

“Cambio climático y eventos extremos en Agricultura: Desafíos Emergentes”

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Departamento de Ecosistemas y
Medio Ambiente
Centro de Cambio Global UC

Contenidos

- Variabilidad y Cambio Climático
- Concepto de Eventos Extremos. SREX Report IPCC
- Tendencias Recientes
- Desafíos Emergentes

Variabilidad Climática (Cortesía de W Baethgen)

("Tiempo" 1 – 10 días)

"Variabilidad Climática"

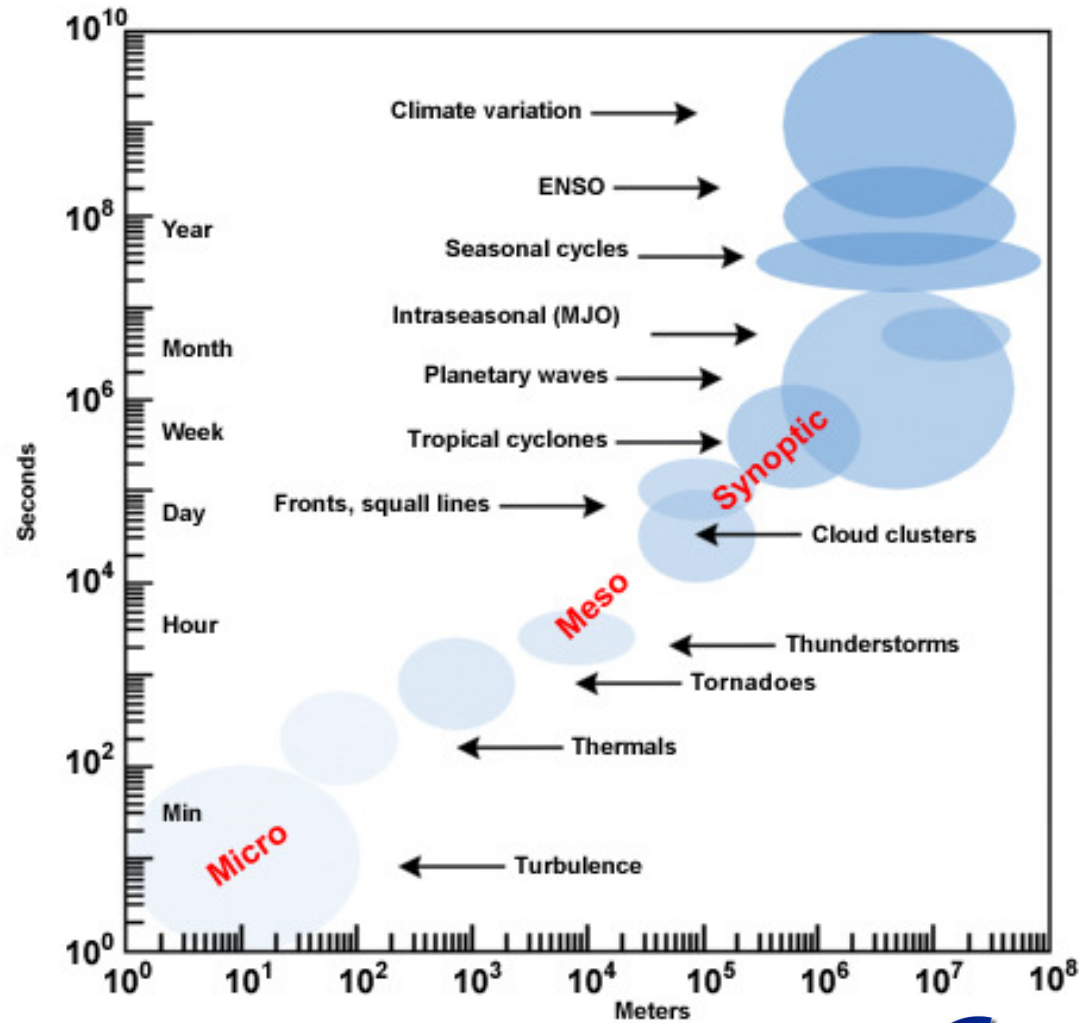
- 2-3 meses
- 6 meses – 1 año
- 1-3 Décadas

Demanda

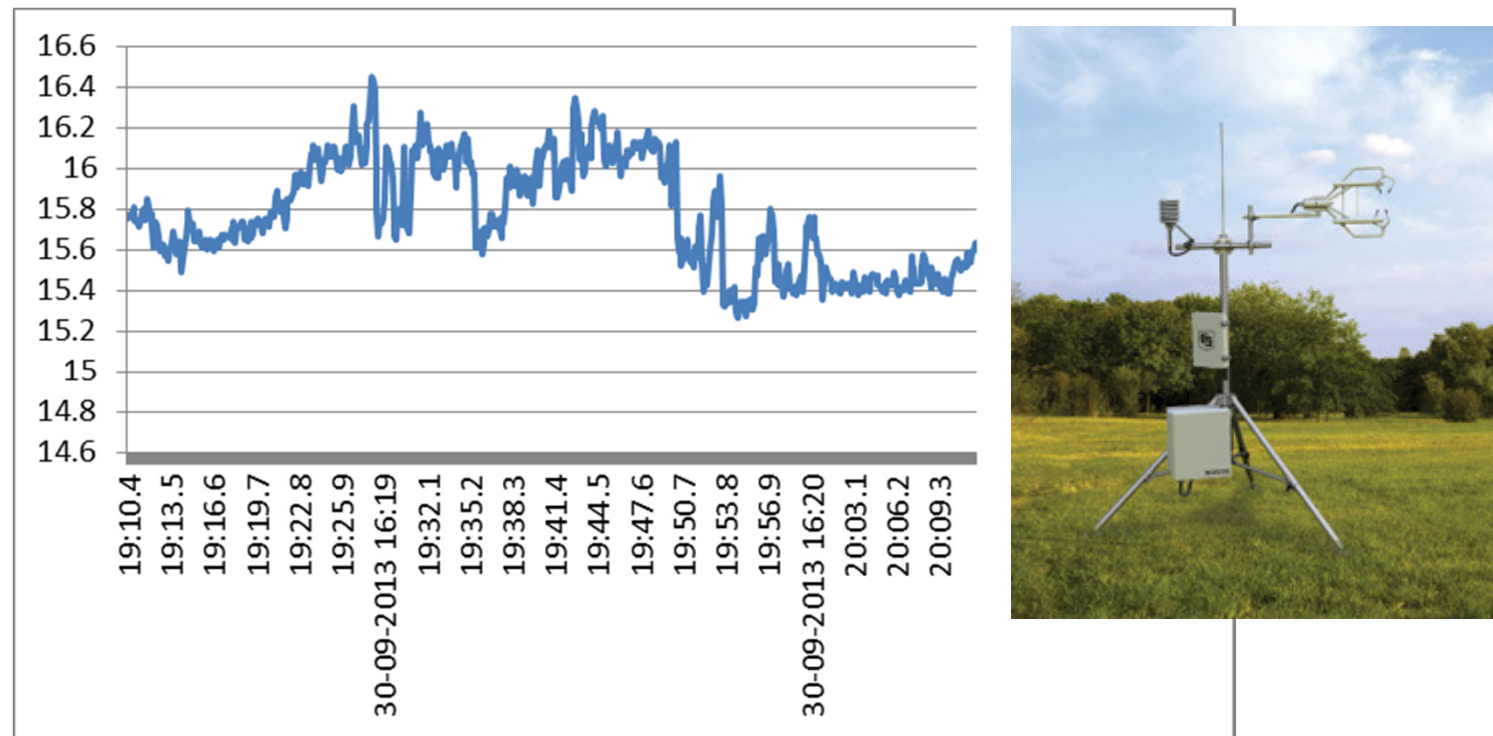
"Cambio Climático"

- Varias Décadas
- Siglos

Distintas Escalas



Variaciones de Temperatura a nivel de Microsegundo



Letelier y Meza en prep

Variaciones Estacionales de Humedad de Suelo

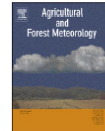
Agricultural and Forest Meteorology 213 (2015) 203–216



Contents lists available at ScienceDirect

Agricultural and Forest Meteorology

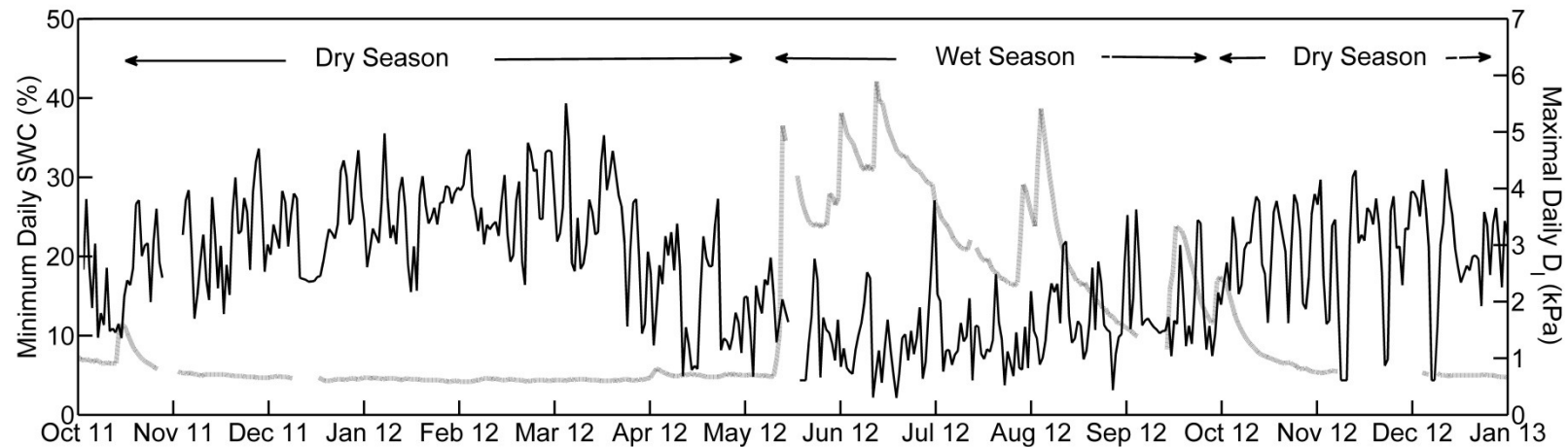
journal homepage: www.elsevier.com/locate/agrformet



Empirical stomatal conductance models reveal that the isohydric behavior of an *Acacia caven* Mediterranean Savannah scales from leaf to ecosystem



Nicolas Raab^{a,*,1}, Francisco Javier Meza^{b,c}, Nicolás Franck^d, Nicolás Bambach^e



Variaciones Interanuales



Available online at www.sciencedirect.com

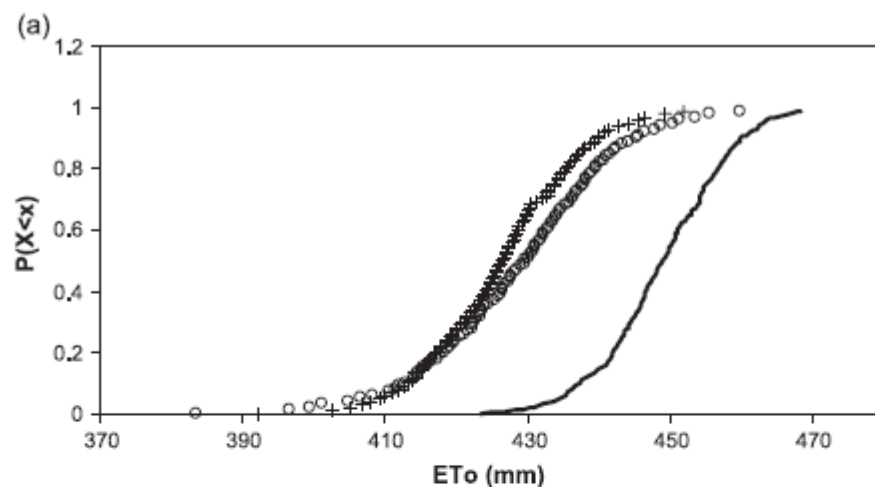
SCIENCE @ DIRECT®

Global and Planetary Change 47 (2005) 212–220

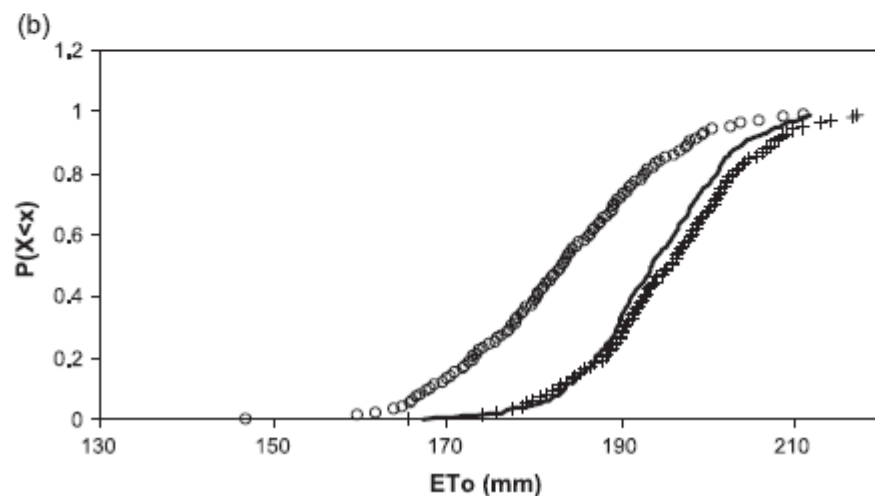
GLOBAL AND PLANETARY
CHANGE

www.elsevier.com/locate/gloplacha

Variability of reference evapotranspiration and water demands.
Association to ENSO in the Maipo river basin, Chile



+ LN — N ○ EN

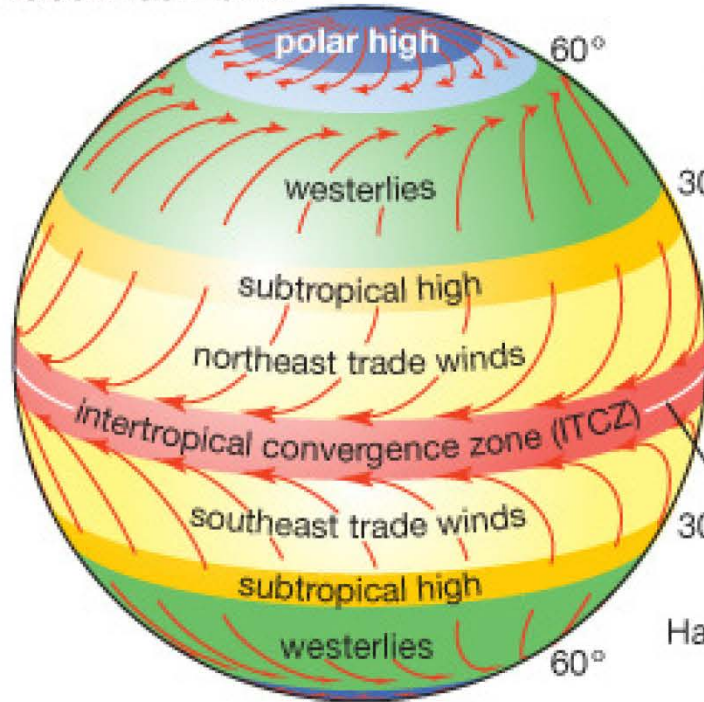


+ LN — N ○ EN

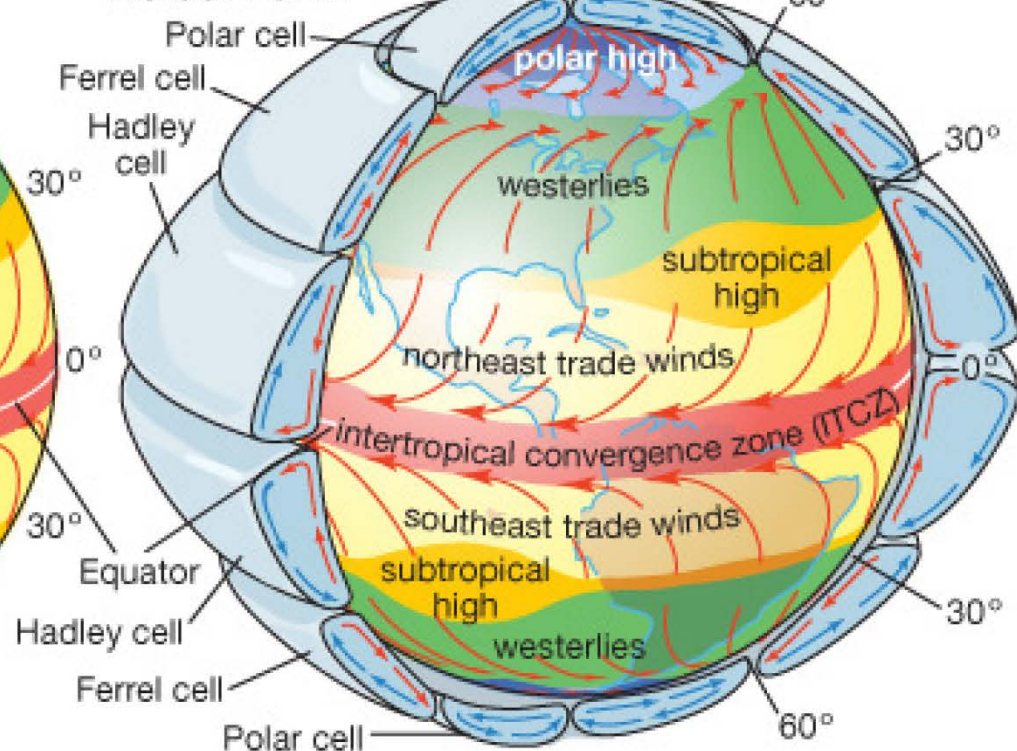


Circulación General de la Atmósfera

Idealized Earth



Actual Earth

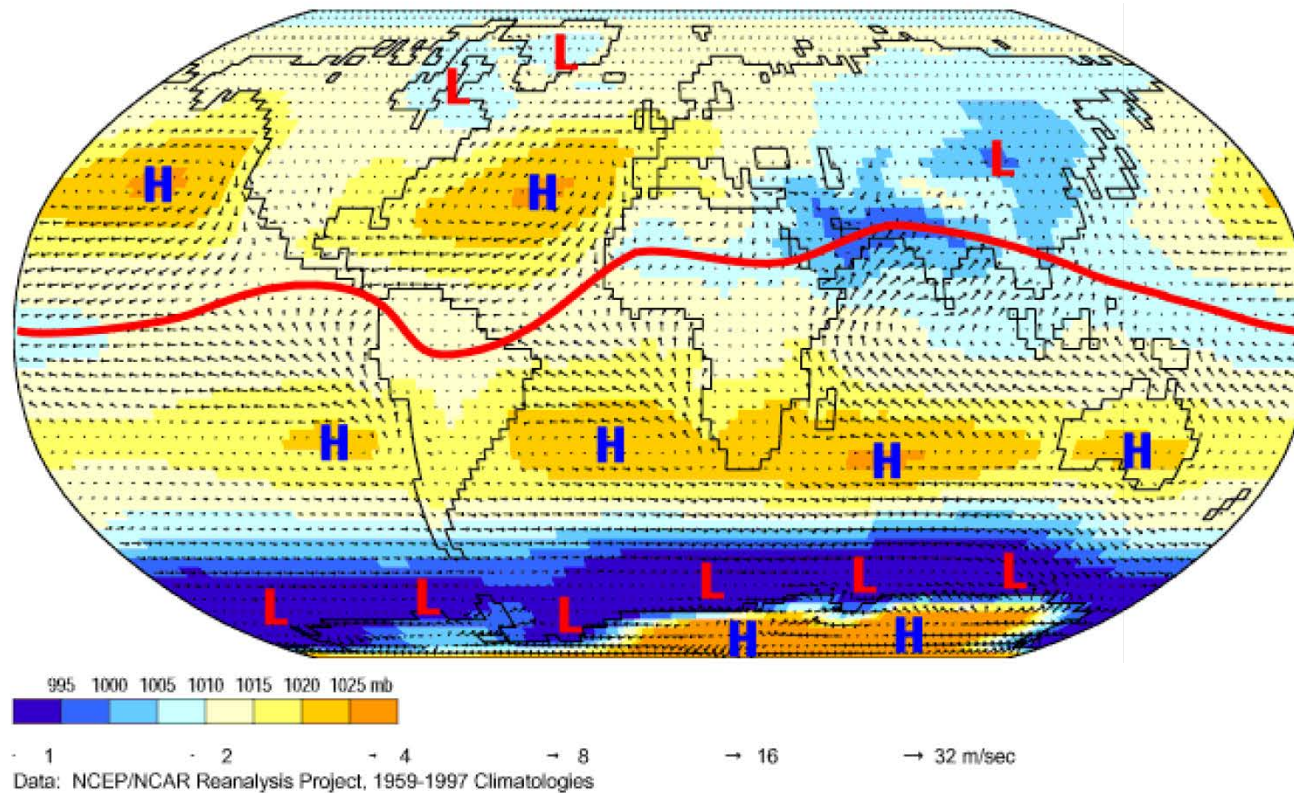


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Circulación General de la Atmósfera

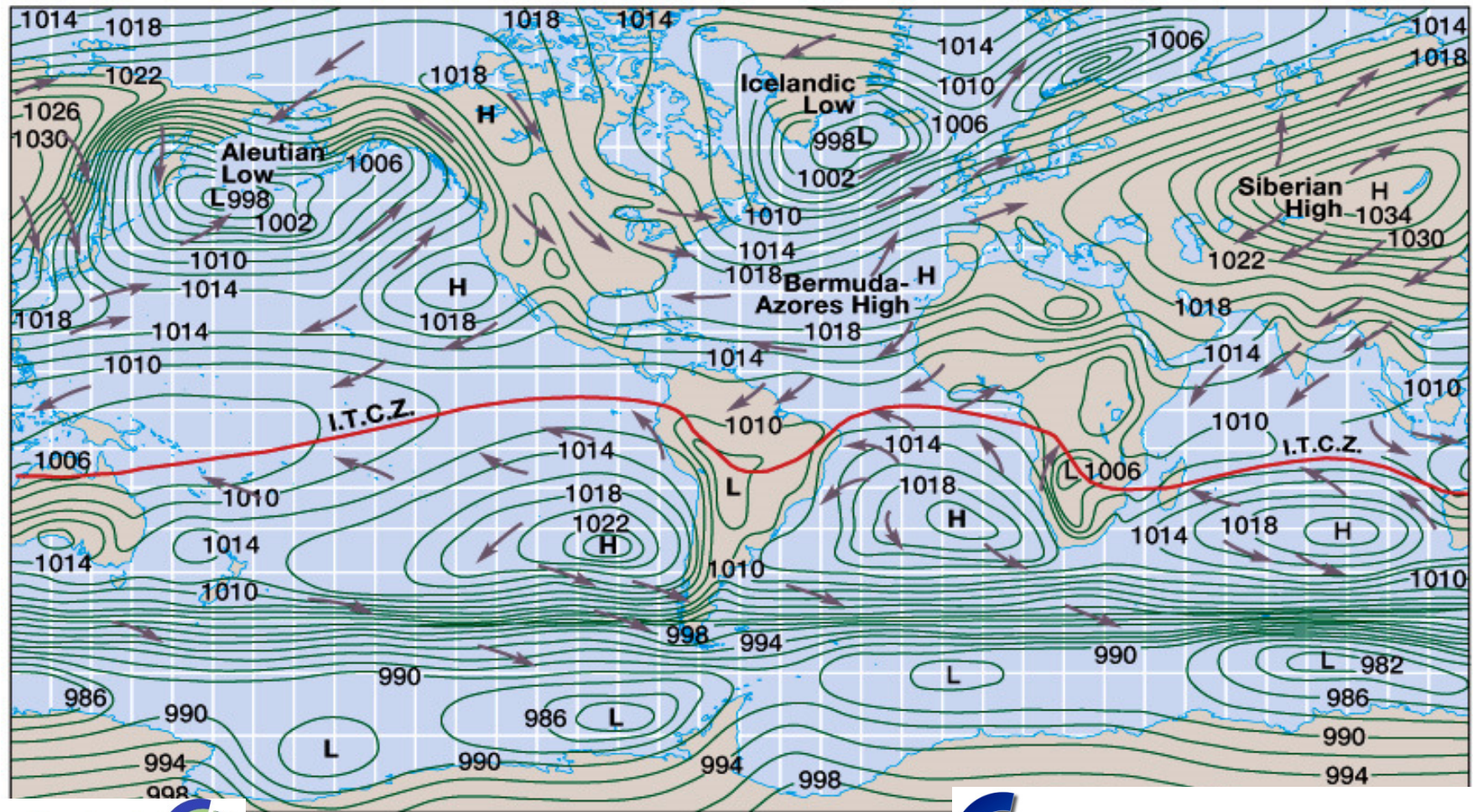
Sea-Level Pressure and Surface Winds

Jul

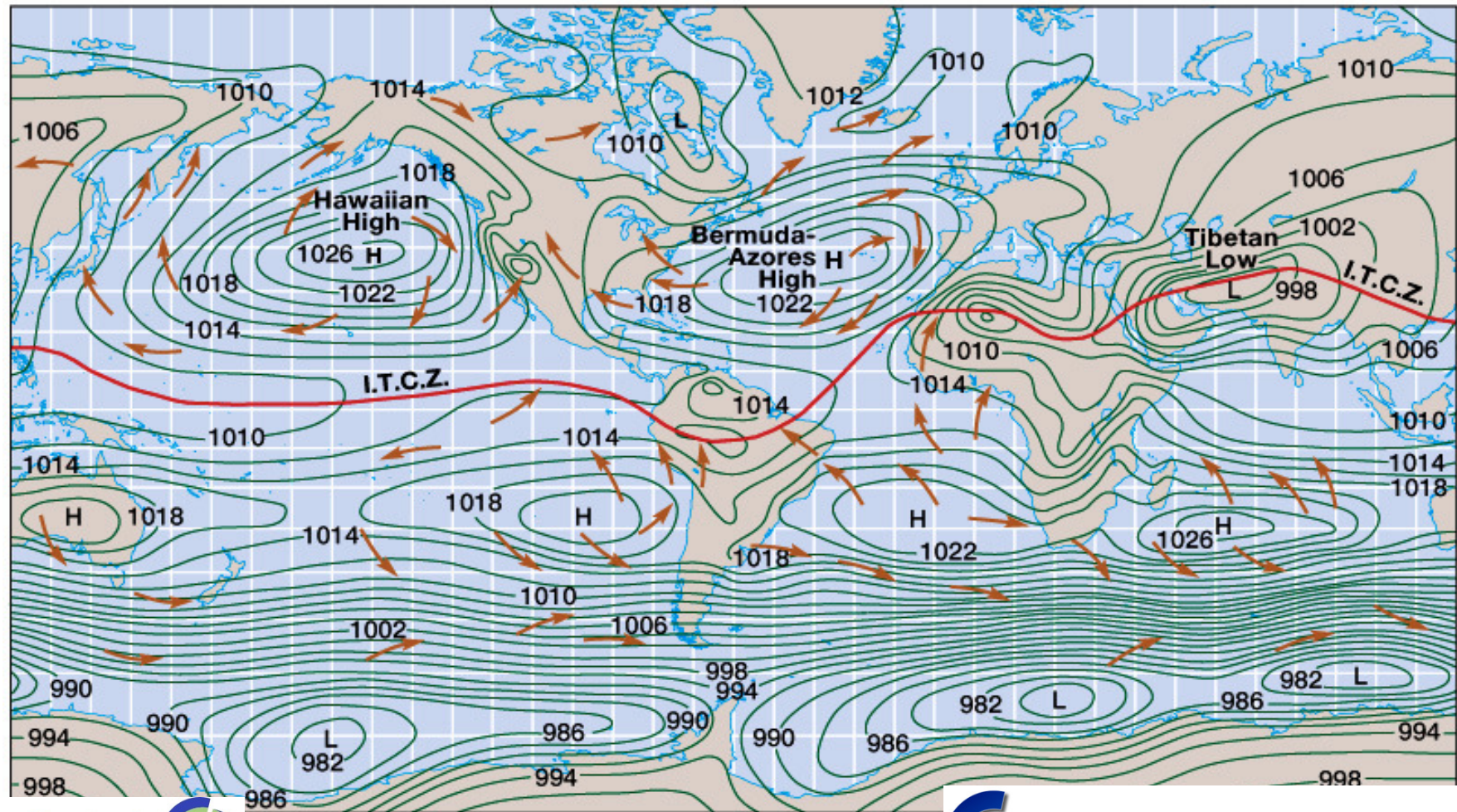




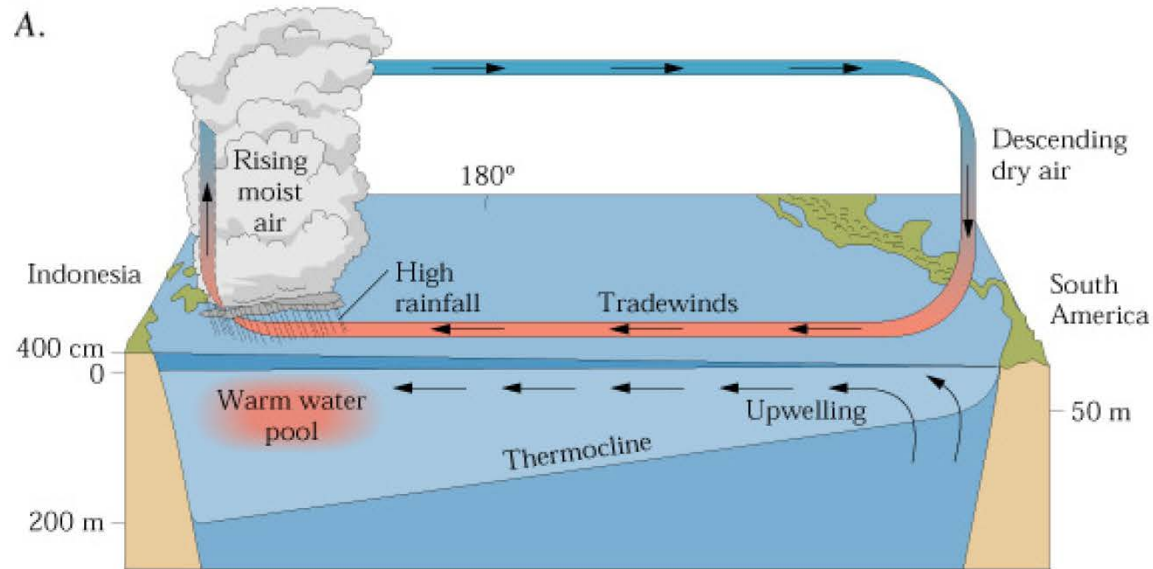
Circulación General de la Atmósfera. ENERO



Circulación General de la Atmósfera JULIO

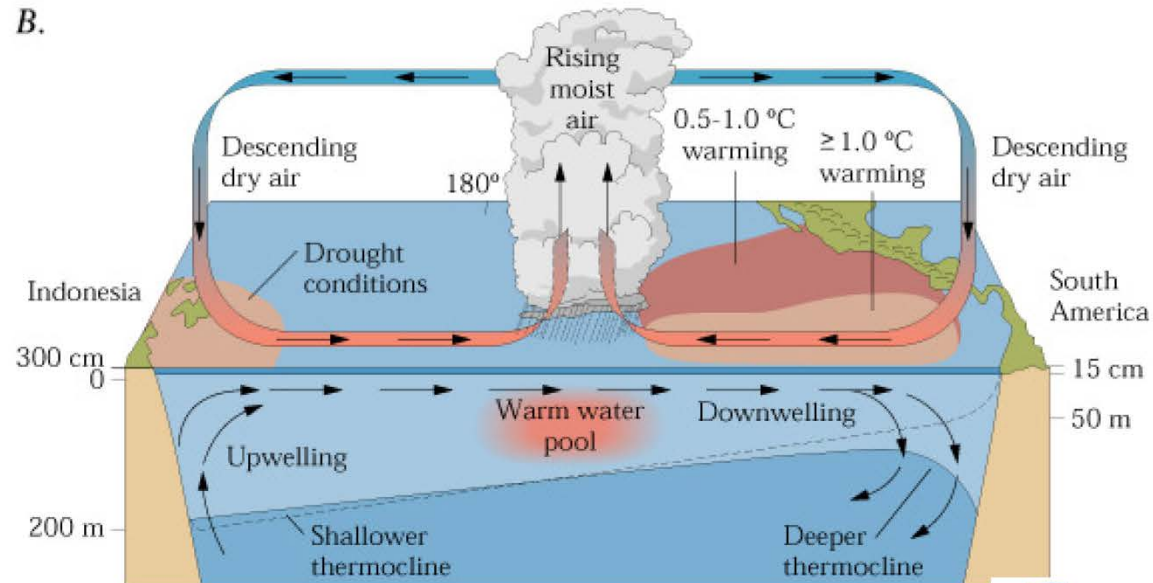


A.



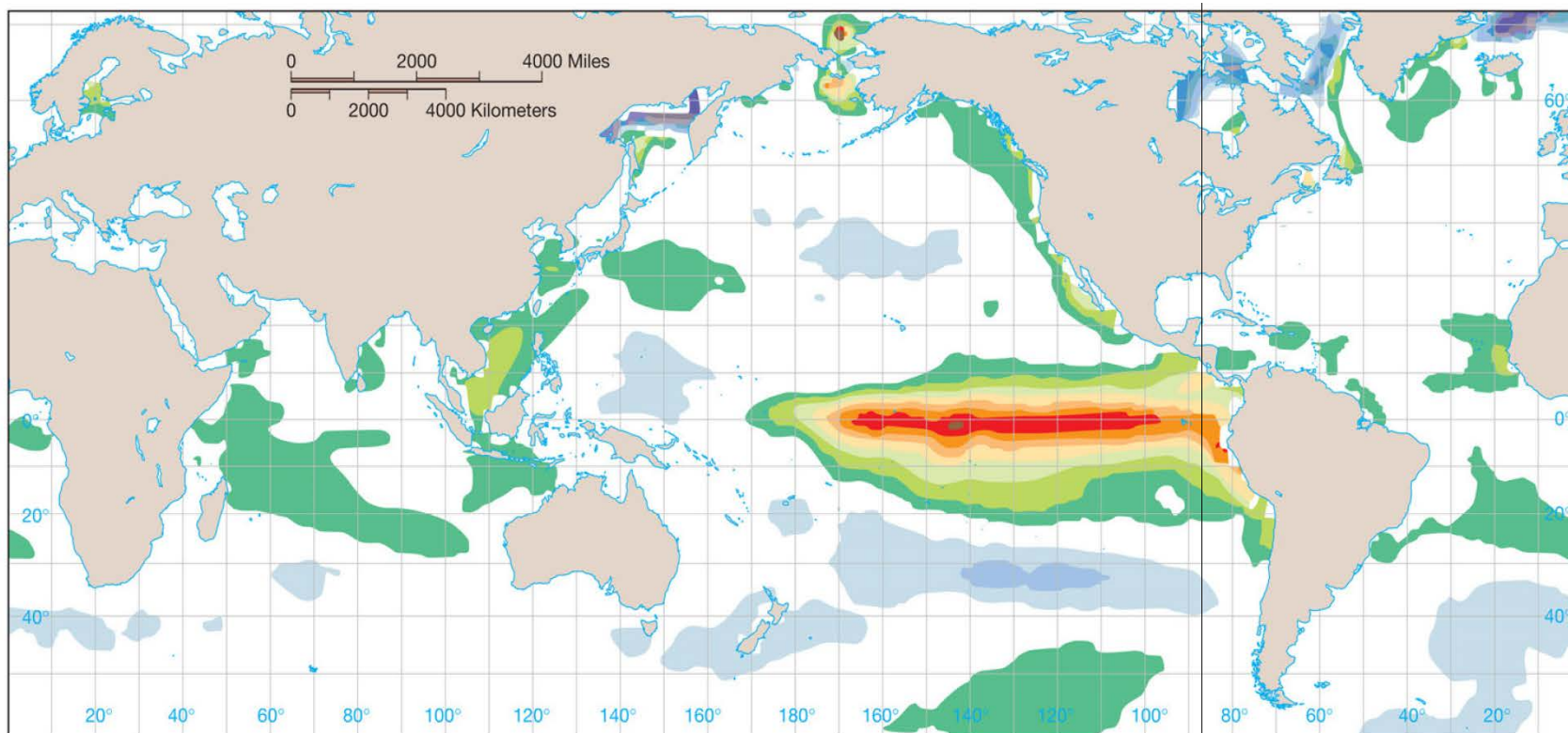
"Normal" conditions in the tropical Pacific

B.



El Niño conditions in the tropical Pacific

Fenómeno del Niño

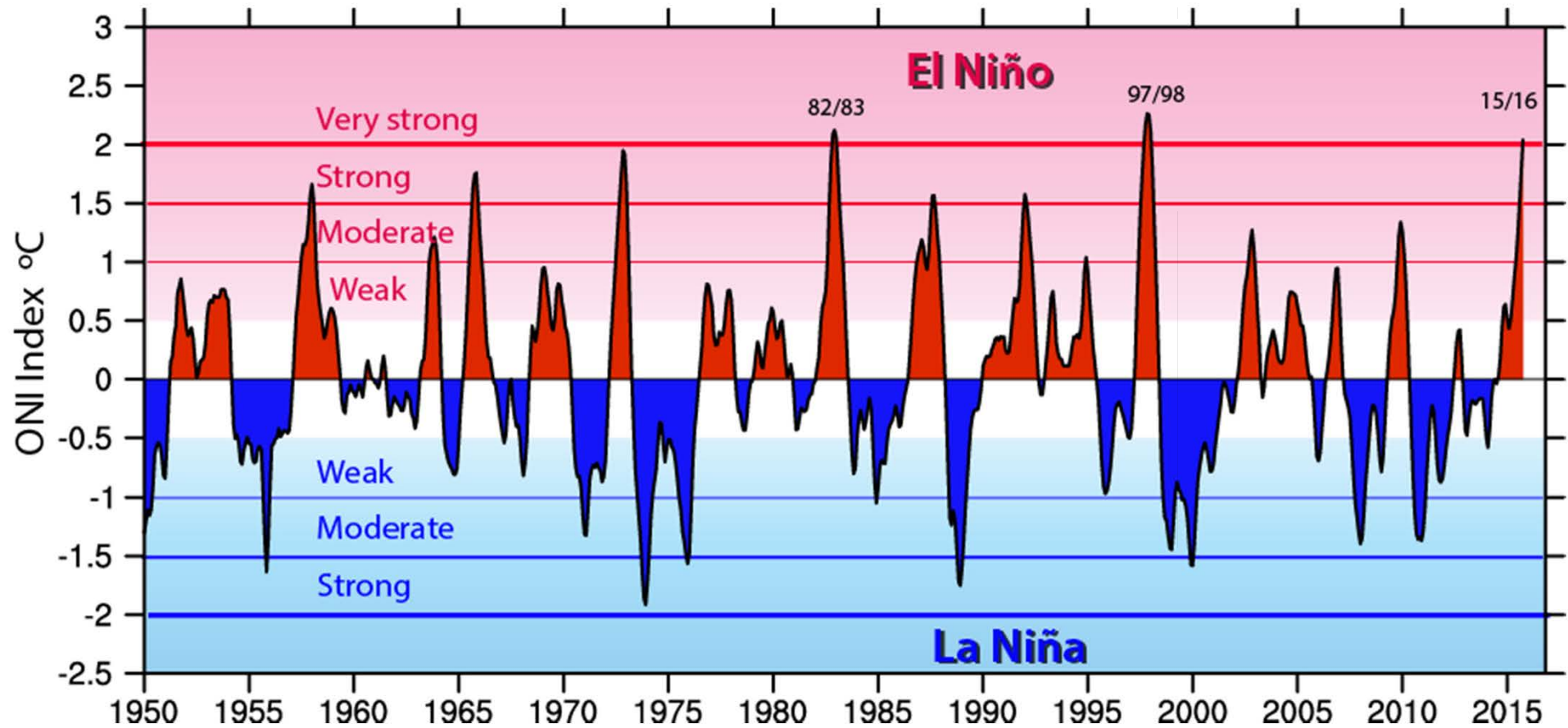


Sea Surface Temperature Composite Anomaly, November to March

1958, 1966, 1973, 1983, 1987, 1992, 1996, 1998

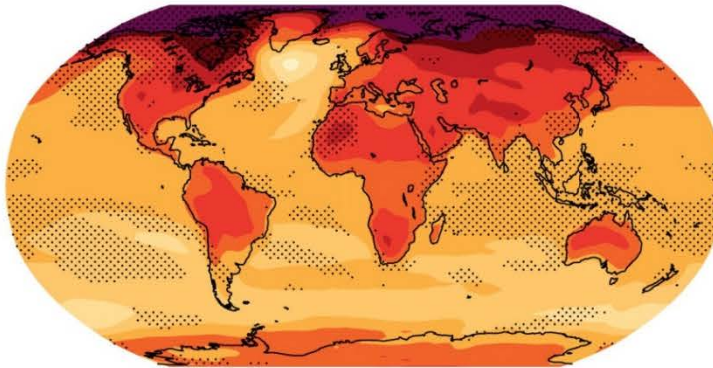


Monitoreo del Fenómeno del Niño

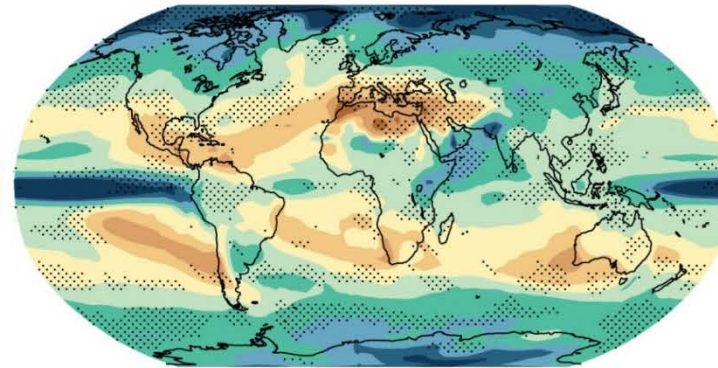


Proyecciones de Cambio Climático

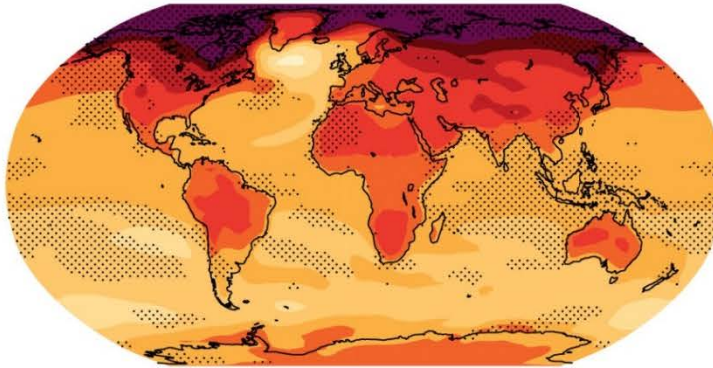
Temperature scaled by global T ($^{\circ}\text{C}$ per $^{\circ}\text{C}$)
CMIP3 : 2080-2099



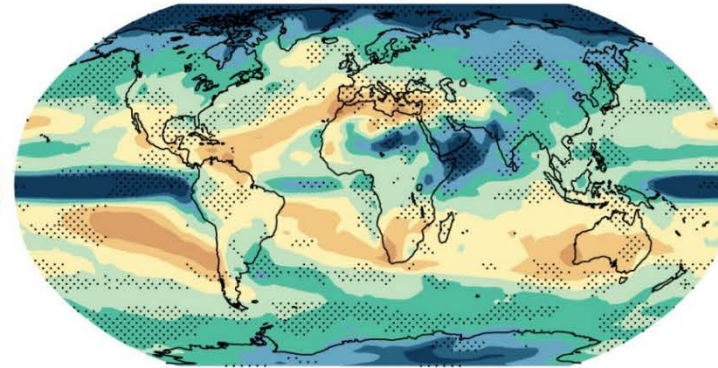
Precipitation scaled by global T (% per $^{\circ}\text{C}$)
CMIP3 : 2080-2099



CMIP5 : 2081-2100



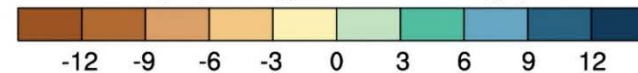
CMIP5 : 2081-2100



($^{\circ}\text{C}$ per $^{\circ}\text{C}$ global mean change)



(% per $^{\circ}\text{C}$ global mean change)



Special IPCC Report on Extreme Events (SREX)



The screenshot shows the official website for the Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX). The header features the IPCC logo and the text 'WORKING GROUPS I+II' and 'Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX)'. A navigation bar includes links for 'Get Fact Sheet', 'Overview', 'Report', 'Contributors', 'Press & Events', 'IPCC Process', and 'Background'. The main content area is titled 'Special Report' and includes a large 'PLAY' button over a video thumbnail labeled 'SREX OVERVIEW'. Below the title, there are two download buttons: 'SUMMARY FOR POLICYMAKERS' (PDF - 29 pages - 5.6MB) and 'FULL SREX REPORT' (Available February 2012). At the bottom right, there is a link to 'Read the Press Release and see Generic Presentation'.

WORKING GROUPS I+II
Managing the Risks of Extreme Events and Disasters
to Advance Climate Change Adaptation (SREX)

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

Get Fact Sheet Overview Report Contributors Press & Events IPCC Process Background

Special Report

Managing the Risks of Extreme Events and
Disasters to Advance Climate Change
Adaptation (SREX)

SREX OVERVIEW

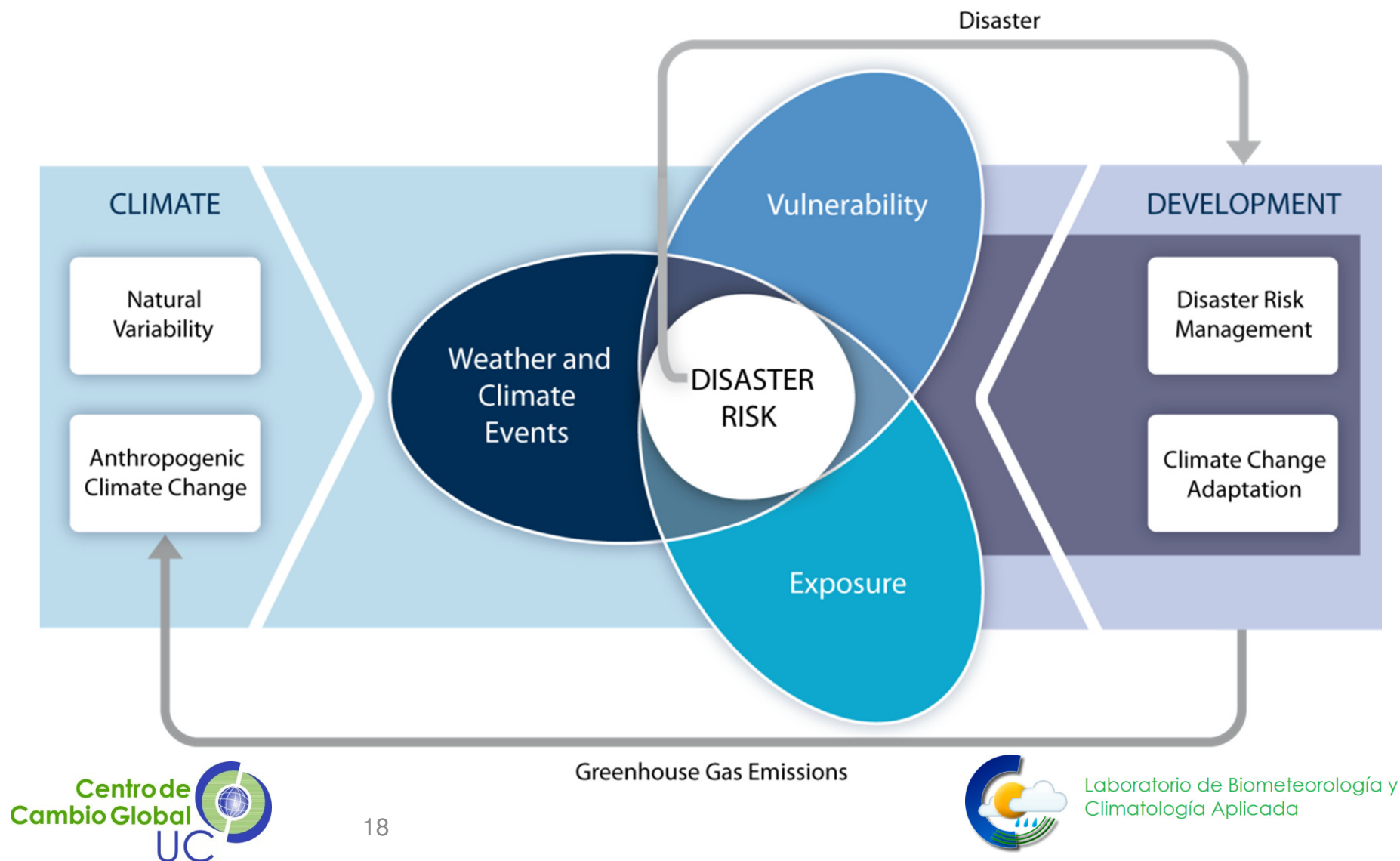
PLAY

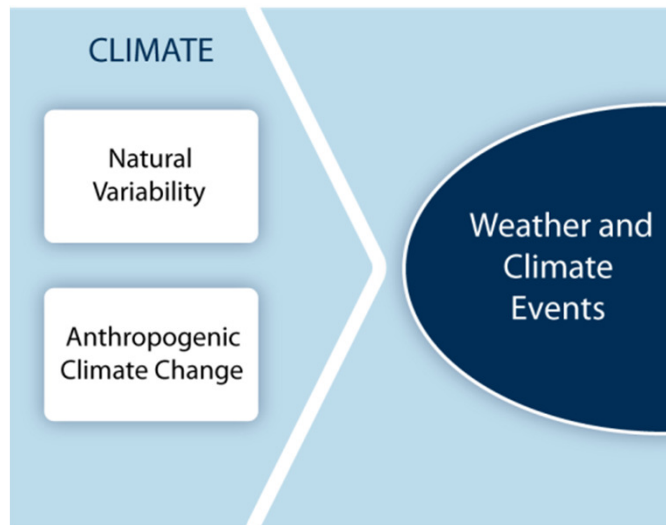
SUMMARY FOR POLICYMAKERS
PDF - 29 pages - 5.6MB

FULL SREX REPORT
Available February 2012

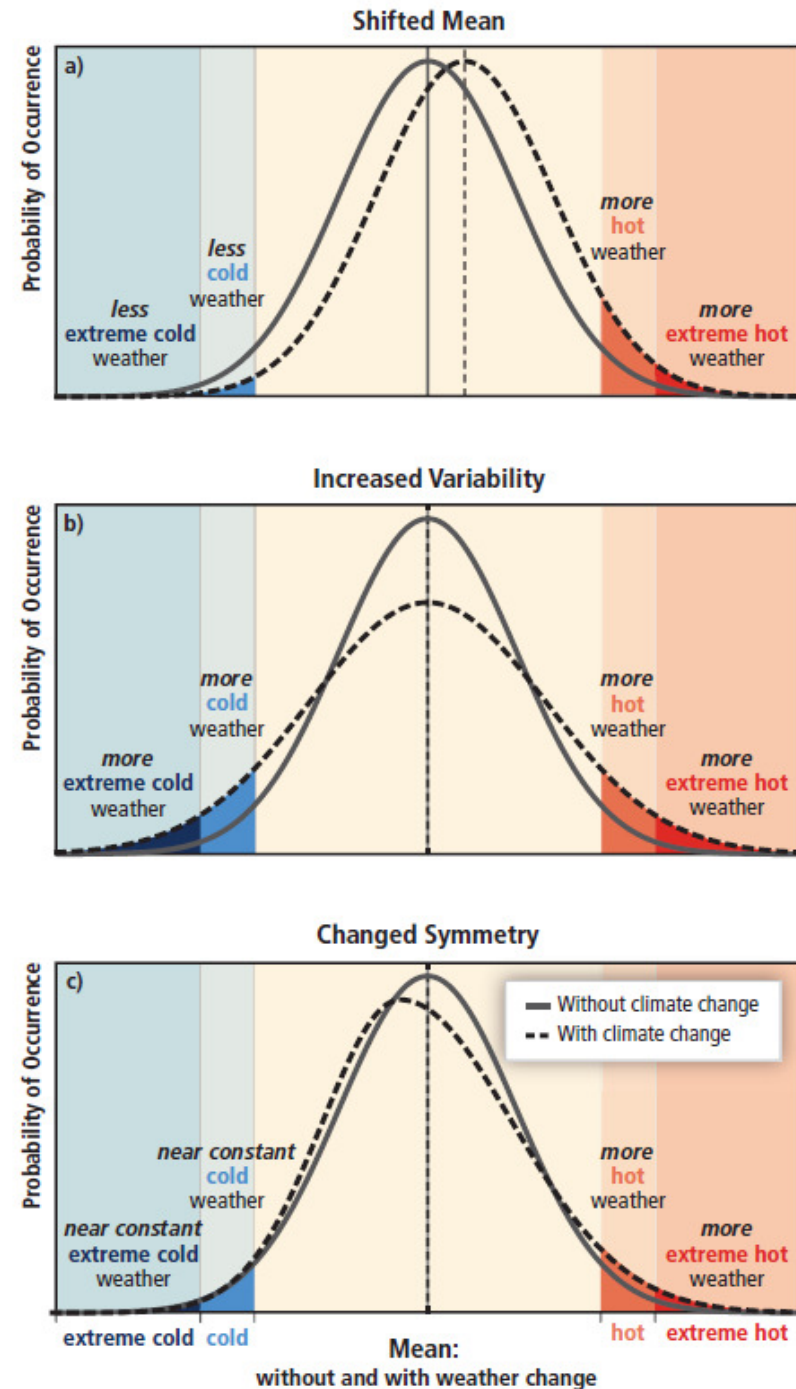
Read the [Press Release](#) and see [Generic Presentation](#)

Marco conceptual que relaciona adaptación al cambio climático y gestión de riesgos de desastres





Un clima cambiante puede provocar cambios en la frecuencia, la intensidad, la extensión espacial, duración y temporalidad de fenómenos extremos meteorológicos y climáticos, y puede resultar en eventos meteorológicos y climáticos sin precedentes



Special IPCC Report on Extreme Events (SREX)

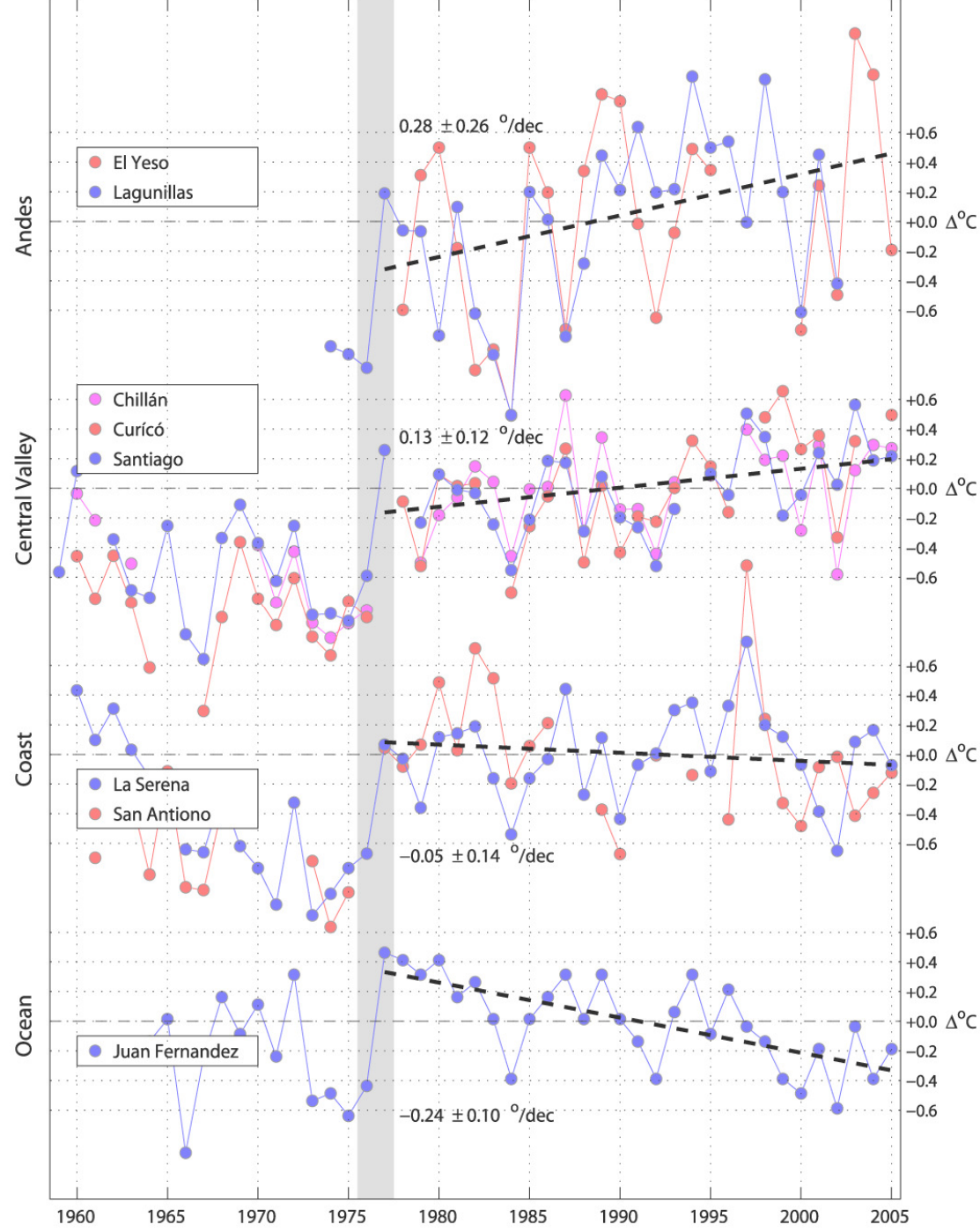
Es muy probable que haya habido una disminución general en el número de días y noches fríos, y un aumento general en el número de días cálidos y noches, para la mayoría de las áreas terrestres con datos suficientes.

Se han observado tendencias estadísticamente significativas en el número de episodios de precipitaciones intensas en algunas regiones. Es probable que más de estas regiones han experimentado aumentos que disminuciones, aunque hay fuertes variaciones regionales y subregionales en estas tendencias.

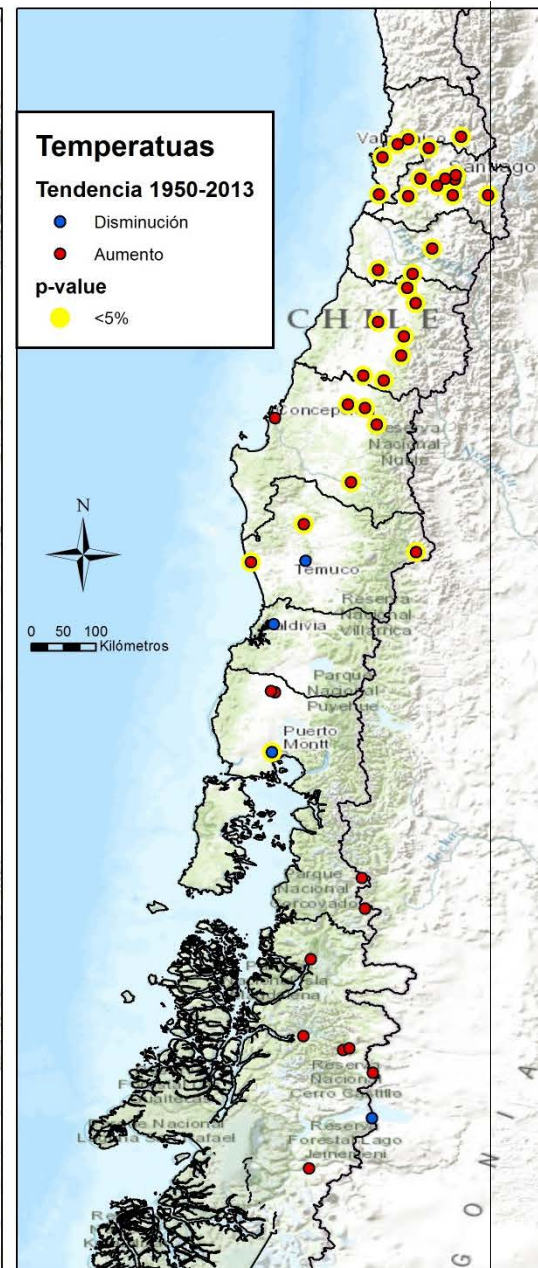
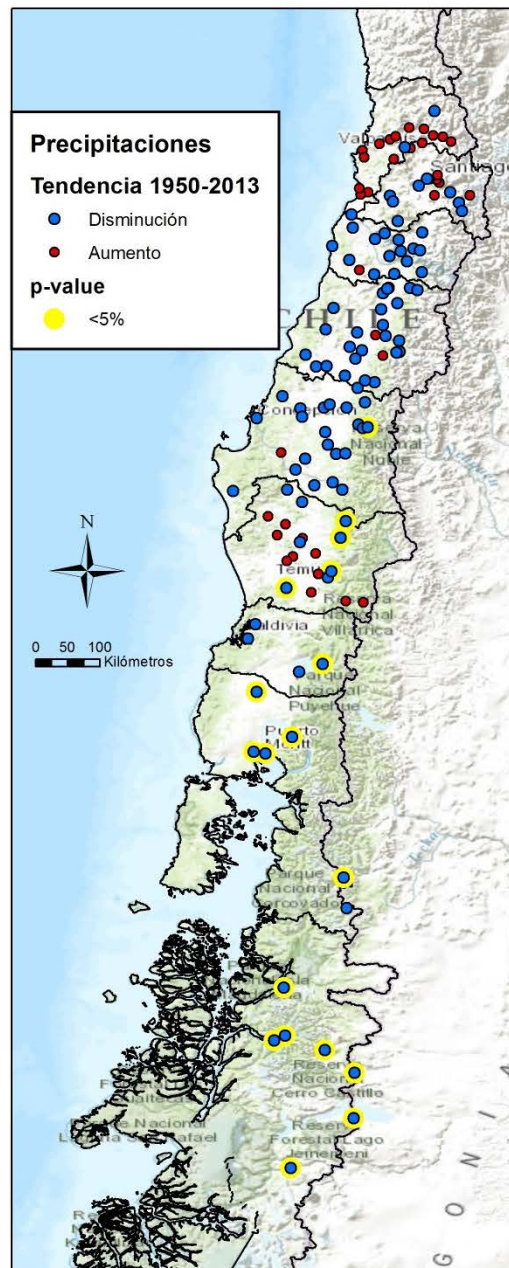
Tendencias Recientes

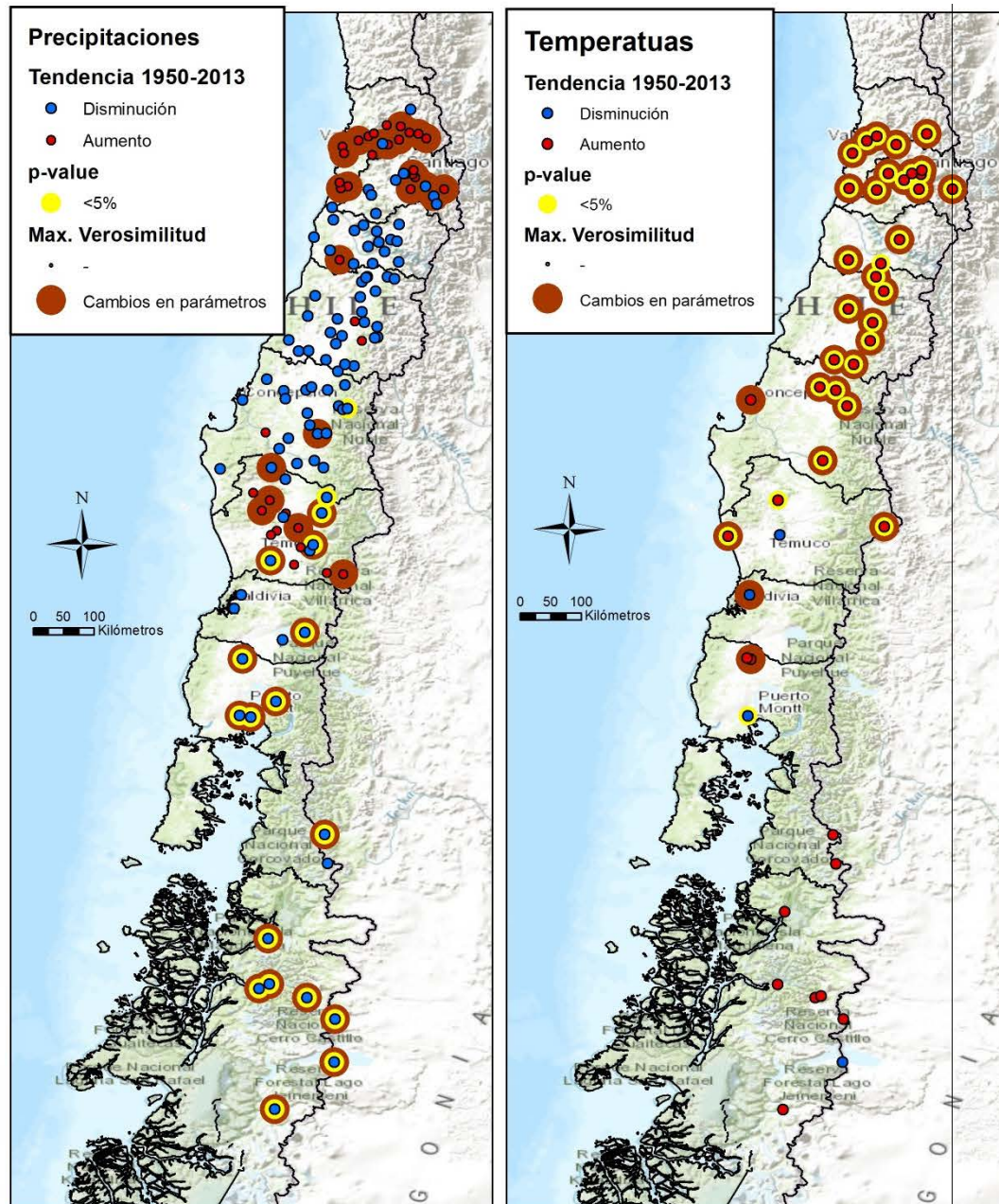
- Temperatura
- Precipitaciones
- Sequías
- Heladas

Tendencia de temperatura en Chile Central

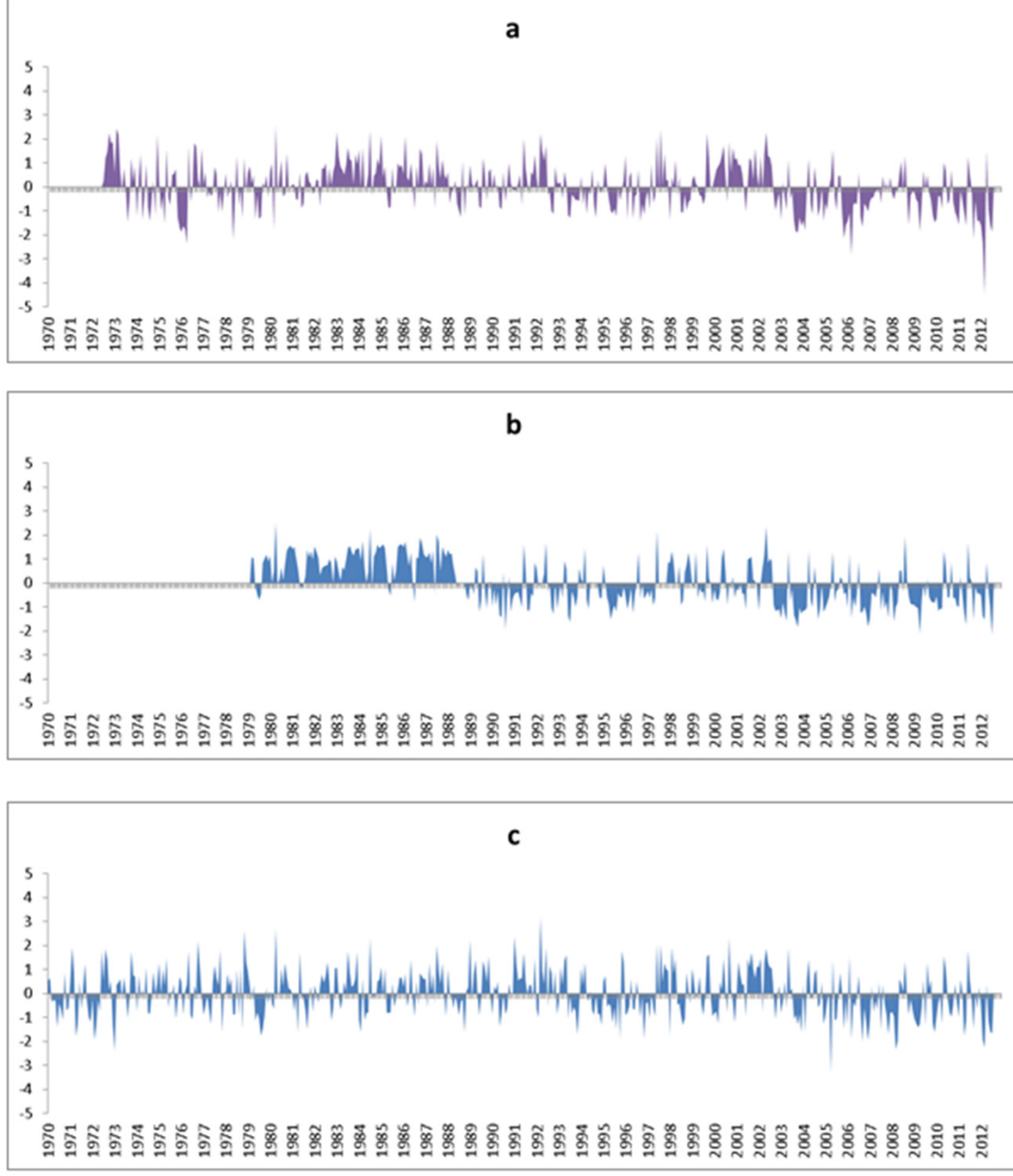


Falvey and Garreaud, 2009





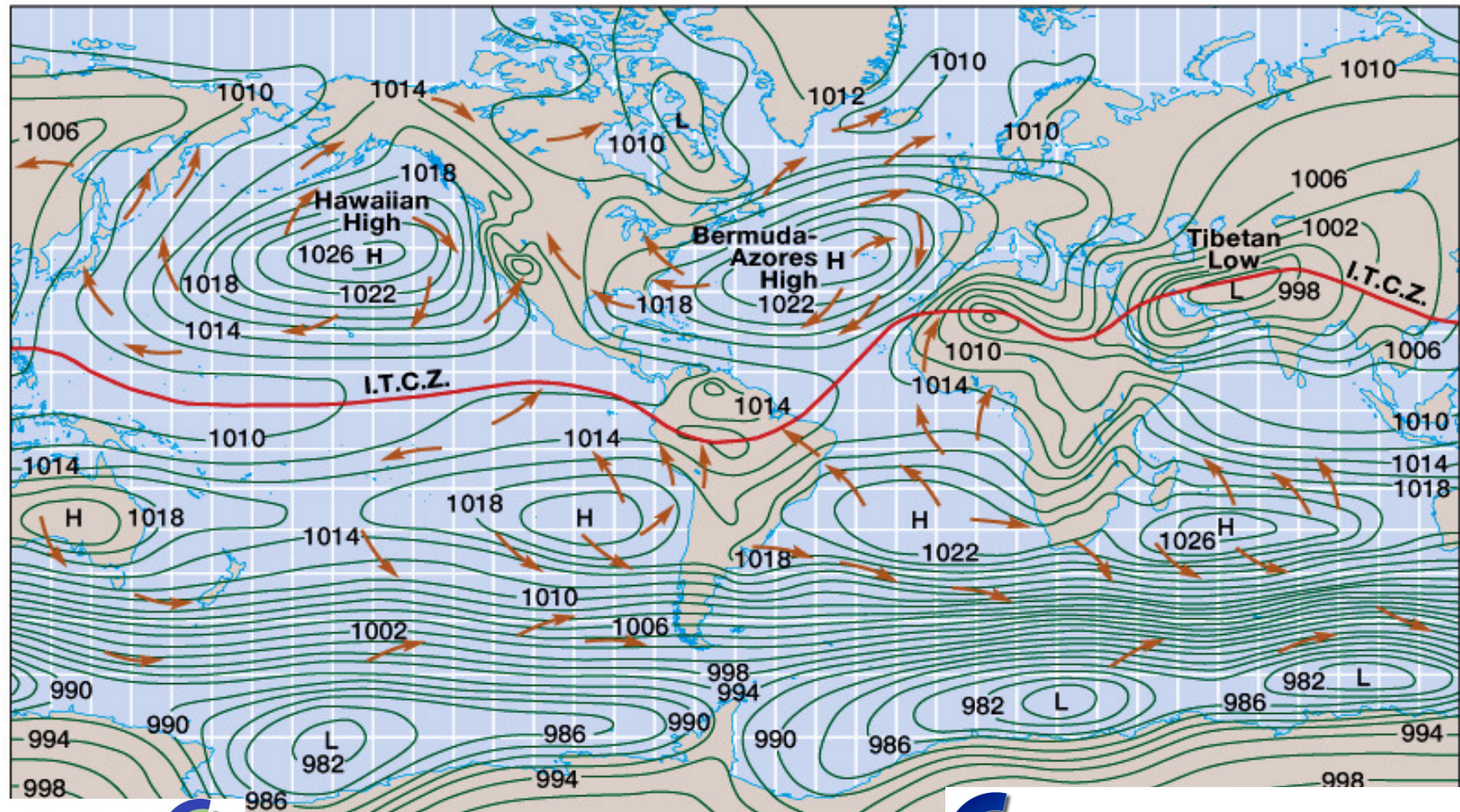
Índice de precipitación evaporación Estandarizada



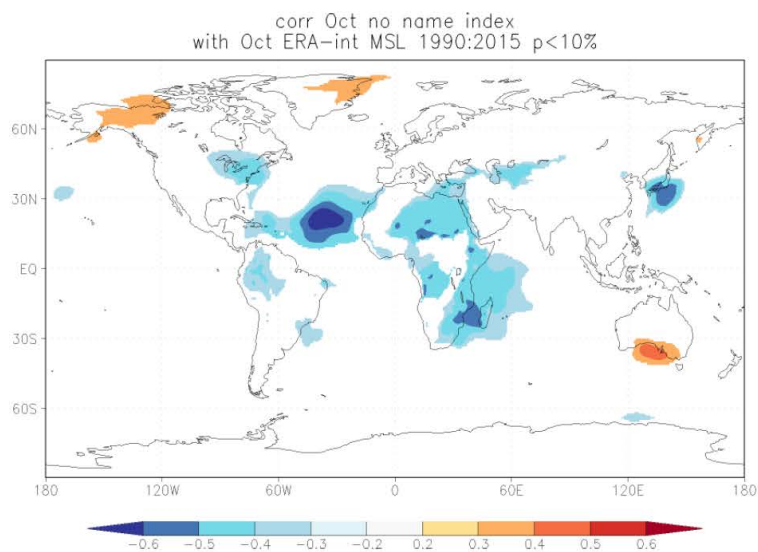
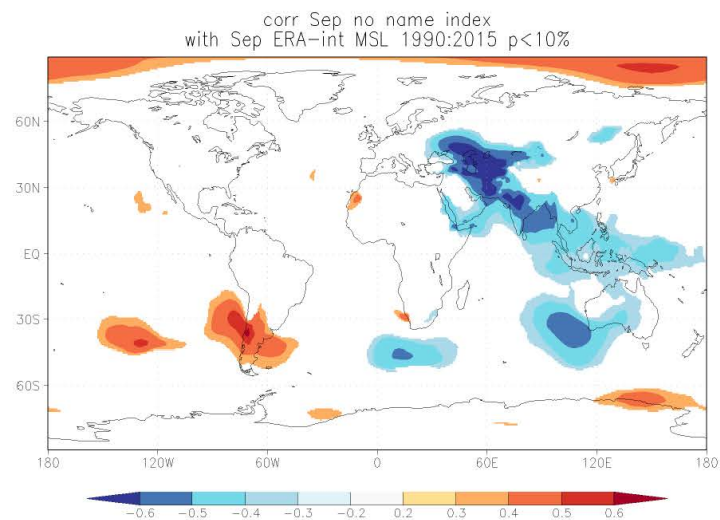
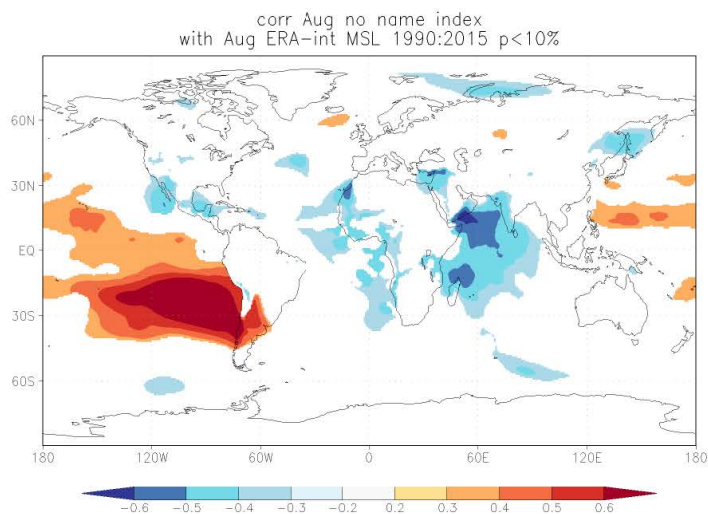
¿Como se responde a la Variabilidad/Cambio Climático?

- Enfoque de Manejo de Riesgos
 - Conocer posibles Escenarios
 - Entender a priori las consecuencias
 - Generar Alternativas de manejos/adaptación a los distintos escenarios
 - Facilitar el uso de Información Climática
- Desarrollo de un Climate Smart Agriculture

Circulación General de la Atmósfera JULIO

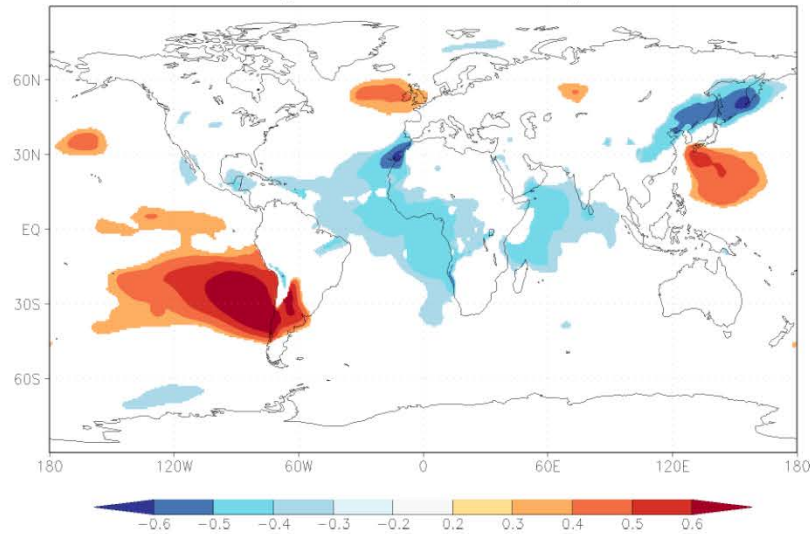


Pirque

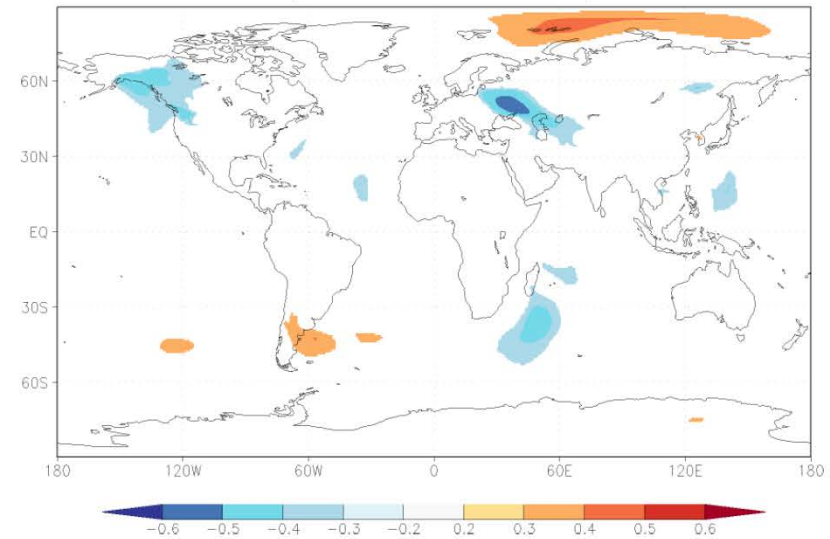


Pencahue

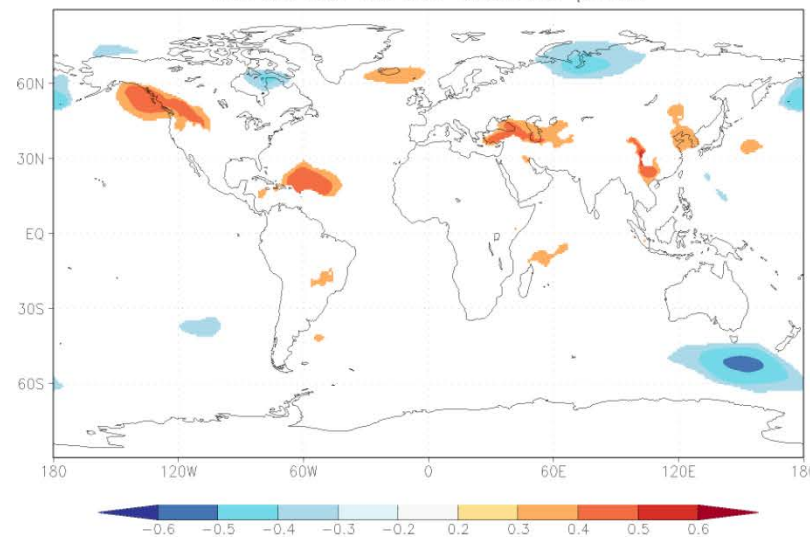
corr Aug no name index
with Aug ERA-int MSL 1990:2015 $p < 10\%$



corr Sep no name index
with Sep ERA-int MSL 1990:2015 $p < 10\%$

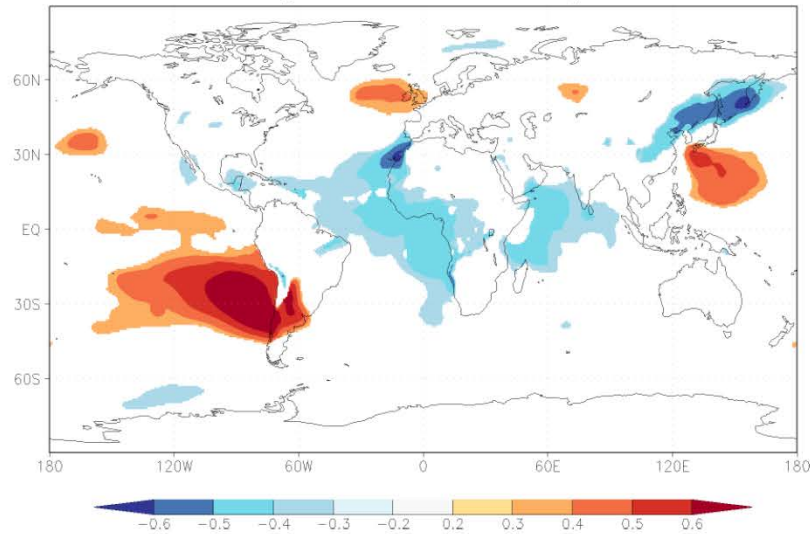


corr Oct no name index
with Oct ERA-int MSL 1990:2015 $p < 10\%$

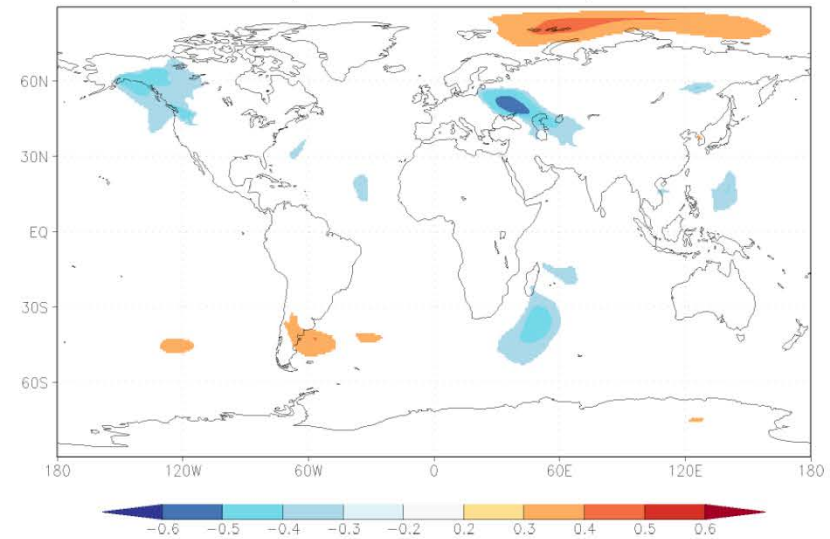


Pencahue

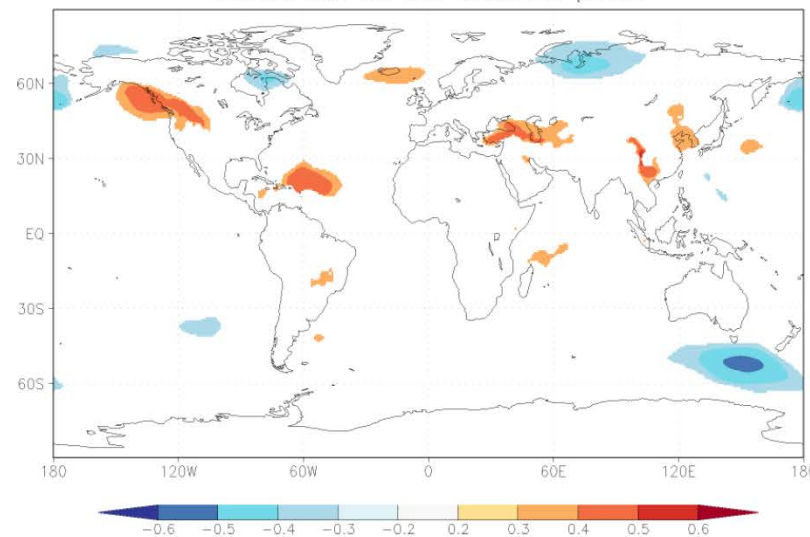
corr Aug no name index
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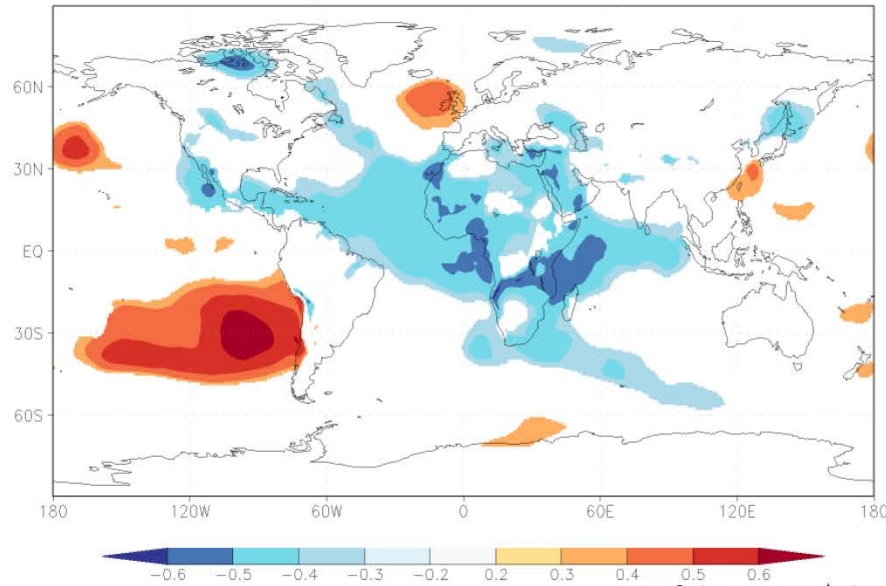


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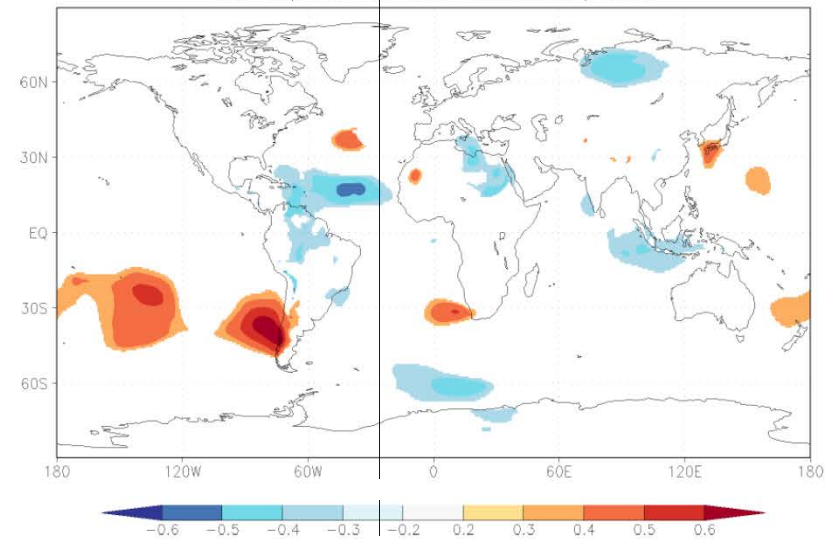


Traiguén

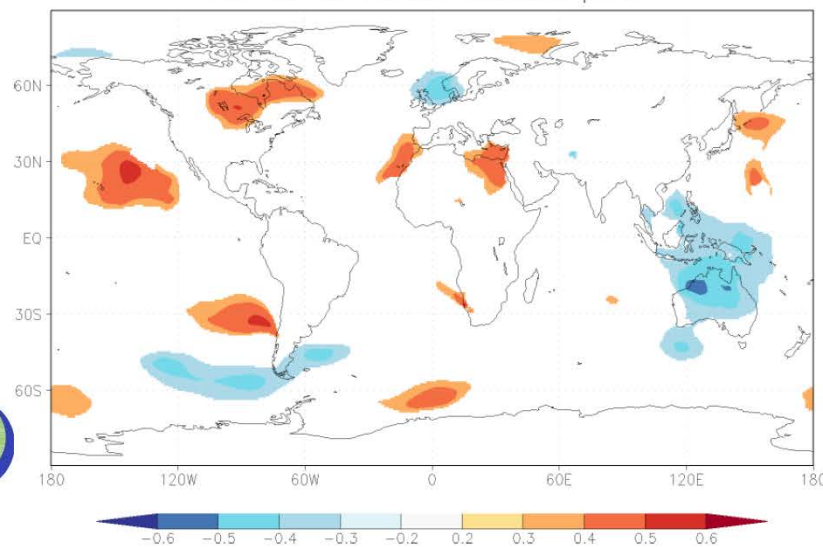
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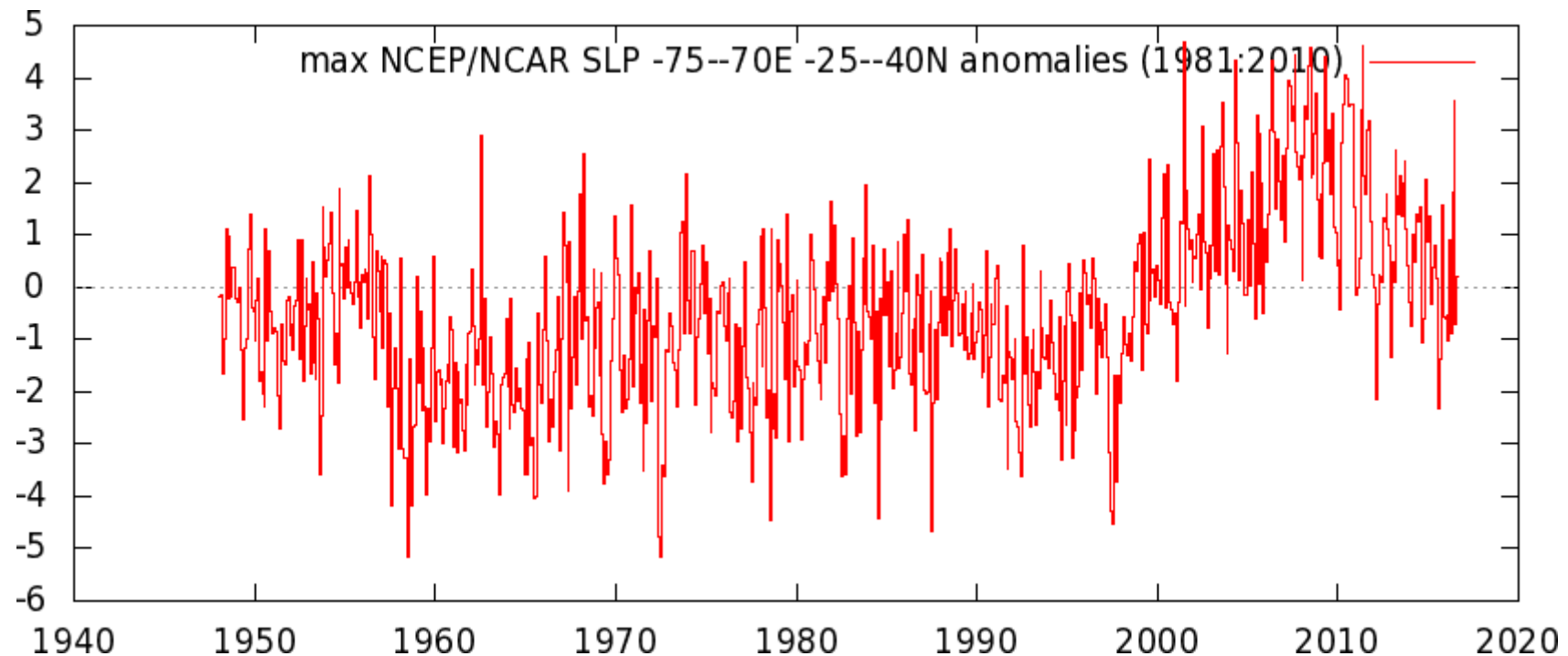
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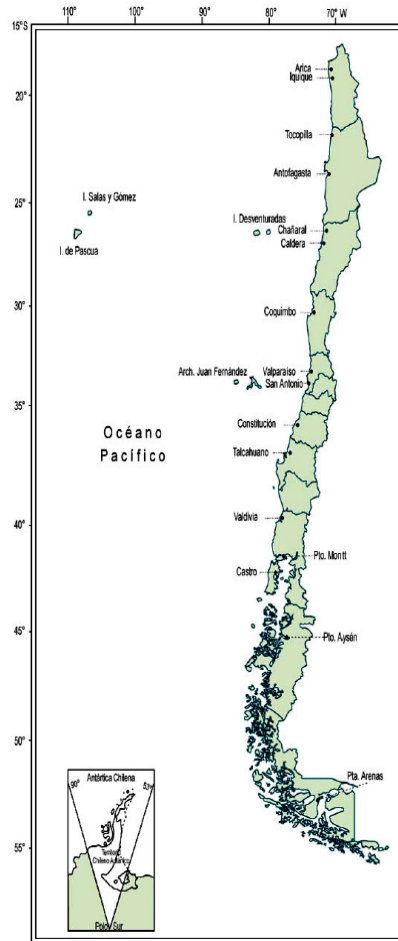
corr Oct no name index
with Oct ERA-int MSL 1990:2015 $p < 10\%$



Evolución de la Presión Superficial en la zona del Anticiclón del Pacífico

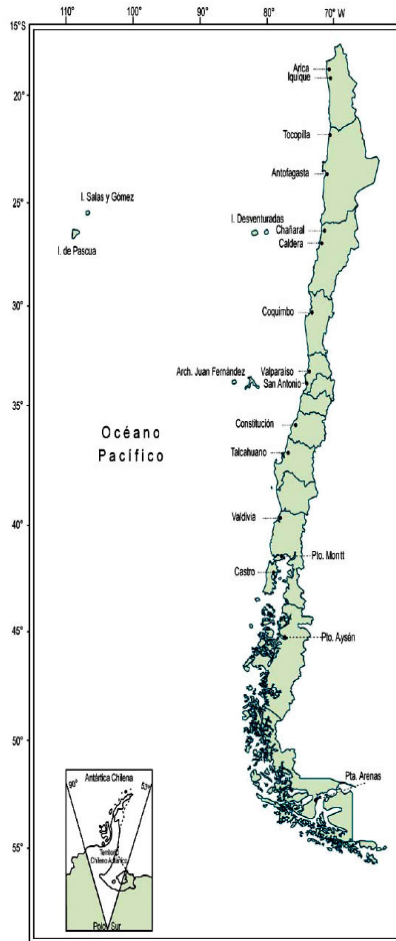


Asociación entre Fenómeno ENSO y Temperatura Máxima



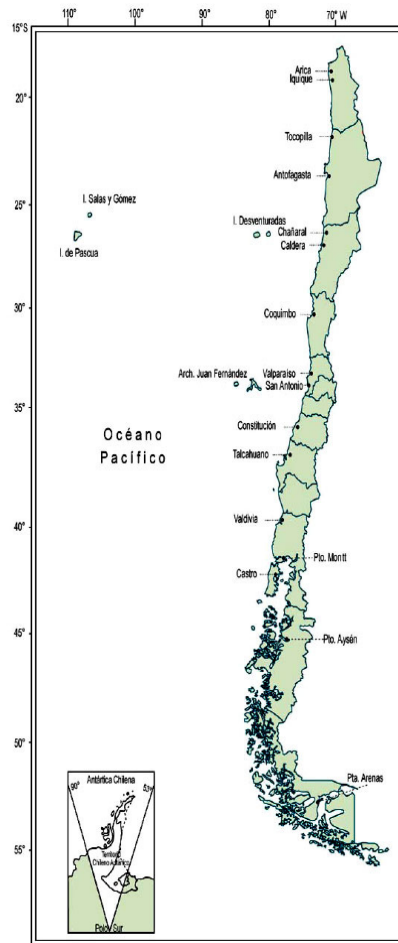
ENSO Tx	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pirque	0.000	-0.506	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-1.108	-0.570	0.000
Melipilla	0.34	-0.36	0	-0.88	-0.89	-0.56	0	0	-0.96	-0.97	-0.33	0
Laguna Aculeo	0	-0.54	0	0	1.394	0	0.96	0	0	-1.12	-0.65	0
Convento Viejo	-0.32	-0.69	-0.87	0	0	0	0	0	0	-0.64	-0.71	-0.39
General Freire Curico Ad.	0	-0.55	-0.48	0	0	0	0	0	0	-0.73	-0.6	-0.34
Potrero Grande	0	-0.49	0	0	0	0	0	0	0	-0.58	-0.81	-0.54
Pencahue	0	-0.63	0	0	0	0	0	0	0	-0.63	-0.67	-0.5
Talca U.C.	0	-0.52	-0.55	0	0	0	0.42	0	0	-0.63	-0.69	-0.46
Colorado	0	-0.63	-0.59	0	0	0	0.58	0	0	-0.57	-0.92	-0.59
Ancoa Embalse	0	-0.76	0	0	1.009	-0.54	0.69	0	0	-0.84	-0.74	-0.53
Parral	0	0	0	0	0	0	0	0.41	0.591	0	-0.55	-0.67
Digua Embalse	0	0	0	0	0	-0.45	0.45	0	0	-0.85	-0.65	-0.42
Bernardo O'Higgins Chillan Ad.	0	-0.49	0	0	0	0	0	0	0	-0.54	-0.56	-0.59
Carriel Sur Concepcion.	0	-0.26	0	0	0	0	0	0	0.418	0	-0.3	-0.19
Diguillin	-0.28	-0.52	0	0	0	0	0	0	0	-0.79	-1.07	-1.01
Quilaco	0	0	0	0	0	0	0.53	0.49	0	-0.6	-0.62	-0.65
Contulmo	0	0	1.17	0	-0.74	-0.58	0	0	0	-0.41	-0.6	-0.86
Laguna Malleco	0	0	0	-1.25	0.977	0.797	0	0	0	-0.76	-1.19	-0.96
Traiguén	-0.34	0	0	0	0	0	0	0.38	0.42	-0.57	-0.79	-0.59
Malalcahuello	0	0	0	0	0	-0.75	0	0	0	0	-0.86	-1.03

Asociación entre Fenómeno ENSO y Temperatura Minima



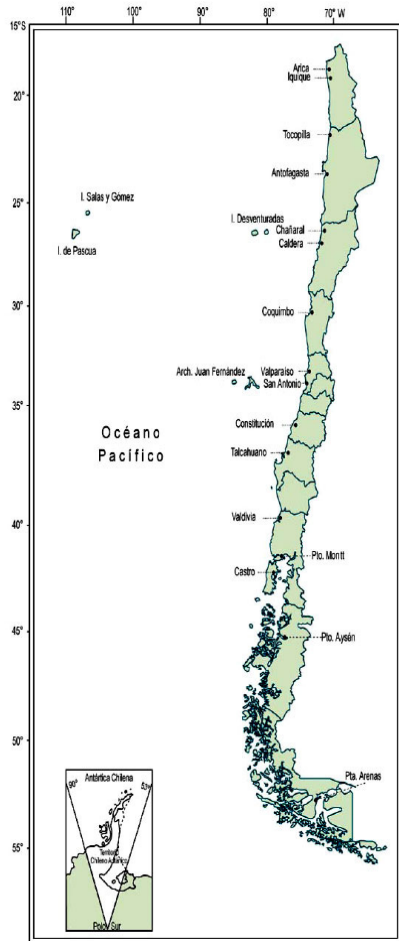
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Melipilla	0.000	0.487	0.000	0.938	0.000	0.832	0.000	0.000	0.951	0.732	0.409	0.000
Laguna Aculeo	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.540	0.854	0.599	0.386	0.000
Convento Viejo	0.000	0.000	-0.420	0.000	0.000	0.000	0.000	0.000	0.482	0.000	0.000	-0.247
General Freire Curico Ad.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Potrero Grande	0.173	0.000	0.000	-0.688	0.000	0.000	0.000	0.000	0.495	0.451	0.000	0.000
Pencahue	0	0	0	-0.84	0	0	0	0	0	0.32	0	-0.3
Talca U.C.	0	0	0	0	0	0	0	0	0	0	-0.21	0
Colorado	0	0	0	0	1.1	0.64	0.49	0	0	0	0	0
Ancoa Embalse	0	-0.28	0	0	1.78	0	0.43	0	0	0	-0.41	0
Parral	0	0	0	0	0	0	-0.55	0	0.73	0.65	0.27	0
Digua Embalse	0.19	0	0	0	0	0	0	0	0	-0.34	0	0
Bernardo O'Higgins Chillan Ad.	0	-0.39	0	-0.83	0	0	0	0	0	0	0	-0.33
Carriel Sur Concepcion.	0	-0.27	0	-0.64	0	0	0	0	0	0	0	0
Diguillin	0	0	0	0	0	-0.43	0	-0.67	0	0	-0.38	-0.24
Quilaco	0.54	0.41	0	1.067	0	0	0	0	0	0.51	0.53	0.455
Contulmo	0	0.34	0	0	-1.4	0	0	0	0.53	0.4	0	0
Laguna Malleco	0.27	0	0	-0.86	0	0.72	-0.42	0	0	0	0	0
Traiguén	0	0	0.515	0	0	0	0	0	0	0	-0.41	-0.27
Malalcahuello	0	0	0	0	0	0	0	0	0.37	0	0	0

Asociación entre Fenómeno SLP y Temperatura Máxima



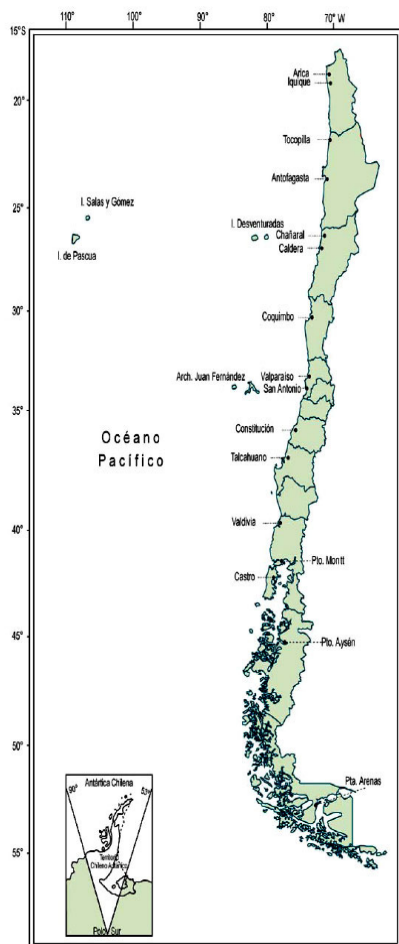
SLP Tx	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pirque	0	-0.43	-0.33	-0.61	0.34	0.487	0	0	0	0	0	0
Melipilla	0	-0.49	-0.48	0	0	0	0	0	-0.58	-0.41	0	0
Laguna Aculeo	0	-0.49	-0.57	0	0.468	0.288	0.2	0	0	0	-0.39	0
Convento Viejo	0	-0.58	-0.53	-0.49	0	-0.22	-0.31	-0.24	0	0	0	0.55
General Freire Curico Ad.	0	-0.37	-0.47	-0.6	0	-0.19	-0.37	0	0	0	0	0
Potrero Grande	0.29	-0.32	-0.39	0	0	0	-0.45	0	0	0	0	0
Pencahue	0.41	0	0	0	0	0	0	0	0	0	0	0
Talca U.C.	0	0	-0.45	0	0	-0.2	0	0	0	0	-0.45	0
Colorado	0.34	0	-0.42	0	0	0.165	-0.37	0	0	0	0	0
Ancoa Embalse	-0.25	0	-0.35	0	0.526	0	-0.17	0	0	0	0	0.32
Parral	0	0	0	-0.41	0	-0.15	0	0	0	0.534	-1.08	-0.47
Digua Embalse	0.76	0	0	0	0	0	-0.14	0	0.382	0	0	0.47
Bernardo O'Higgins Chillan Ad.	0	0	0	-0.52	0.198	0	0	0	0.218	0.36	0	0
Carriel Sur Concepcion.	0	0	0.05	0.053	0	0	-0.02	0	-0.03	0	0	0
Diguillin	0	0	-0.42	0	0.274	0.284	0	0	0.3	0	0	0
Quilaco	0	0	0	0	0.385	0	0	0	0.365	0	0	0
Contulmo	-0.59	0	0	-0.41	0	0	0	0	0.323	0	-0.51	-0.95
Laguna Malleco	0	0	-0.61	-0.76	0.326	0	0	0	0	0	0	0
Traiguen	-0.4	0	-0.43	-0.39	0	-0.17	0	0	0.394	0	-0.91	0
Malalcahuello	0	0	-0.53	-0.49	0.403	0.177	-0.2	0	0.311	0	-0.6	0

Asociación entre Fenómeno SLP y Temperatura Mínima



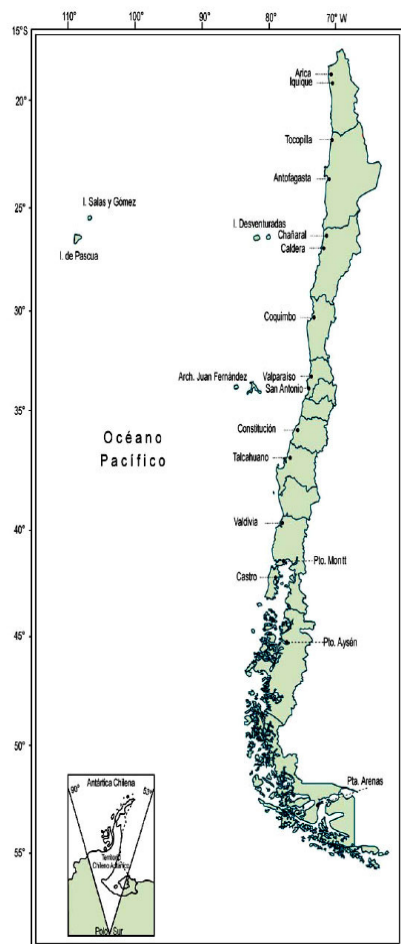
SLP Tn	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pirque	-0.16	-0.46	0	-0.45	-0.7	-0.76	-0.58	-0.84	-0.4	-0.54	0	0.161
Melipilla	-0.39	-0.73	-0.95	-0.32	-0.43	-0.6	-0.62	-0.73	-0.29	-0.93	0	-0.3
Laguna Aculeo	-0.2	-0.26	-0.62	-0.82	-0.75	-0.91	-0.57	-0.72	0	0	0	-0.36
Convento Viejo	-0.37	-0.55	-0.83	-0.35	-0.47	-0.61	-0.46	-0.66	-0.26	-0.47	-0.68	-0.22
General Freire Curico Ad.	-0.23	-0.22	-0.66	-0.82	-0.45	-0.71	-0.56	-0.79	-0.49	-0.26	-0.38	0
Potrero Grande	-0.46	0	-0.7	-0.9	-0.48	-0.7	-0.75	-0.85	-0.49	0	0	-0.19
Péncahue	-0.36	-0.27	-0.45	-0.91	-0.48	-0.87	-0.6	-0.78	-0.57	-0.54	-0.5	-0.21
Talca U.C.	-0.44	-0.47	-0.74	-0.91	-0.51	-0.82	-0.58	-0.69	-0.48	-0.44	0	-0.29
Colorado	0	0.38	-0.67	-0.75	-0.33	-0.32	-0.63	-0.61	-0.23	0	-0.48	0.195
Ancoa Embalse	-0.36	0	-0.84	0	0	-0.56	-0.46	-0.48	-0.22	0	-0.36	0
Parral	0	0	-0.49	-0.73	-0.45	-0.72	-0.74	-1	0	-0.38	-1.07	0
Digua Embalse	0	-0.34	-0.78	-0.49	-0.38	-0.5	-0.39	-0.77	-0.3	-0.56	0	0
Bernardo O'Higgins Chillan Ad.	0	-0.28	-0.44	-0.99	-0.47	-0.65	-0.59	-0.82	-0.49	-0.45	-0.48	0
Carriel Sur Concepcion.	0.04	0.03	0.043	0.043	0	0.05	0	0	0	0	0	0
Diguillin	-0.24	-0.63	-0.88	0	-0.38	-0.43	-0.42	-0.73	0	-0.27	-0.3	0.301
Quilaco	-0.64	0	-0.74	-1.05	-0.29	-0.72	-0.53	-0.7	-0.38	-0.55	0	0
Contulmo	0.32	0	-0.6	-0.52	-0.44	-0.37	-0.39	-0.51	-0.38	0	-0.44	0
Laguna Malleco	-0.82	-0.37	-0.46	-0.5	-0.24	-0.7	-0.5	-0.2	-0.22	-0.33	-0.62	-0.25
Traiguen	0	-0.35	-0.53	-0.67	-0.23	-0.38	-0.37	-0.64	0	-0.29	-0.69	-0.41
Malalcahuello	-0.58	0	-0.59	-0.6	0	-0.3	-0.37	-0.33	-0.28	0	-0.48	0

Tendencias en Temperatura Máxima



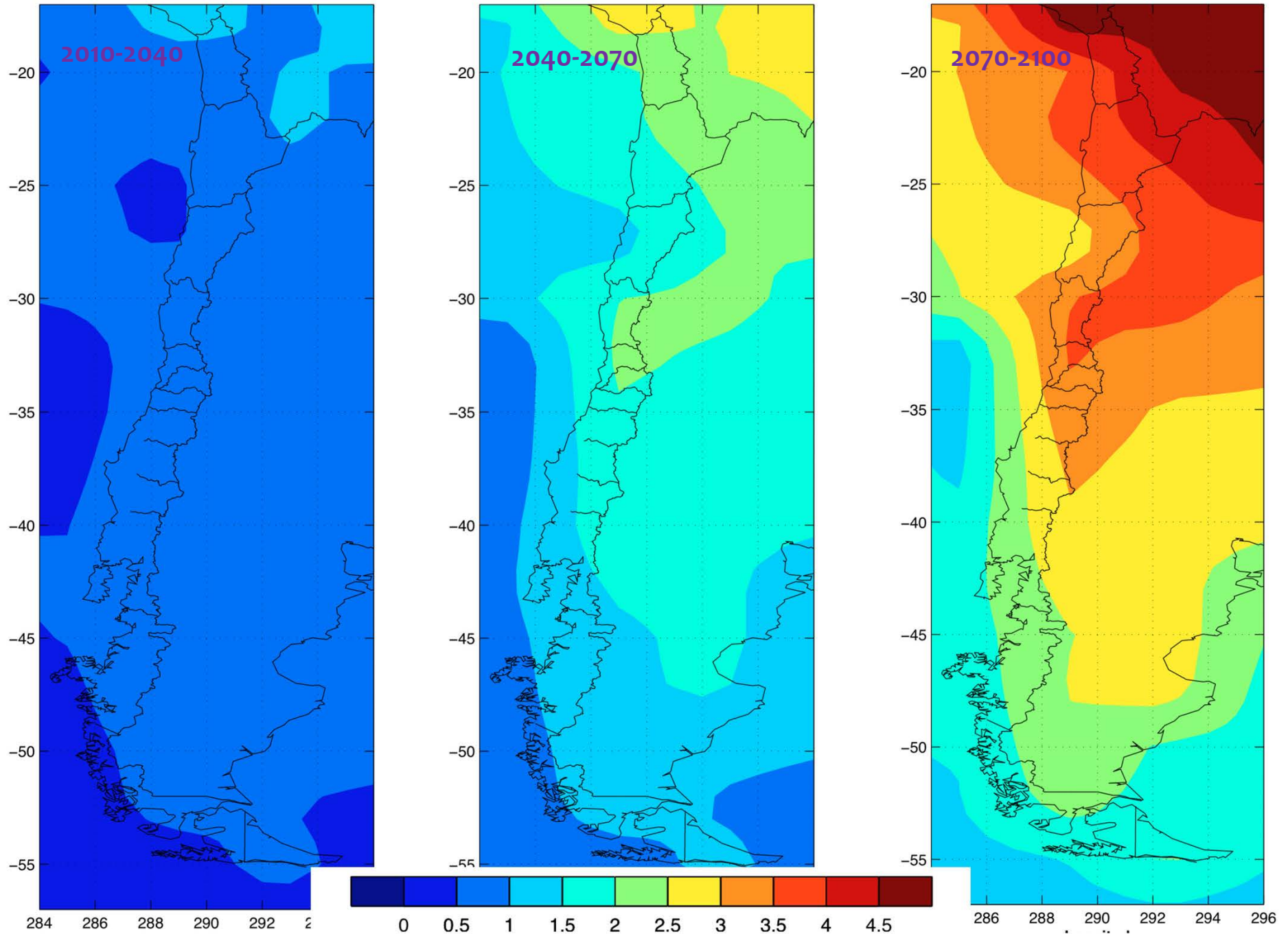
PDO Tx	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pirque	0.02	0	0.06	0.144	0	0	0	0	0	0	0	0
Melipilla	0	0	0	0	-0.12	-0.08	0	0	0	0	-0.08	0
Laguna Aculeo	0.03	0	0.09	0.099	0	0	0	0.06	0	0.048	0	0
Convento Viejo	-0.04	0	0	0.125	0	0	0.08	0	0	0	0	0
General Freire Curico Ad.	0.04	0	0.07	0.11	0	0	0	0	0	0	0	0
Potrero Grande	0.08	0.047	0.08	0.058	0	-0.04	0	0	0	0	0.056	0
Pencahue	0.04	0	0.08	0.134	0	0.036	0	0	0	0.047	0.05	0
Talca U.C.	0	0	0	0	0	0	0	0	0	0	0	0
Colorado	0	0	0	0	0	0	0	-0.05	0	-0.07	0	0
Ancoa Embalse	-0.09	-0.08	0	0	0	0	0.04	0	0	0	-0.08	-0.16
Parral	0.09	0.055	0.07	0.183	0.057	0.058	0.08	0.06	0	0.046	0.098	0.14
Digua Embalse	0	0	0	0	-0.07	-0.06	-0.09	-0.07	-0.08	-0.05	0	0
Bernardo O'Higgins Chillan Ad.	0	0	0	0.108	0	0	0	0	0	0	0	0
Carriel Sur Concepcion.	0	0	0.05	0.053	0	0	-0.02	0	-0.03	0	0	0
Diguillin	0.04	0	0.05	0.119	0	0	-0.09	-0.1	-0.06	0	0	-0.06
Quilaco	0.06	0	0	0.073	0	0	-0.06	-0.08	0	0	0	0
Contulmo	0	0	0	0.059	0	-0.07	-0.07	-0.09	-0.08	-0.07	0	0.14
Laguna Malleco	0.12	0	0.06	0.11	0	-0.07	0	0	0	0.082	0.07	0.1
Traiguén	0.09	0	0.05	0.108	0.05	0.065	0	0	0	0.034	0.081	0.06
Malalcahuello	0.12	0	0.07	0.15	0	-0.04	0	0	0	0	0.106	0.06

Tendencias en Eventos Extremos e Índices Bioclimáticos

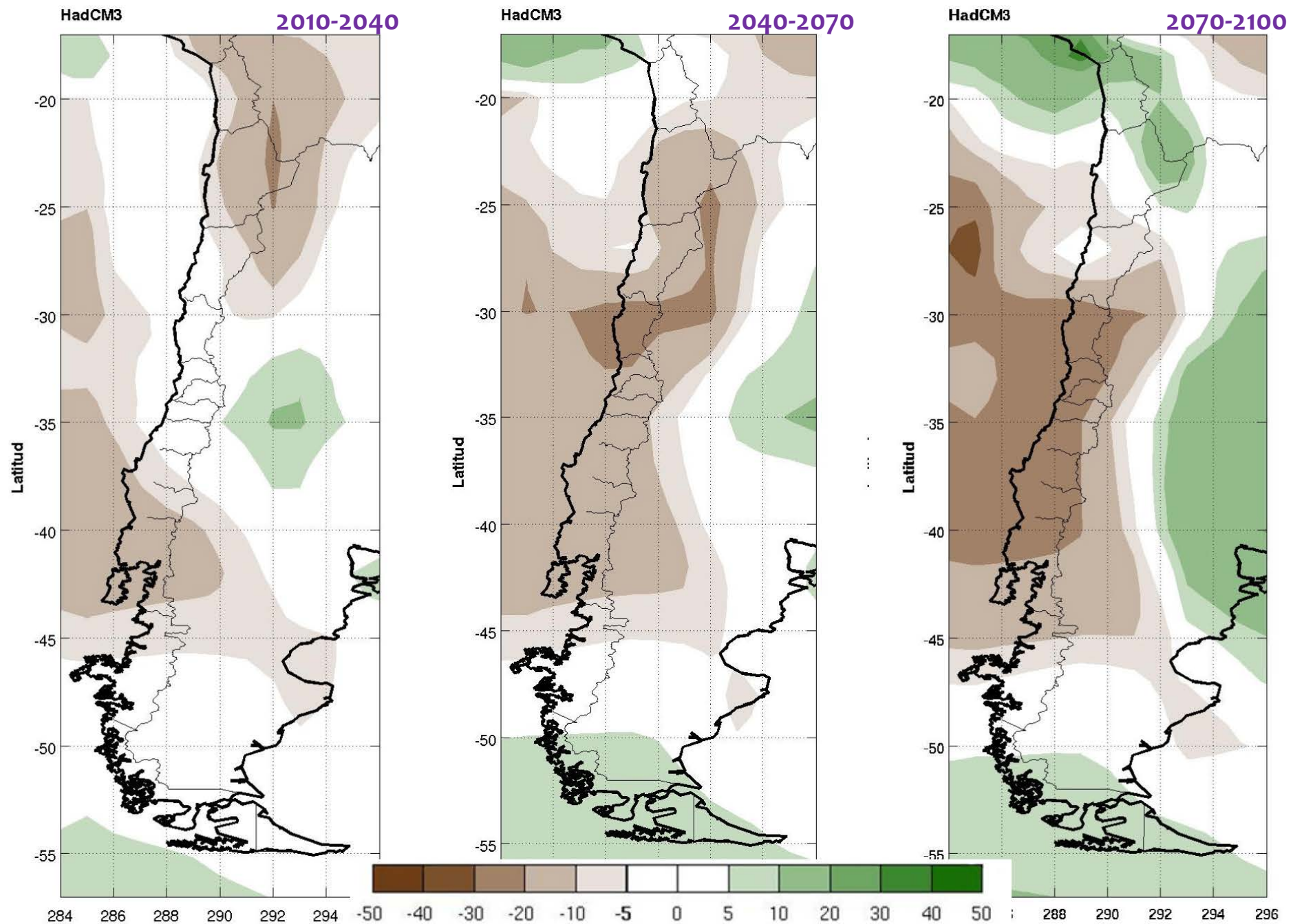


SLP	FRIO	HELADAS	ESTRÉS	SUMA T	FREGONI
Pirque	7.87	0.861460912	0	0	0
Melipilla	12.9	0.191065687	0	0	0
Laguna Aculeo	8.91	0	0	0	0
Convento Viejo	12.6	0	0	0	0
General Freire Curico Ad.	9.17	0	0	0	1081.020334
Potrero Grande	4.99	1.250872556	0	0	858.281664
Pencahue	11.4	0	0	0	1690.266598
Talca U.C.	9.07	0	0	-99.4000455	1491.223709
Colorado	6.05	0	0	0	1086.765035
Ancoa Embalse	0	0	0	0	0
Parral	11.8	0	0	0	0
Digua Embalse	4.42	0	0	0	0
Bernardo O'Higgins Chillan Ad.	7.98	0.504571402	0	0	1346.56357
Carriel Sur Concepcion.	7.46	0.262625804	0	0	1492.038297
Diguillin	4.88	0	0	0	0
Quilaco	7.25	0	0	0	1551.730806
Contulmo	8.8	-0.091291833	0	-129.508481	0
Laguna Malleco	0	1.367522195	0	0	0
Traiguen	6.17	0	0	0	920.2235128
Malalcahuello	0	1.832035762	0	0	0

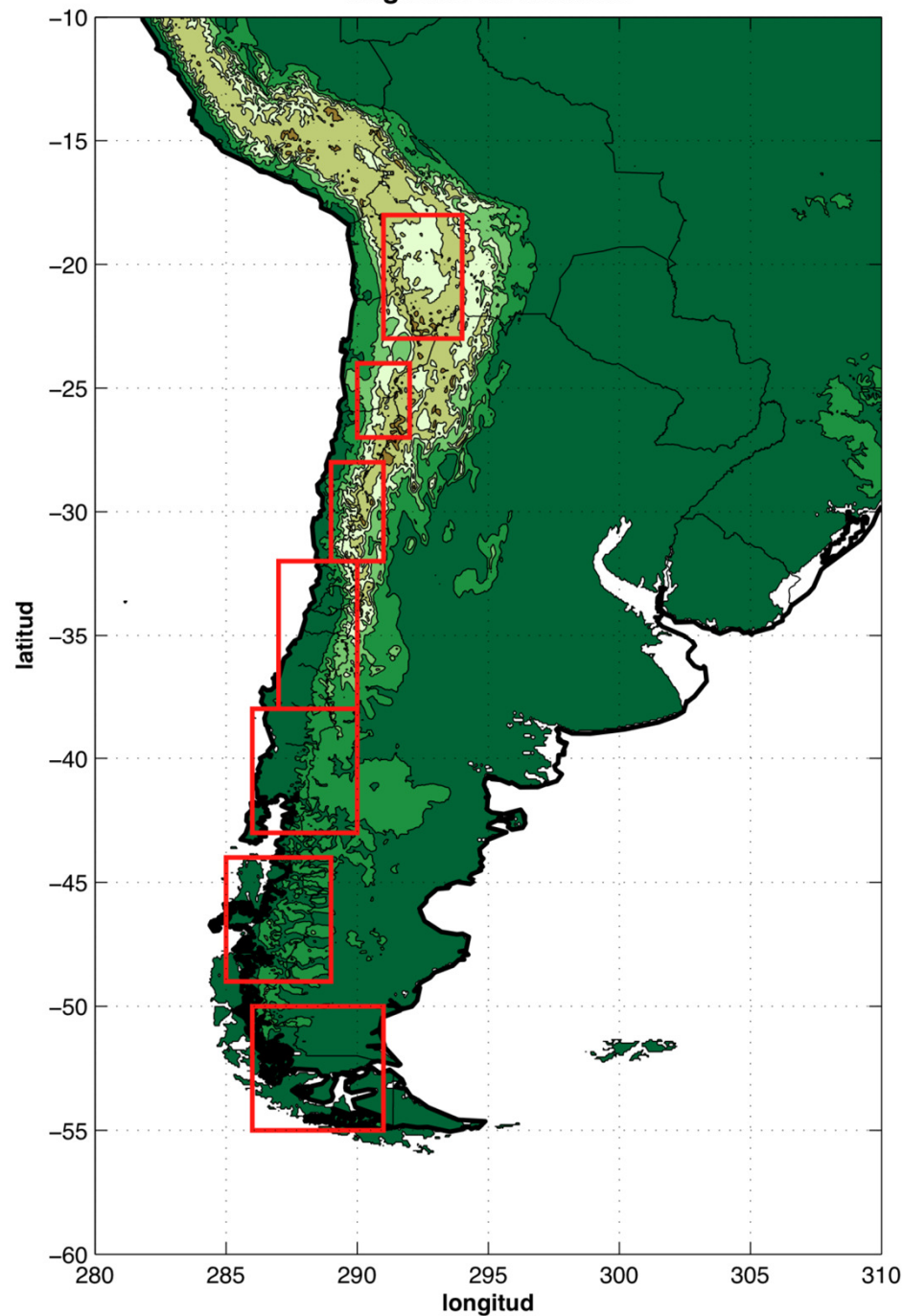
Proyecciones temperatura – HadCM3



Proyecciones precipitación – HadCM3

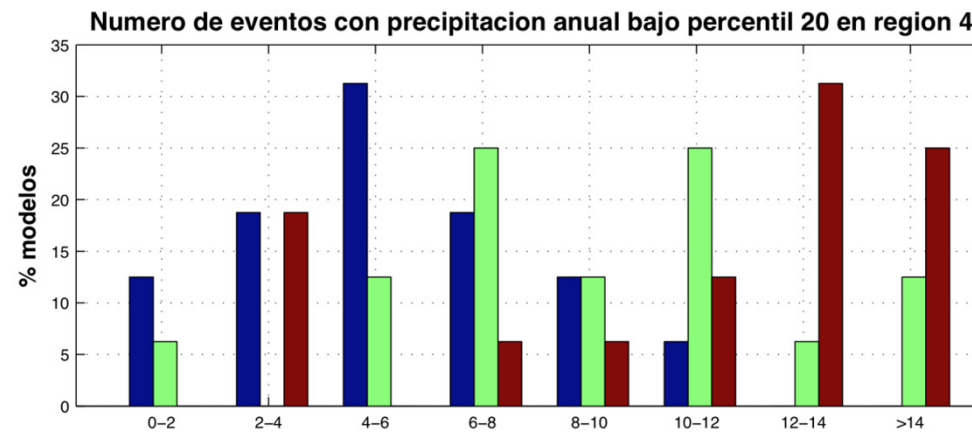
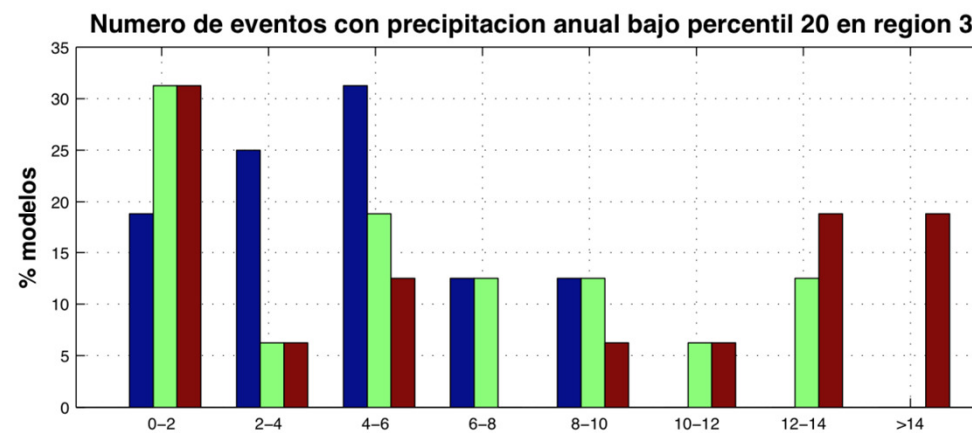
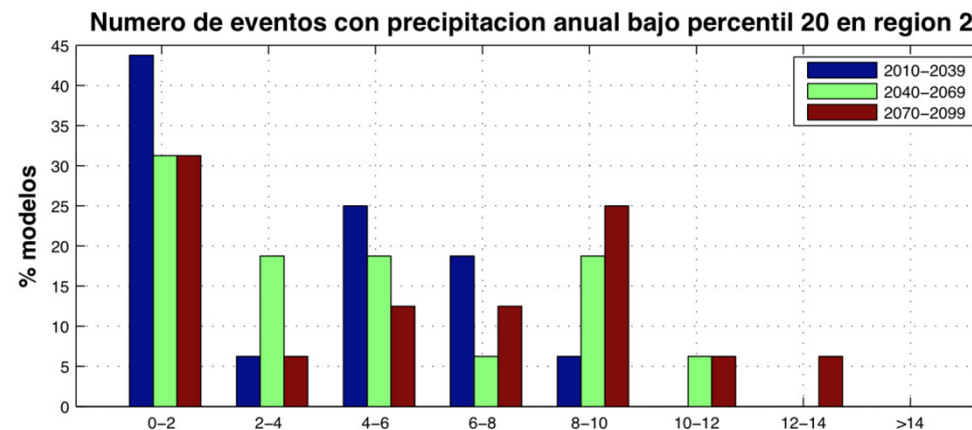


Regiones de Analisis

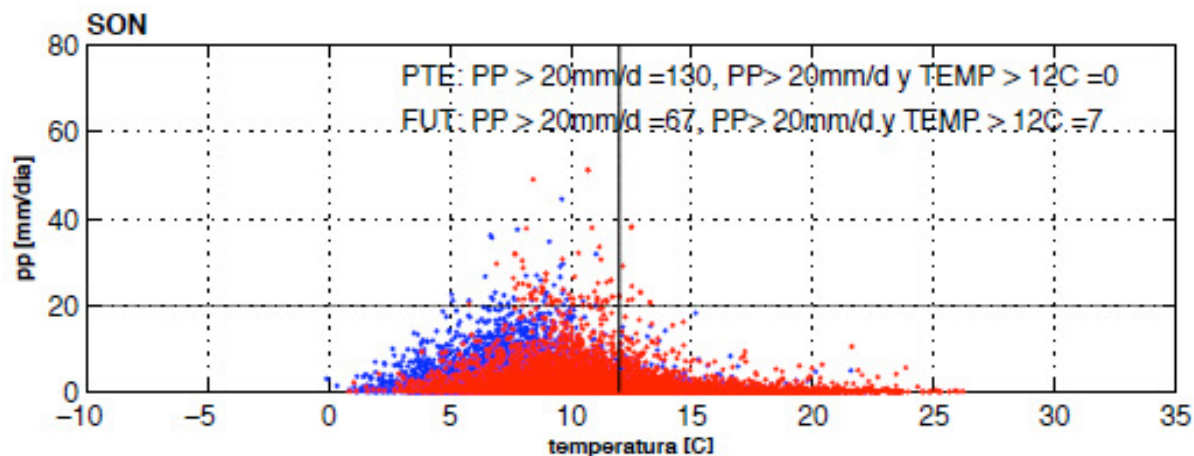
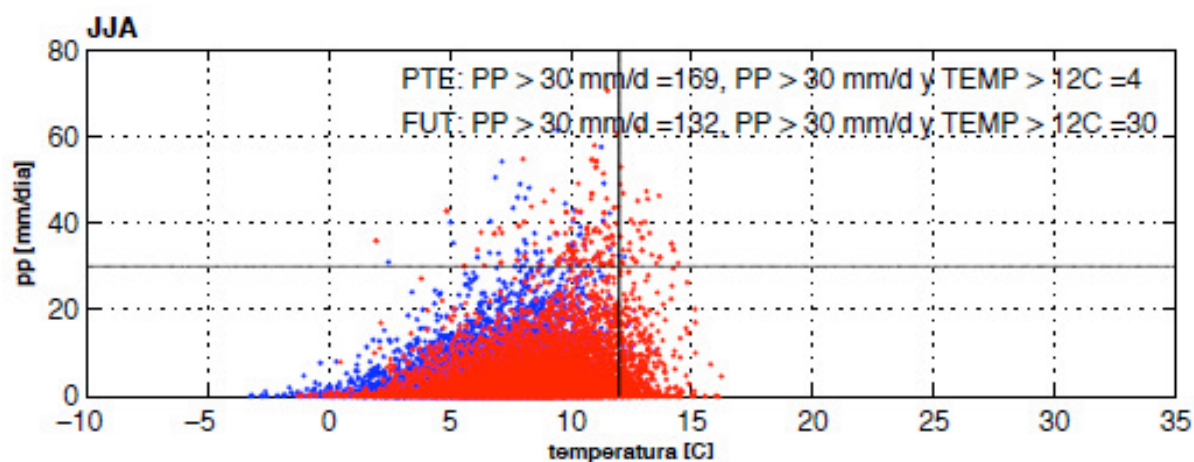
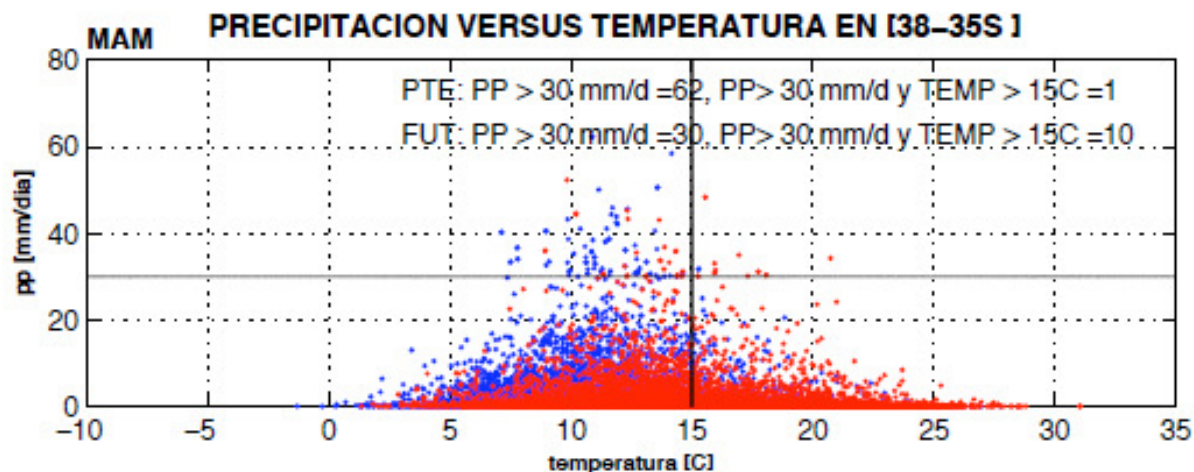


- Zona 1: Altiplano (18-23S)
- Zona 2: Norte Grande (23-27S)
- Zona 3: Norte Chico (28-32S)
- Zona 4: Chile Central (32-38S)
- Zona 5: Zona Sur (38-42S)
- Zona 6: Patagonia (44-49S)
- Zona 7: Magallanes (50-55S)

Extremos 1. Sequias

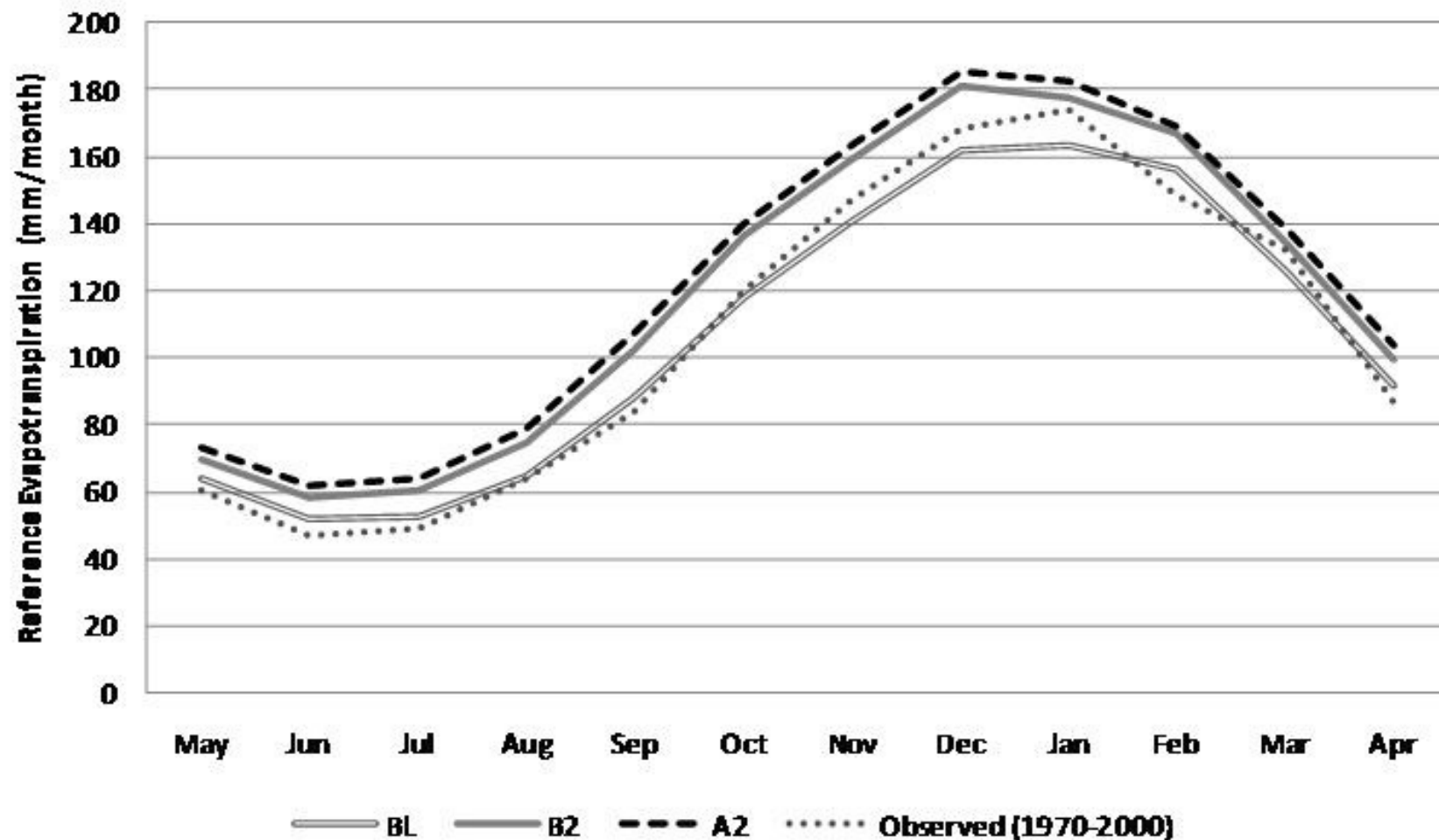


Extremos 2. Tormentas cálidas



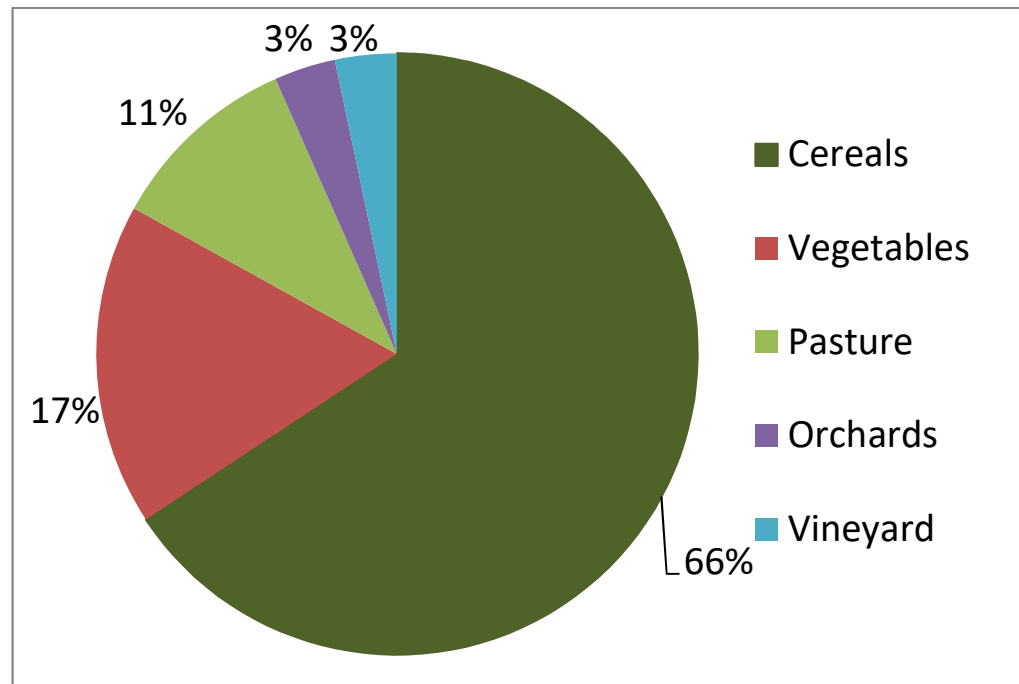
Impacts of Climate Change on Irrigated Agriculture in the Maipo Basin, Chile: Reliability of Water Rights and Changes in the Demand for Irrigation

Francisco J. Meza¹; Daniel S. Wilks²; Luis Gurovich³; and Nicolás Bambach⁴



Sistema Paloma

- Diseño Inicial: Riego para 28,500 has



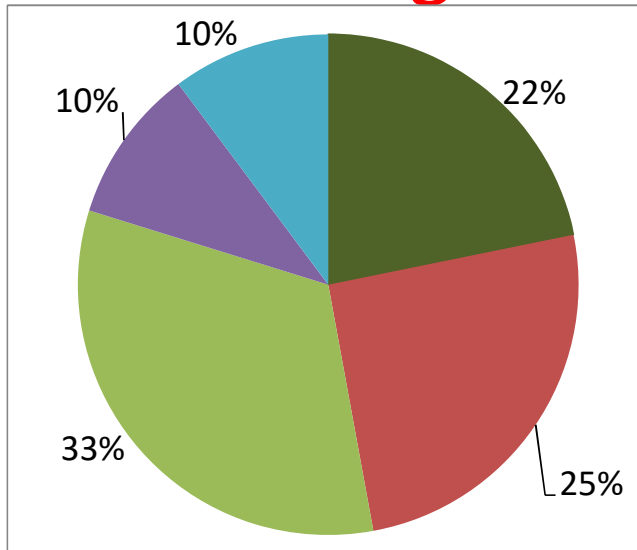
Irrigation infrastructure development in the Limarí Basin in Central Chile: implications for adaptation to climate variability and climate change

S. Vicuna^{a*}, P. Alvarez^b, O. Melo^{a,c}, L. Dale^d and F. Meza^{a,e}

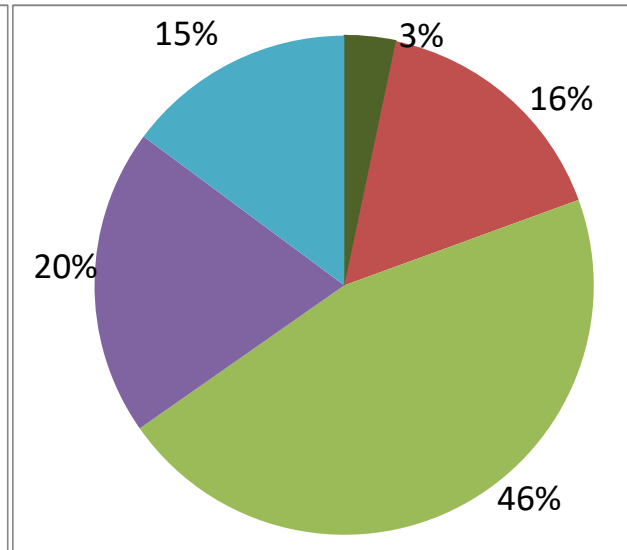


Evolución *Sistema Paloma*: increased

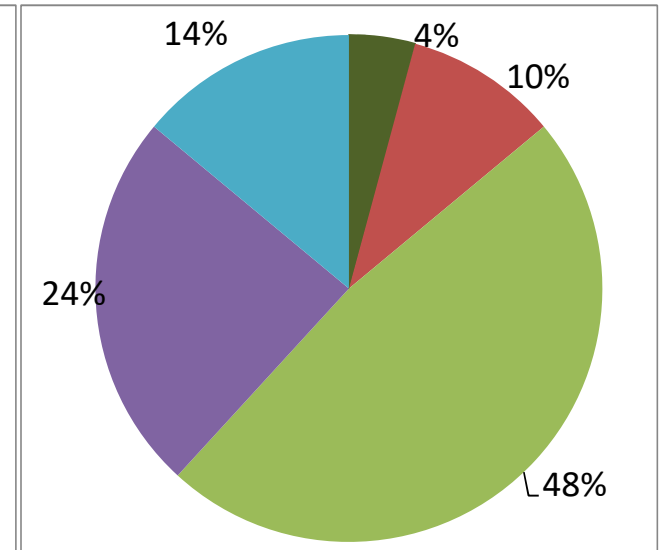
**Futuro según
Diseño Original**



Censo 1997

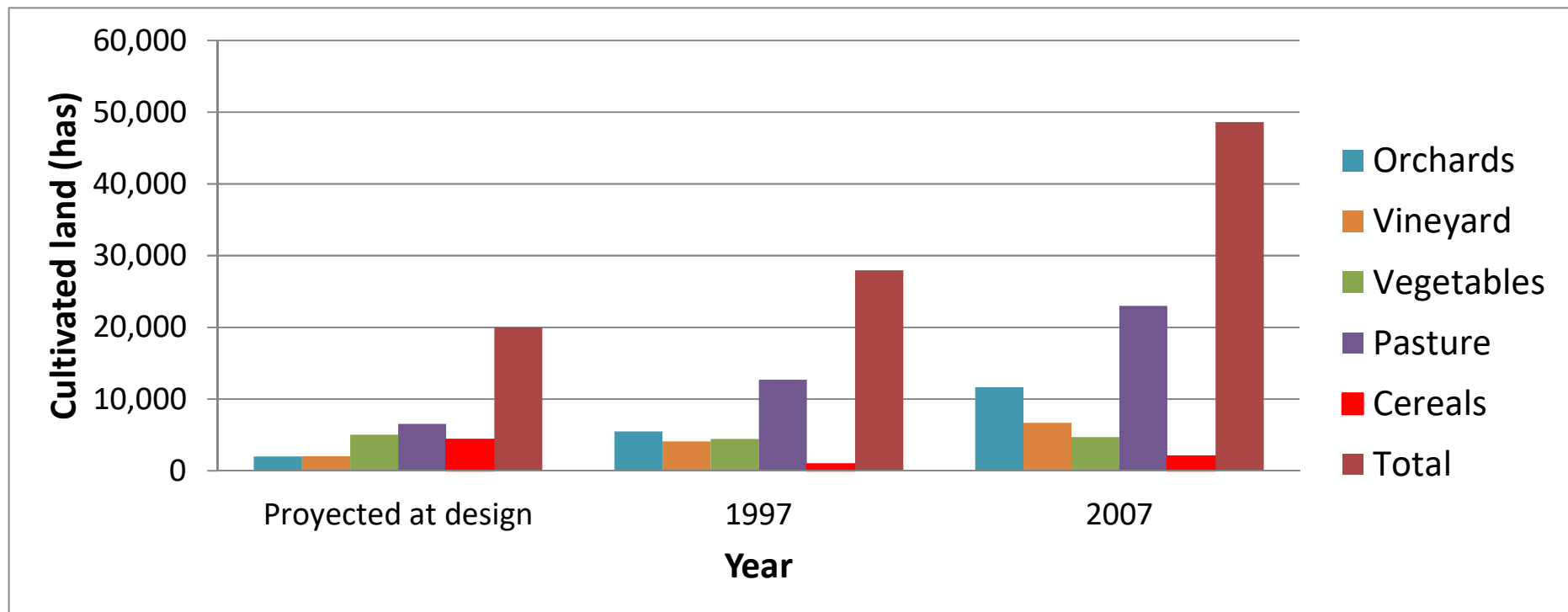


Censo 2007

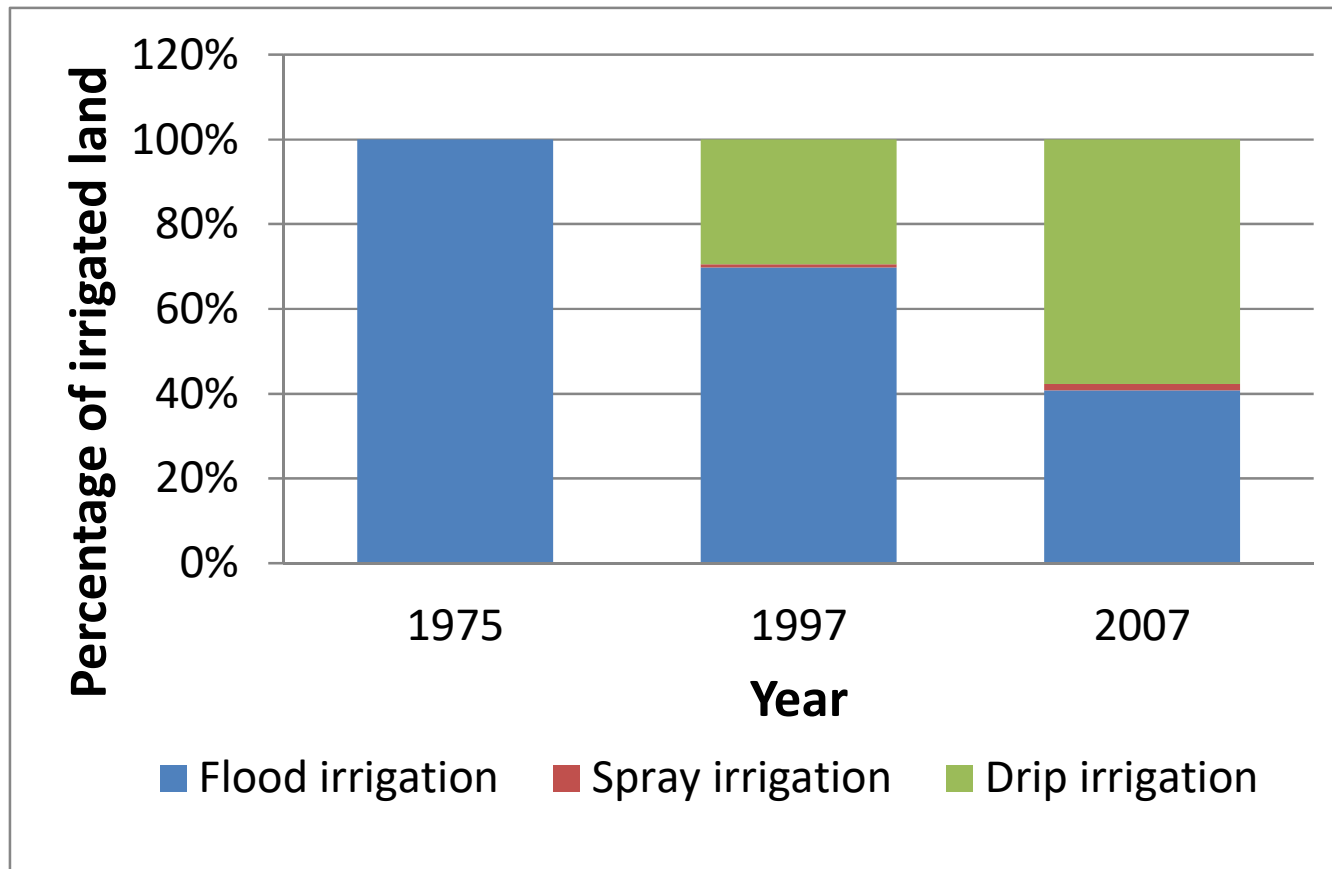


■ Cereals ■ Vegetables ■ Pasture ■ Orchards ■ Vineyard

Desarrollo Histórico Sistema Paloma

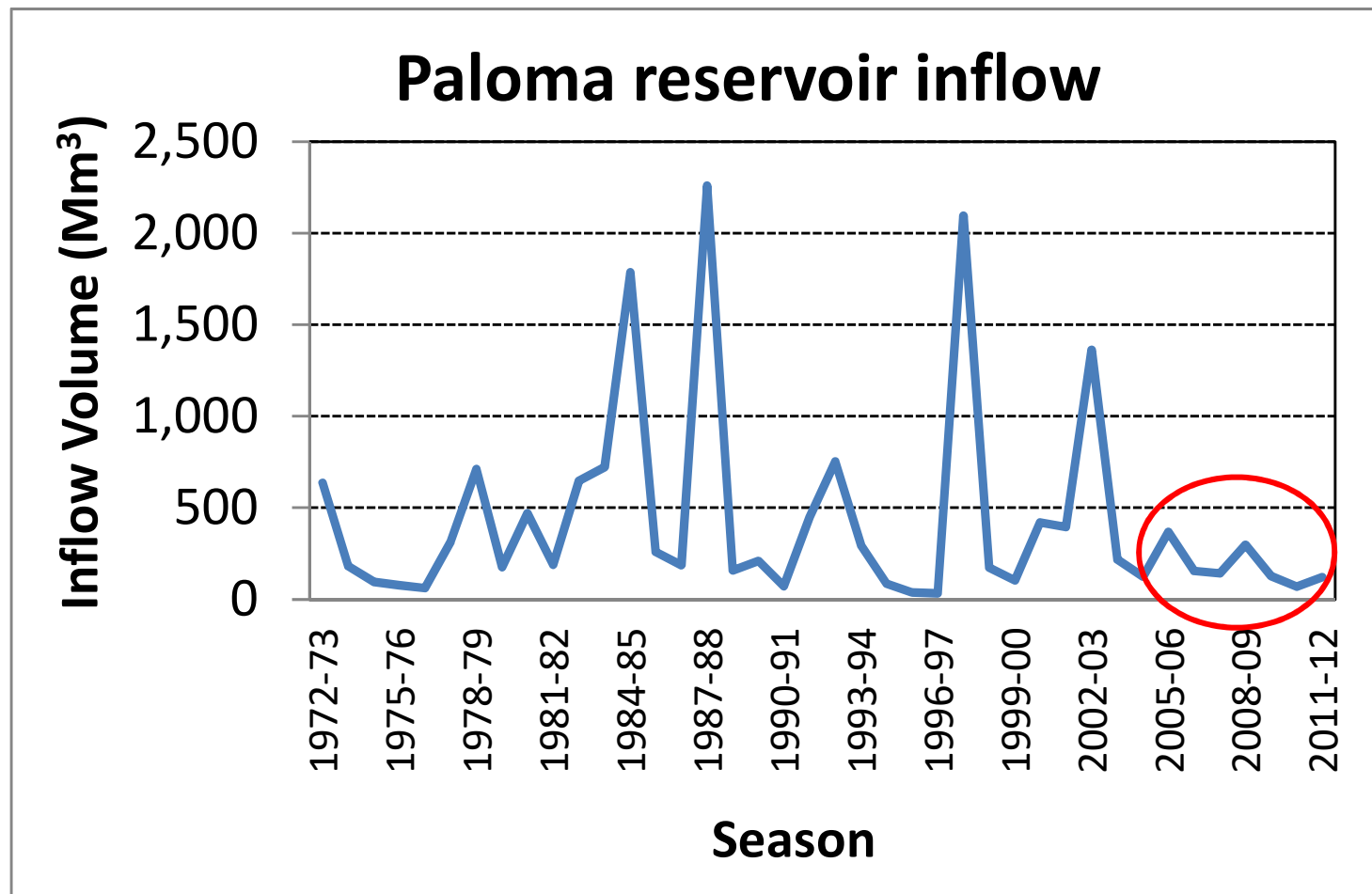


Eficiencia de Riego *Sistema Paloma*

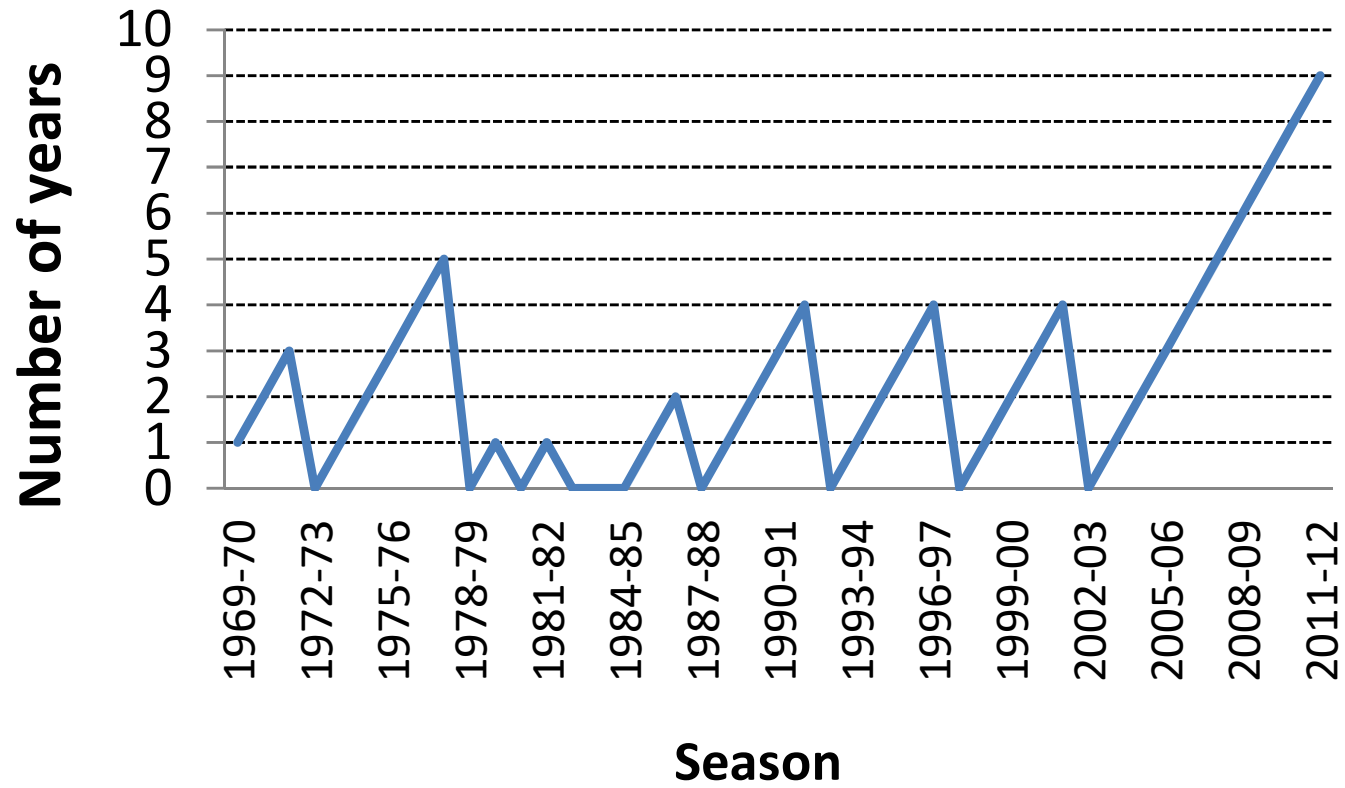


Capacidad de Reestablecer el sistema

- Desde el 2006 que no se logra el volumen superior a 300 Mm³ que permite rellenar el embalse (media 425 Mm³)



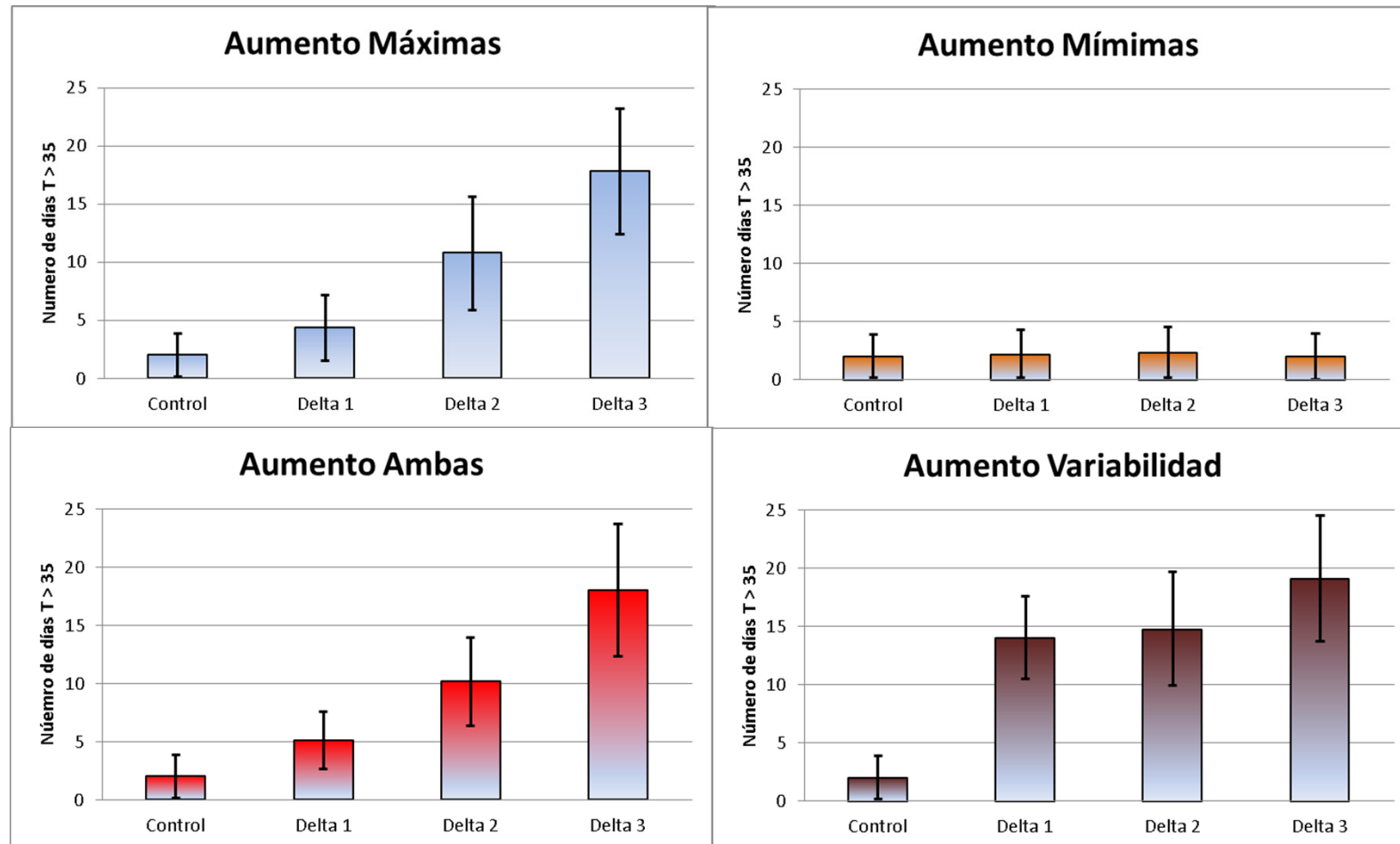
Number of consecutive years with inflow volume below 425 Mm³



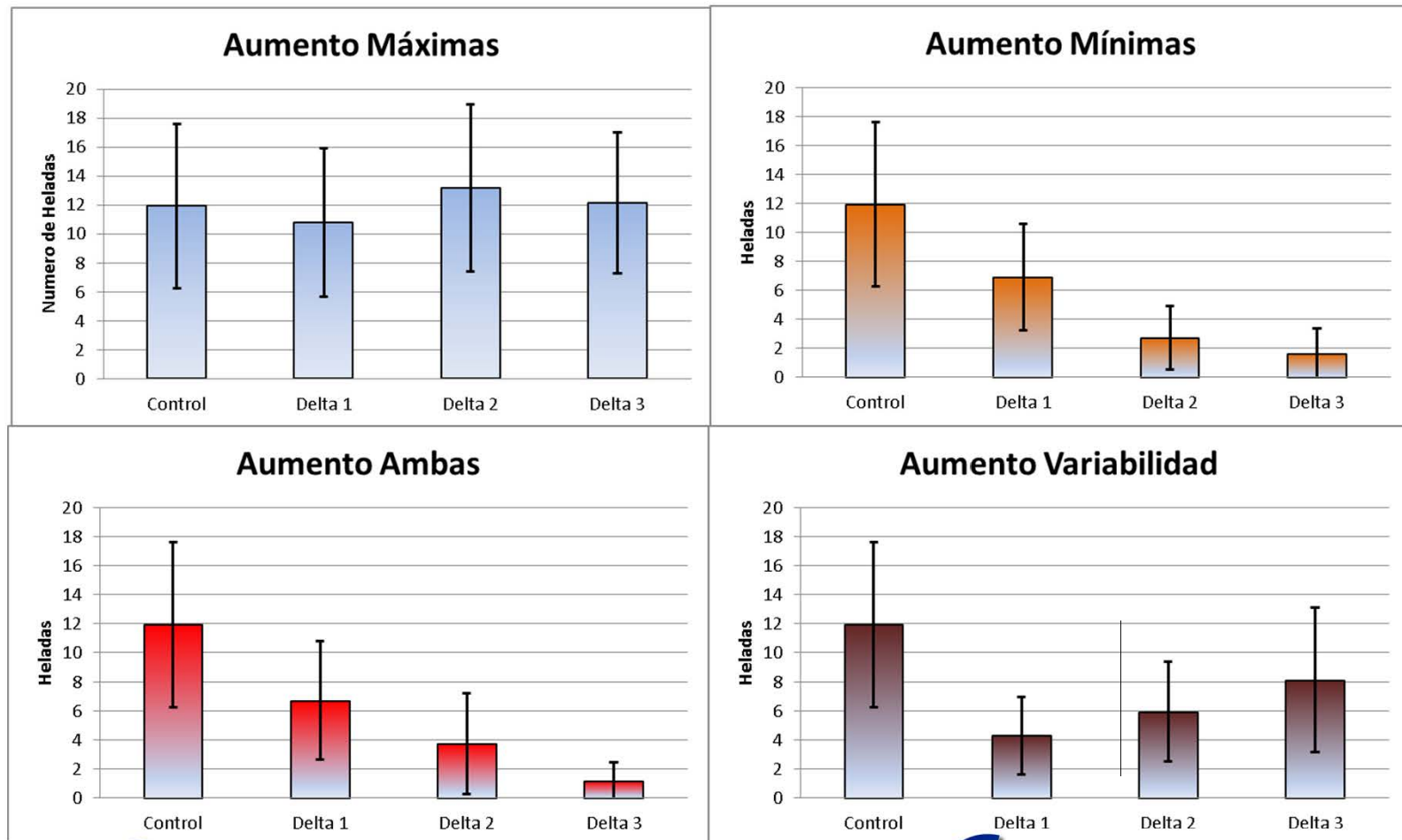
Experimento sobre Indices Bioclimáticos

- Localidad de Convento Viejo
- Datos de Temperatura diaria y horaria de 5 años
- Construcción de un modelo de simulación sensible a cambios climáticos
- 4 Experimentos
 - E1: Aumento de la Media de las Temperaturas Máximas (+1°C;+2°C;+3°C)
 - E2: Aumento de la Media de las Temperaturas Mínimas (+1°C;+2°C;+3°C)
 - E3: Aumento de la Media de las Temperaturas Máximas y Mínimas (+1°C;+2°C;+3°C)
 - E4: Aumento de la Media de las Temperaturas Máximas y Mínimas en 2°C y variabilidad en 10%,20% y 30%

Estrés Térmico



Número de Heladas



Conclusiones

- Comportamiento de Anticiclón del Pacífico y Fenómeno del Niño son los principales factores que explican el clima en la zona central de Chile
- Se observan algunas tendencias en temperatura y precipitaciones que son aun leves como para alterar la frecuencia de eventos extremos
- Los eventos extremos de bajas temperaturas y heladas en Chile central muestran una leve tendencia al alza en algunas regiones

Conclusiones

- Cambio climático impone desafíos por cuanto se prevé que aumentaría la incidencia de:
 - Sequías
 - Tormentas cálidas (Posibles inundaciones)
 - Estrés térmico
- Persiste incertidumbre sobre
 - Granizadas
 - Heladas (Aumento de Temperatura es positivo pero poco se sabe sobre heladas polares y comportamiento del anticiclón)

Muchas Gracias!



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