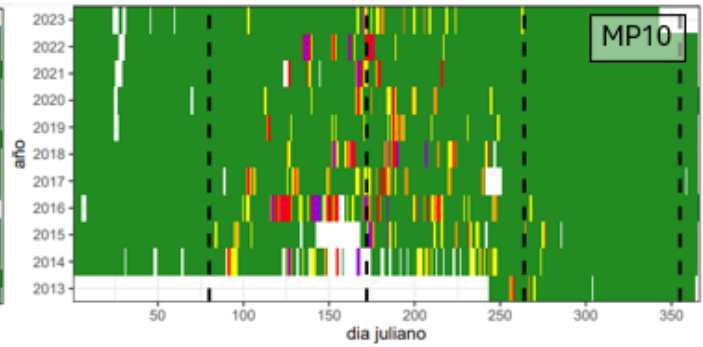


EPISODIOS CRÍTICOS

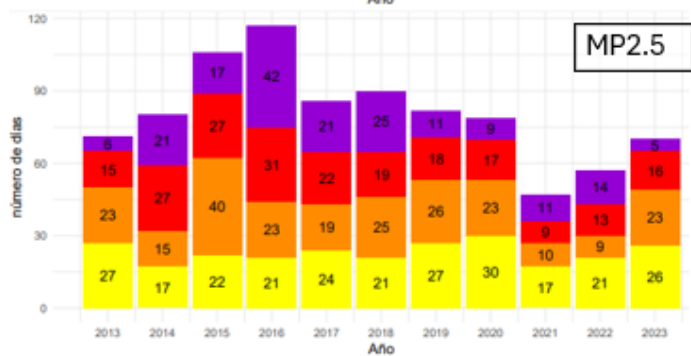
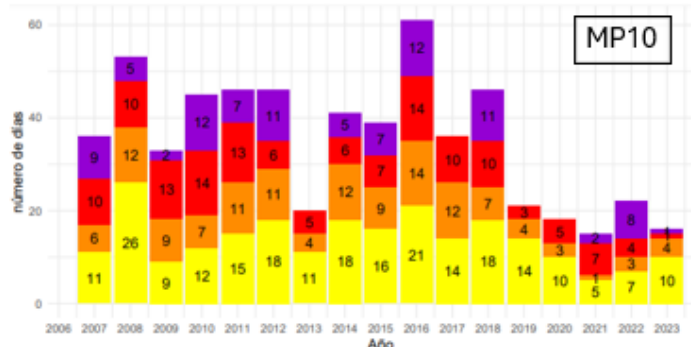
Coyhaique I



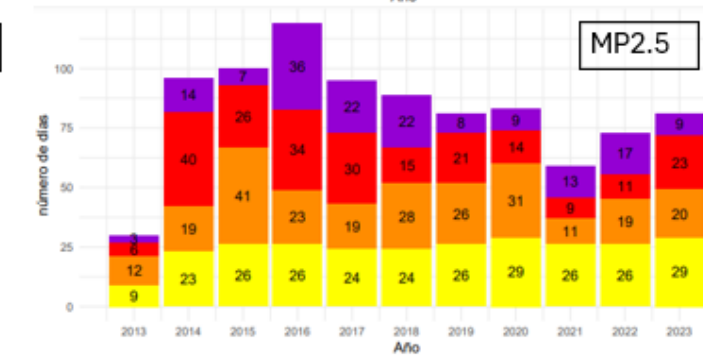
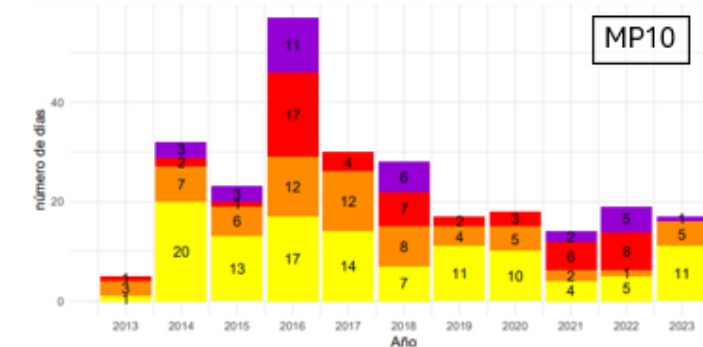
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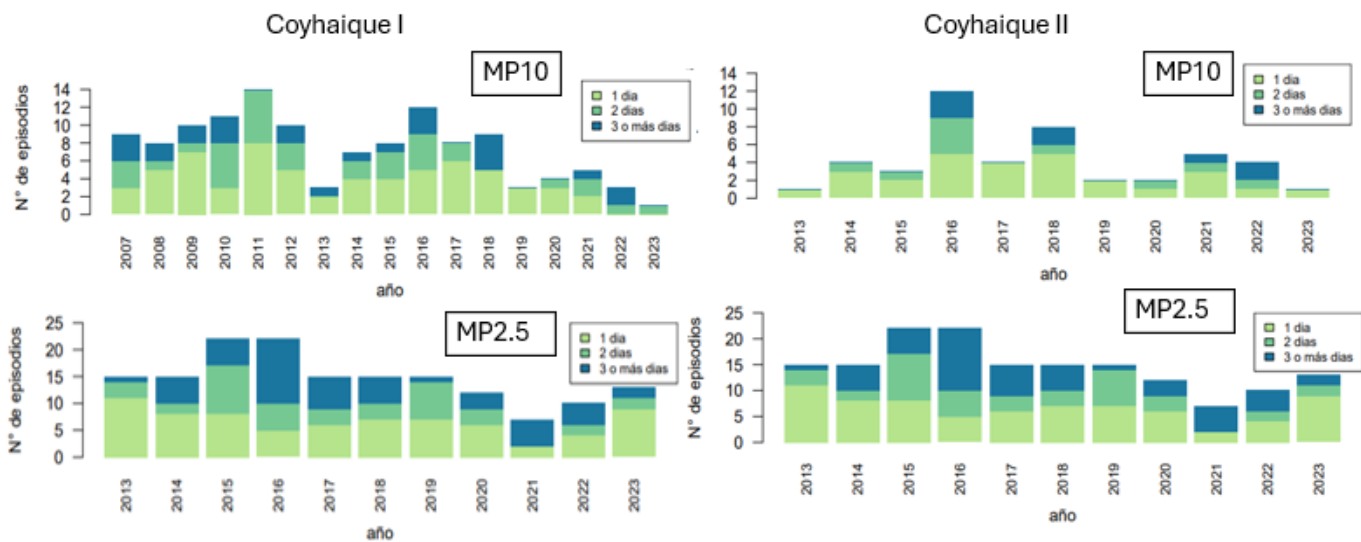
Coyhaique I



Coyhaique II

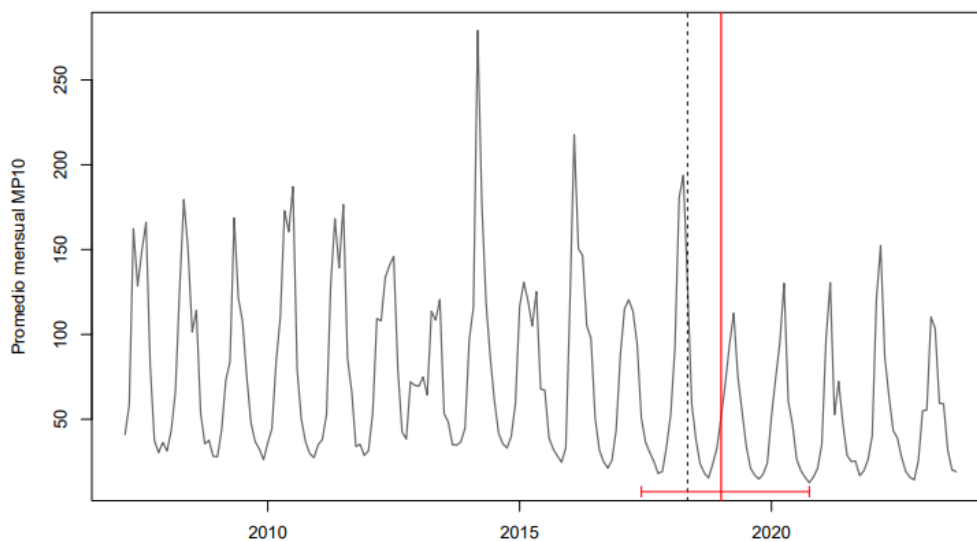


DURACIÓN EPISODIOS

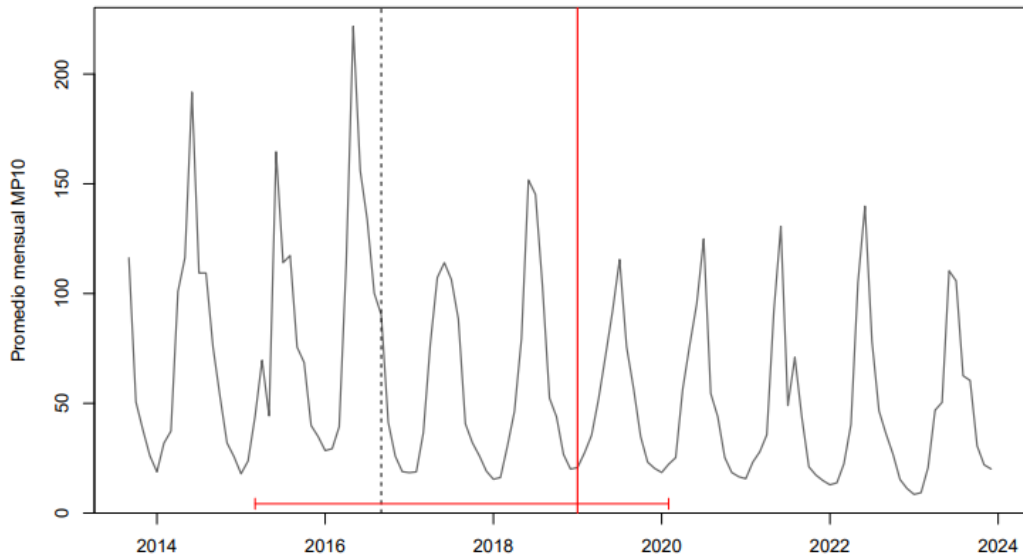


PUNTO DE QUIEBRE

Coyhaique – Estacion Coyhaique I (MP10)

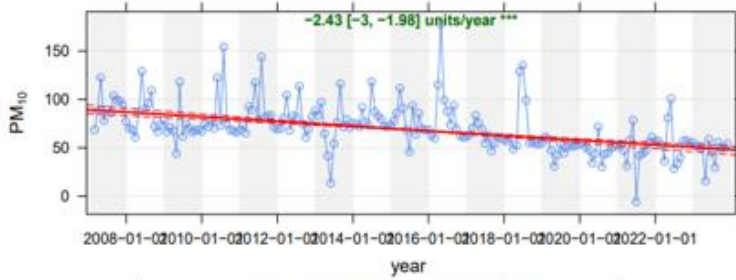


Coyhaique – Estacion Coyhaique II (MP10)

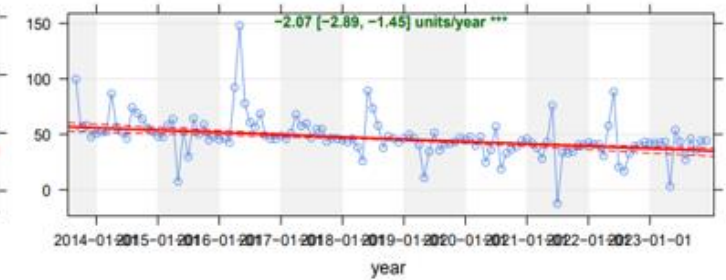
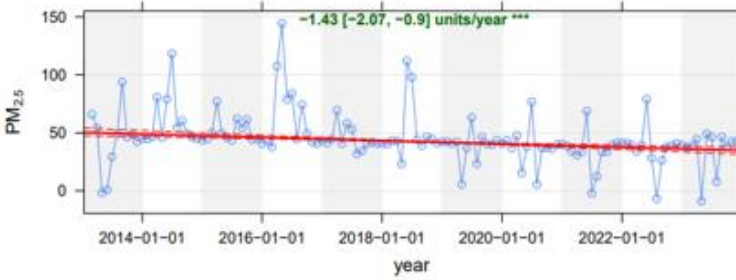
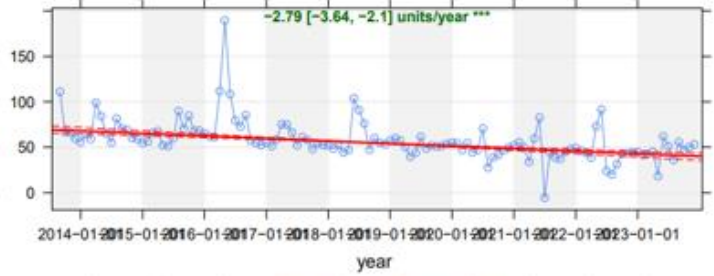


TENDENCIAS

Coyhaique I

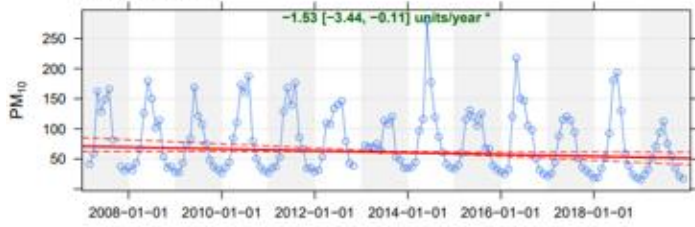


Coyhaique II

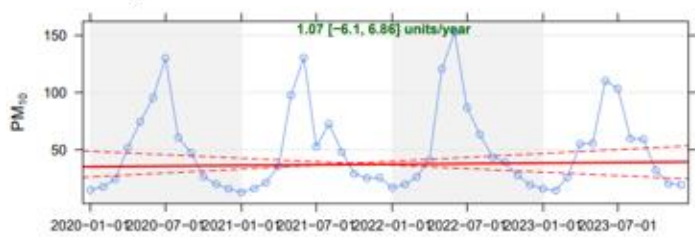


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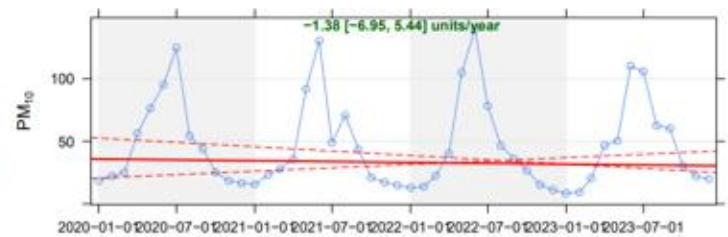
Antes PDA



Después PDA

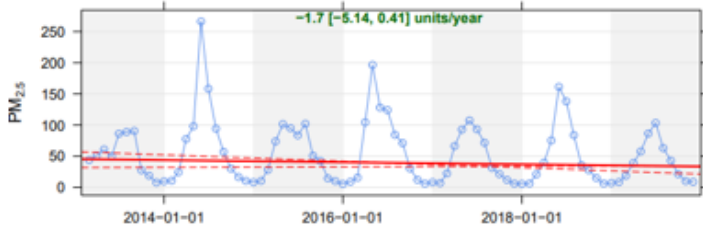


Coyhaique II

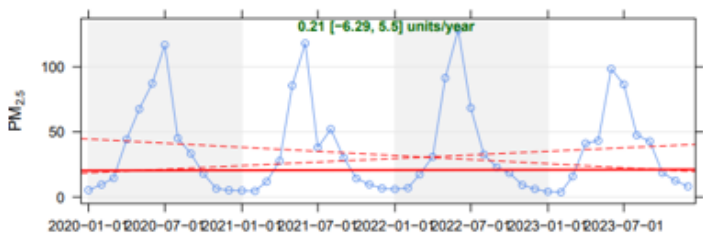


Coyhaique I

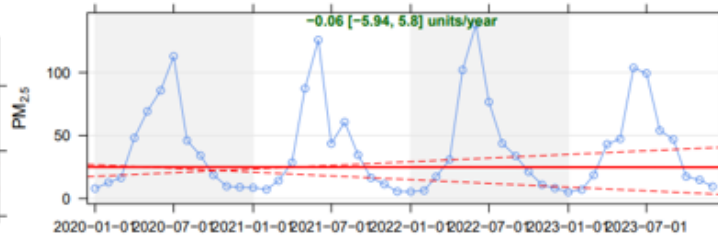
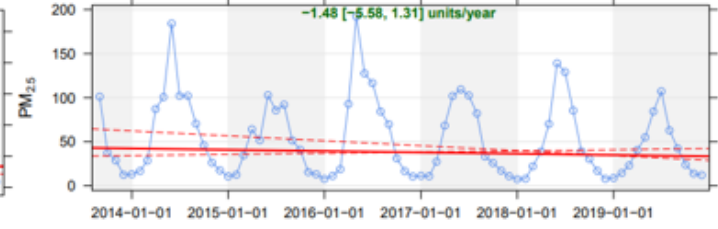
Antes PDA



Después PDA

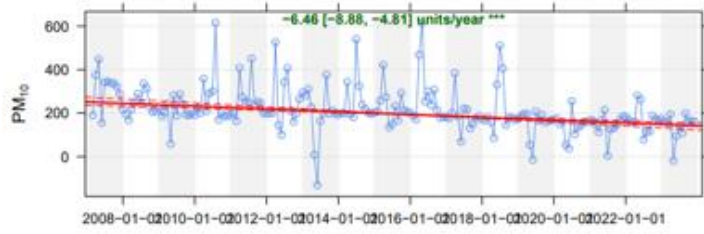


Coyhaique II



TENDENCIAS PERCENTIL 95

Coyhaique I



Coyhaique II

