

¿Vuelven los gigantes?

Grandes crecidas en tiempos de la mega sequía

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SOCHID-UDP

12 Noviembre 2020

Programa

- La Mega Sequía en Chile central: Update...
- La híper sequia 2019
- Como viene la mano?
- Gigantes actuales y futuros
- Palabras al cierre...

Como vamos con la Mega Sequia?

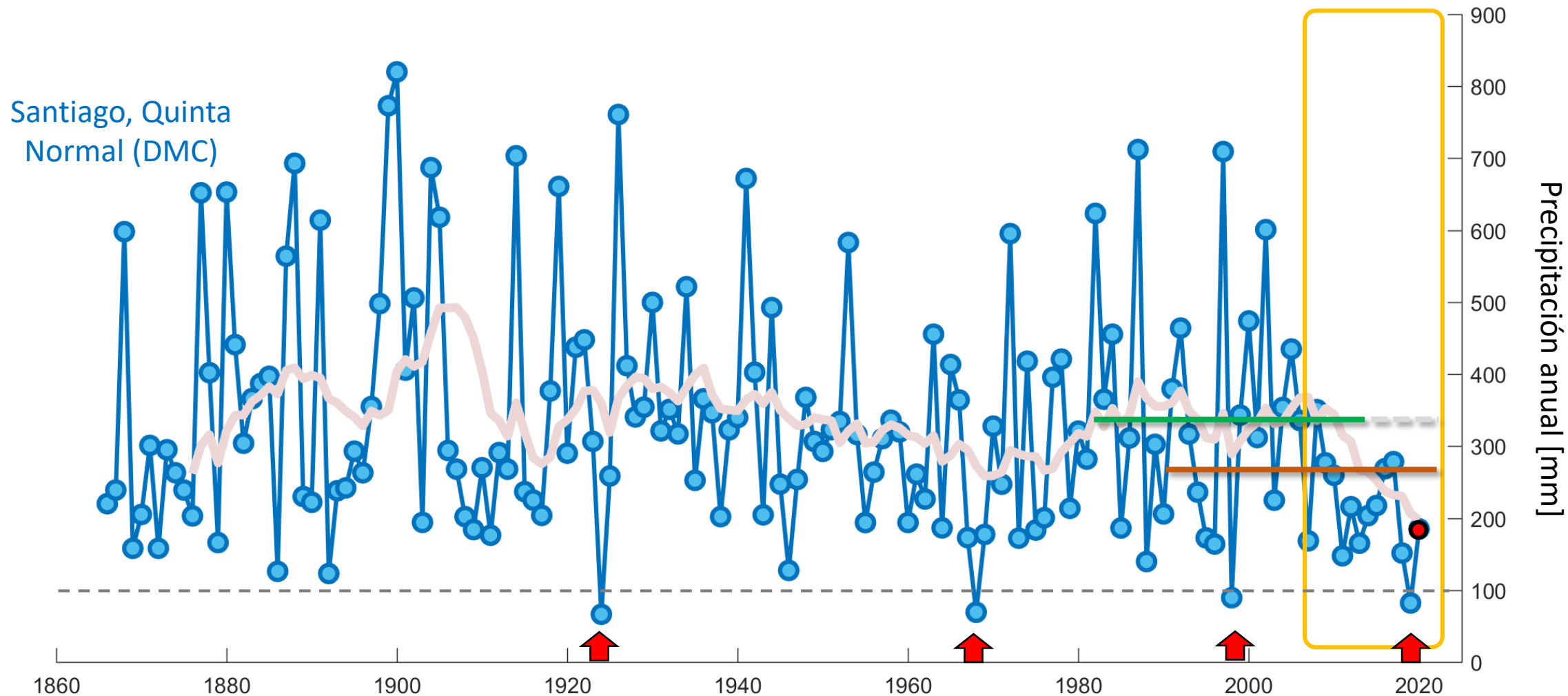
Mal...aunque escapamos de la hiper sequía

Promedio 1980-2010: 340 mm

Déficit 2020: $1-180/342 \approx 50\%$

Promedio 1990-2020: 283 mm

Déficit 2020: $1-180/283 = 37\%$



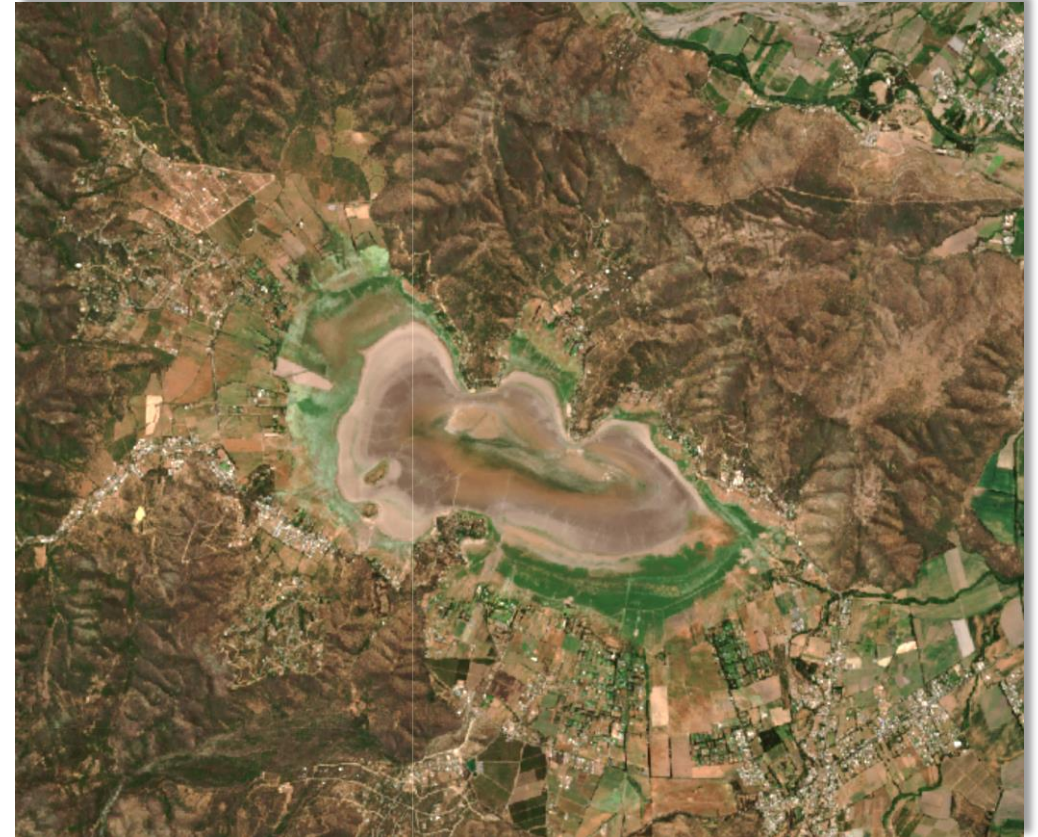
Como vamos con la Mega Sequia?

Mal....aunque escapamos de la híper sequía

05 Noviembre 2019



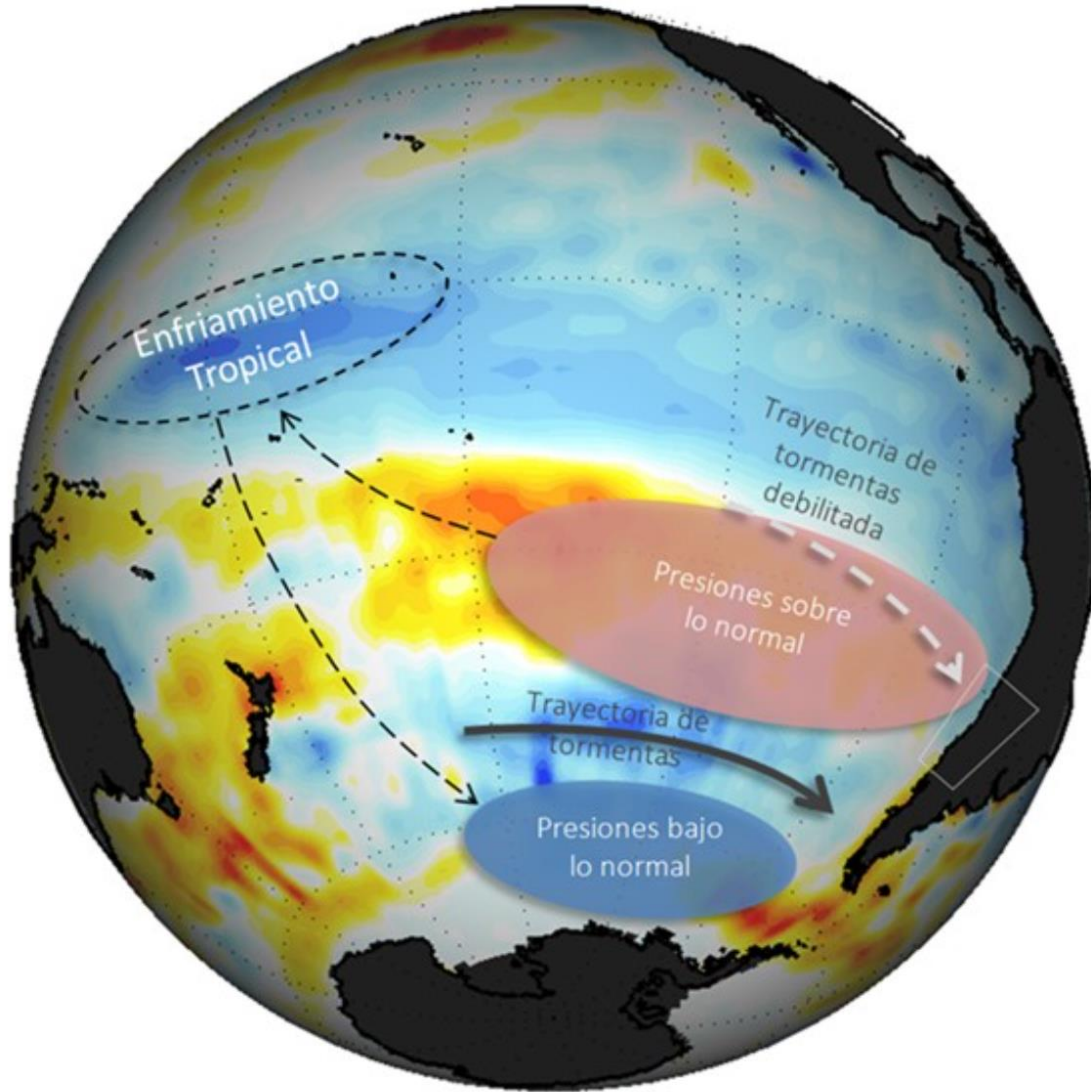
10 Noviembre 2020



Imágenes Sentinel-2 L2A – Visible

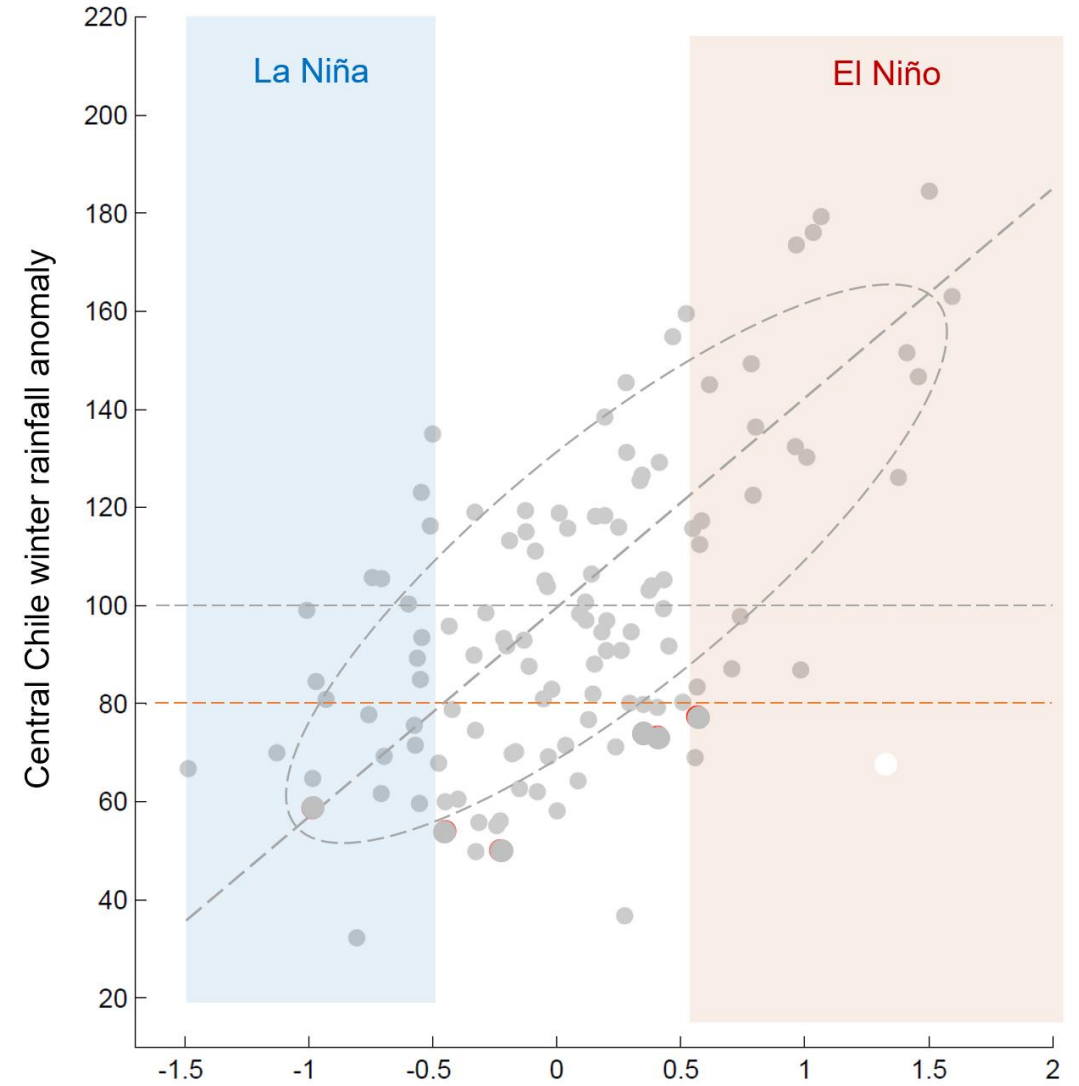
SEQUÍAS HISTÓRICAS

La vida era más simple solo con ENSO



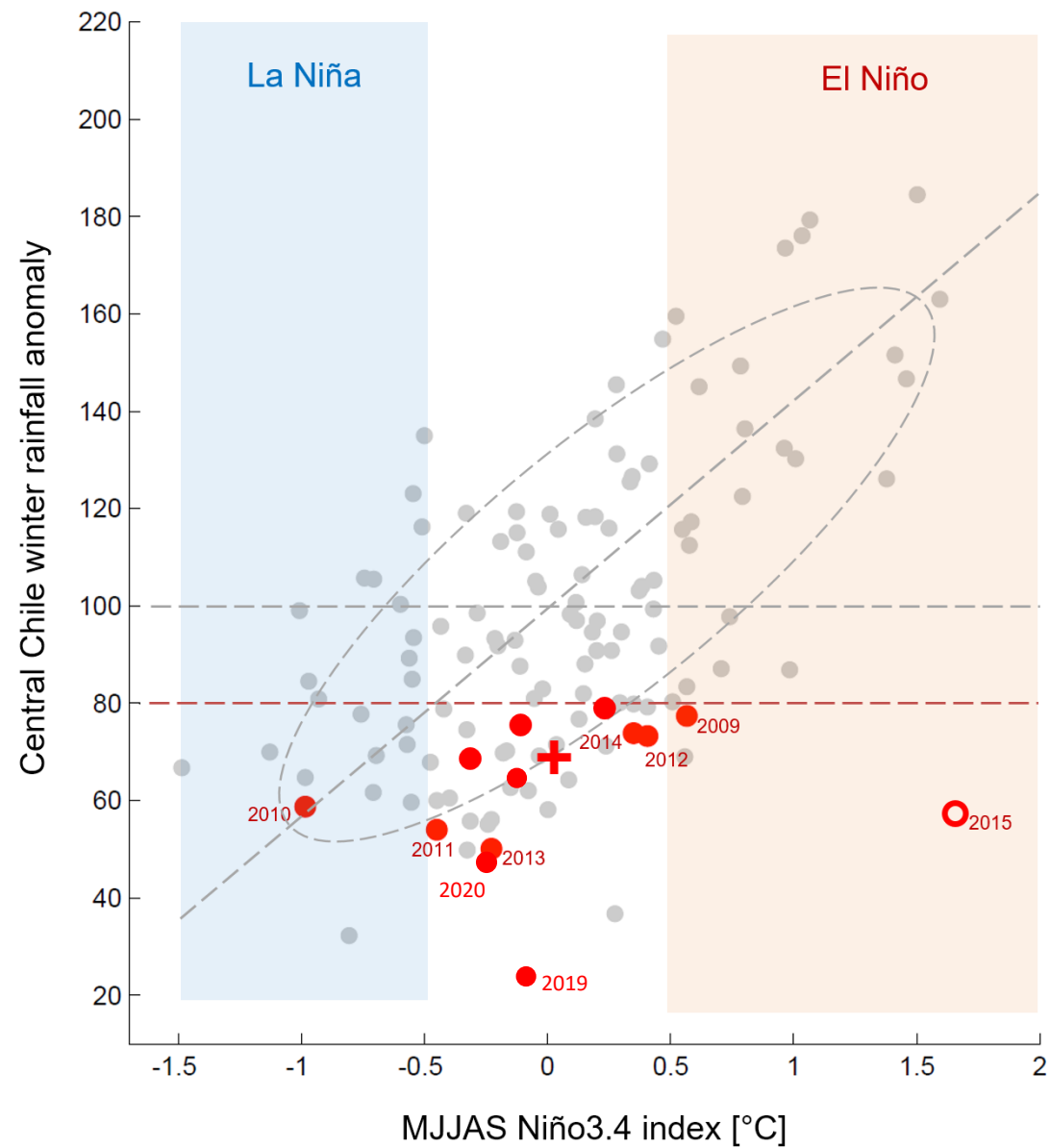
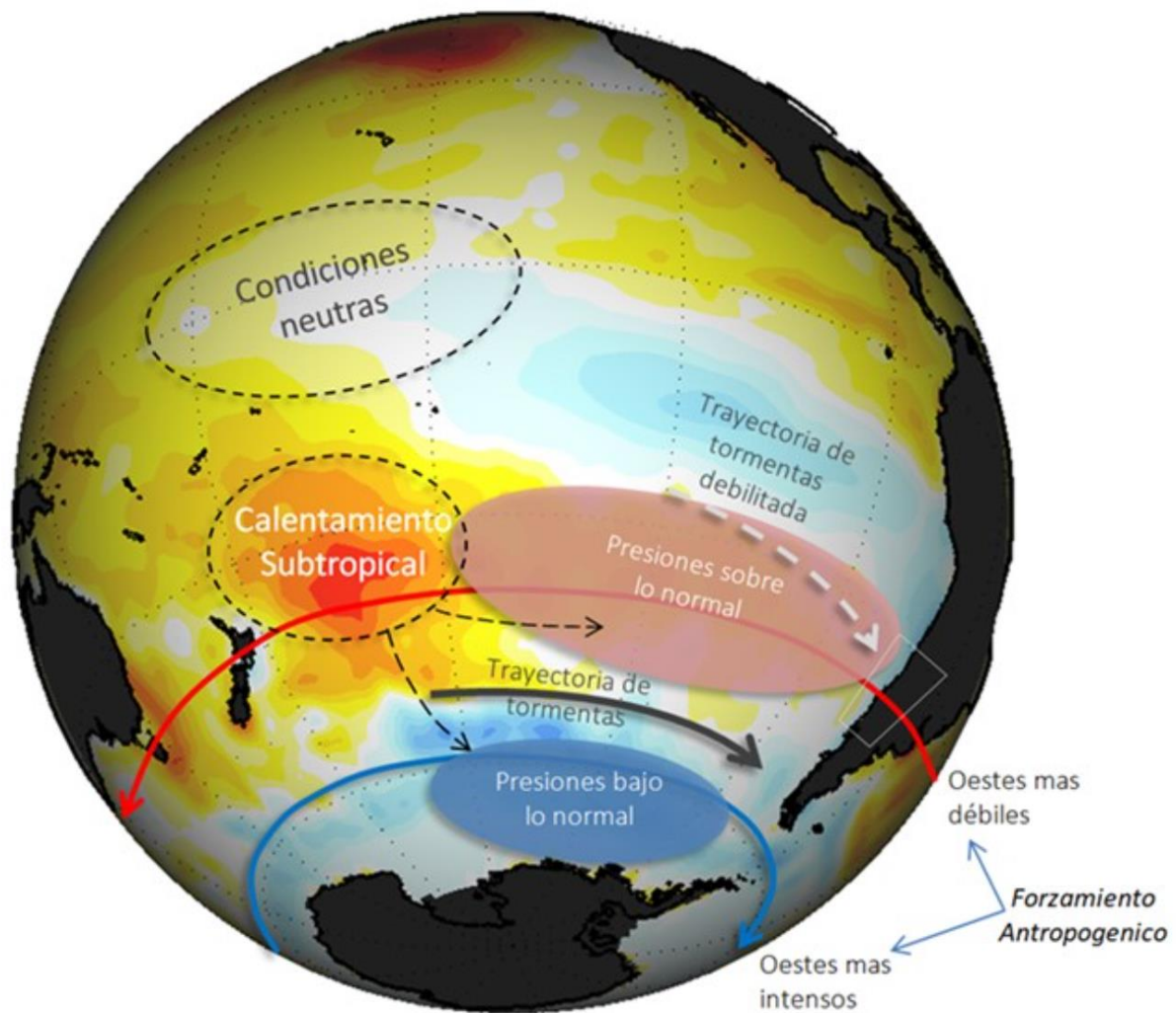
ENSO Modulation

1911-2000

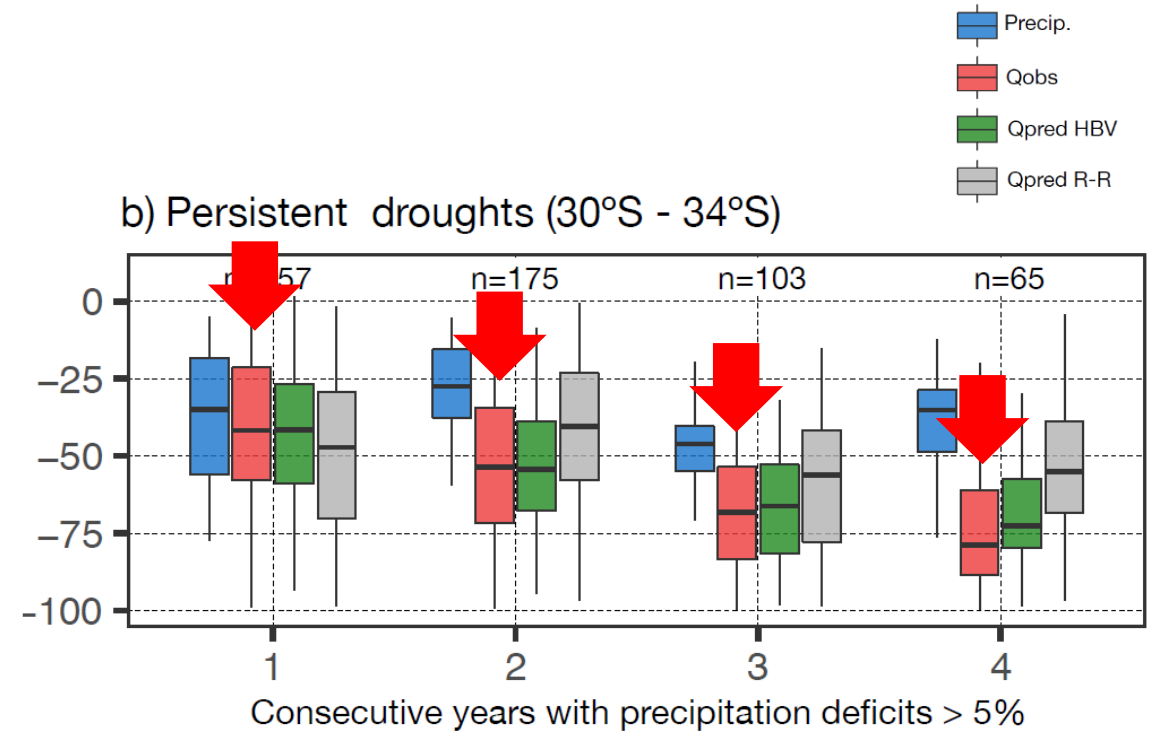
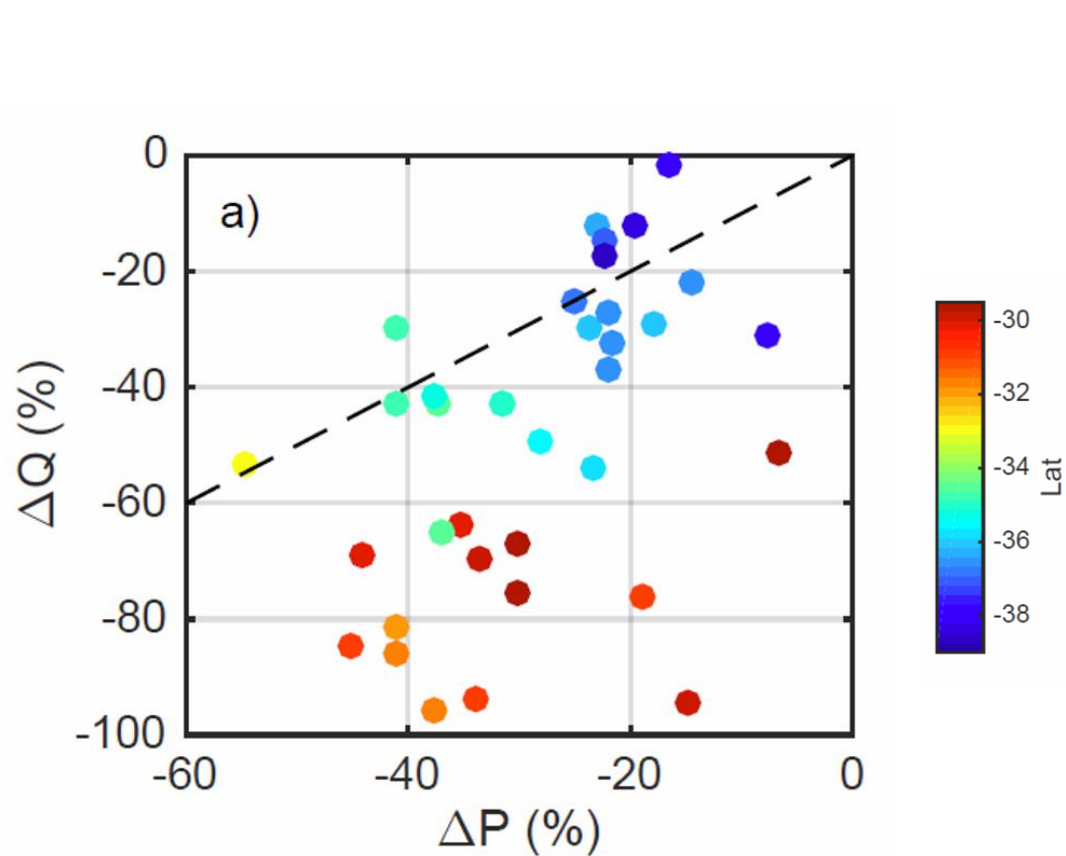


MEGASEQUÍA 2010-2019

Dos nuevos elementos aparecen



Impactos en Hidrología



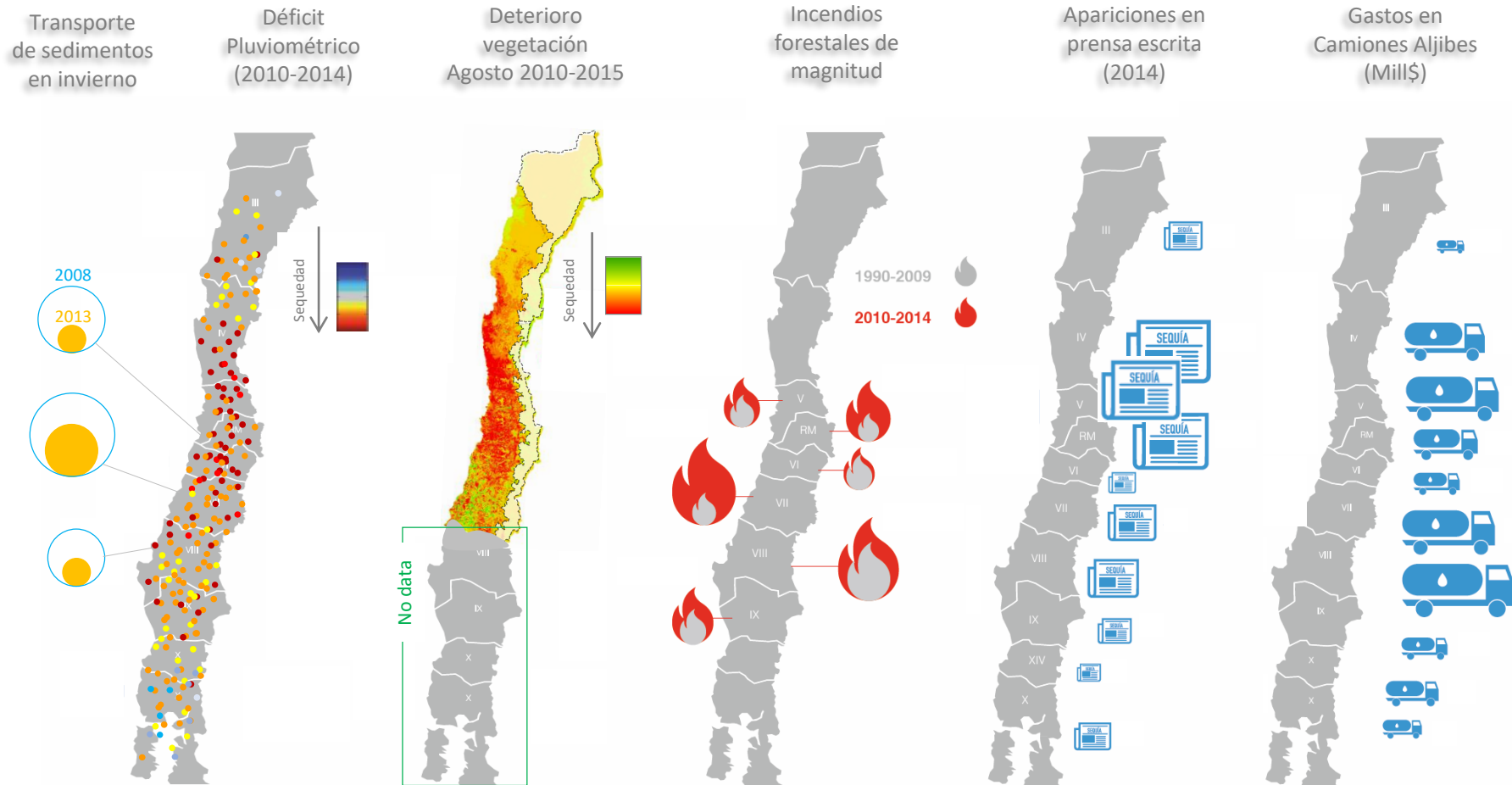
Sequia hidrológica > Sequia Meteorológica

5 años secos \neq $5 \times$ (1 año seco)

The 2010-2018 mega drought in Central Chile

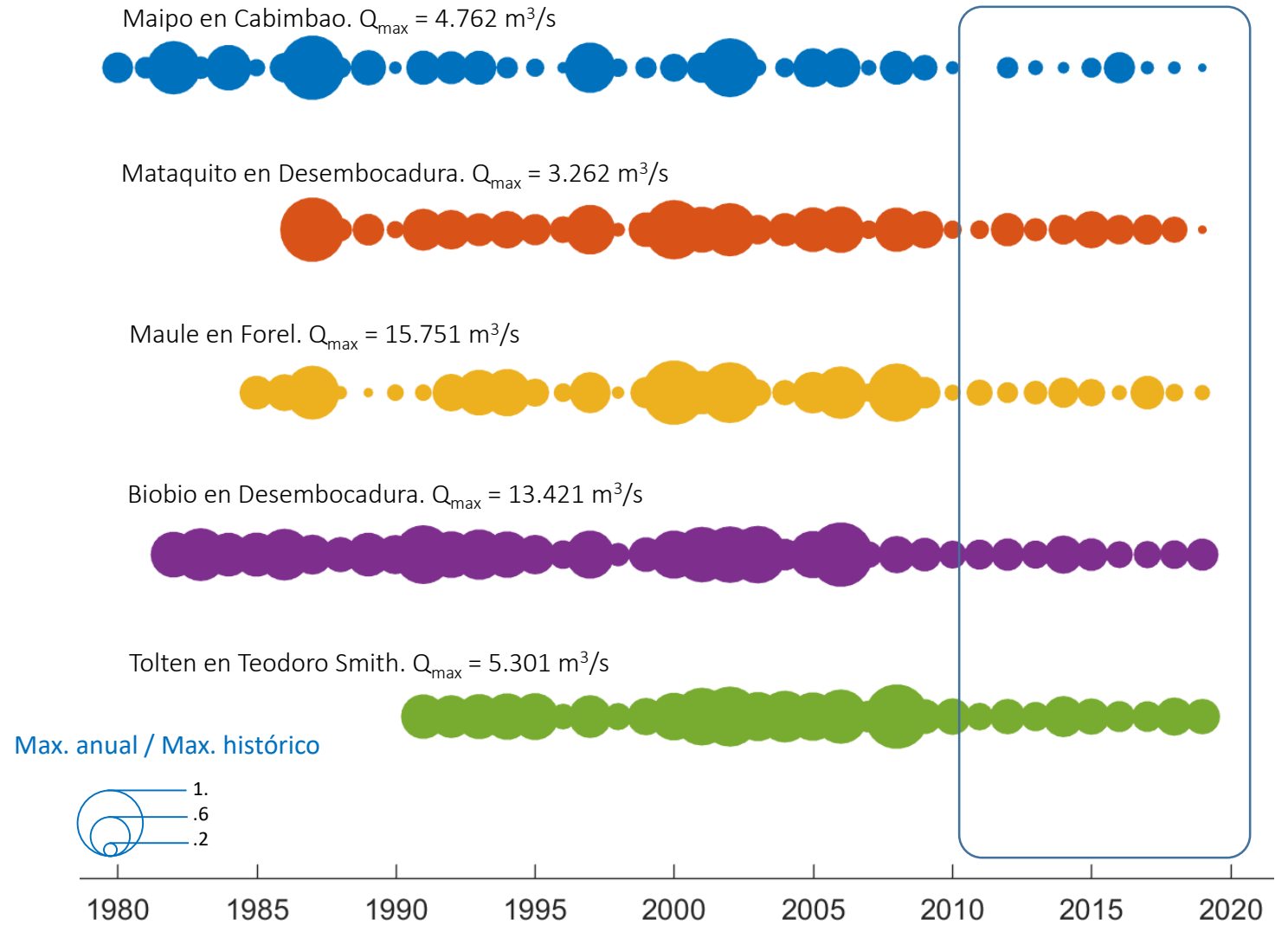
Individual year rainfall deficit were not extreme

But MD length has caused major ecological and social impacts

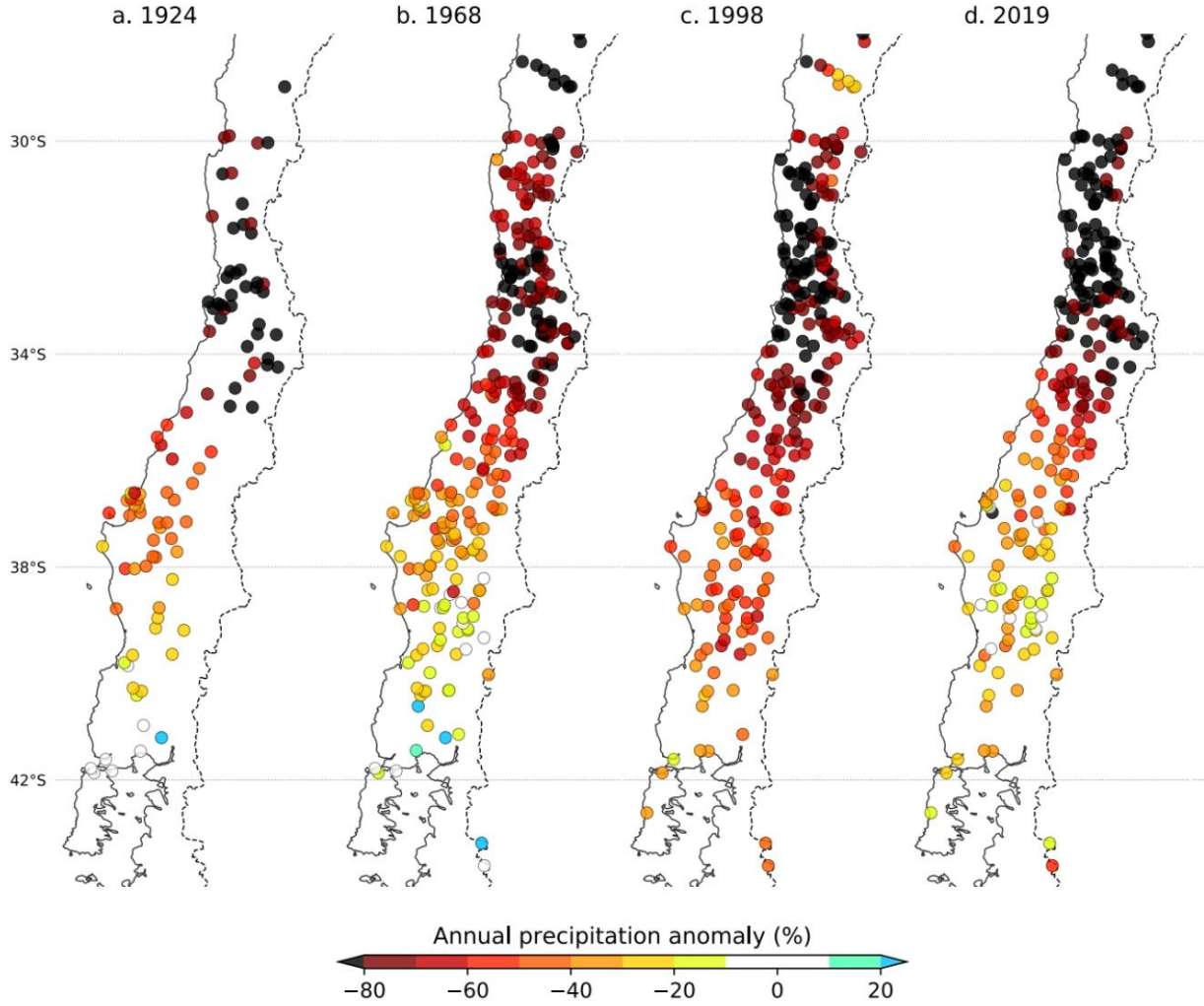


Perdimos los Gigantes

Por ahora....

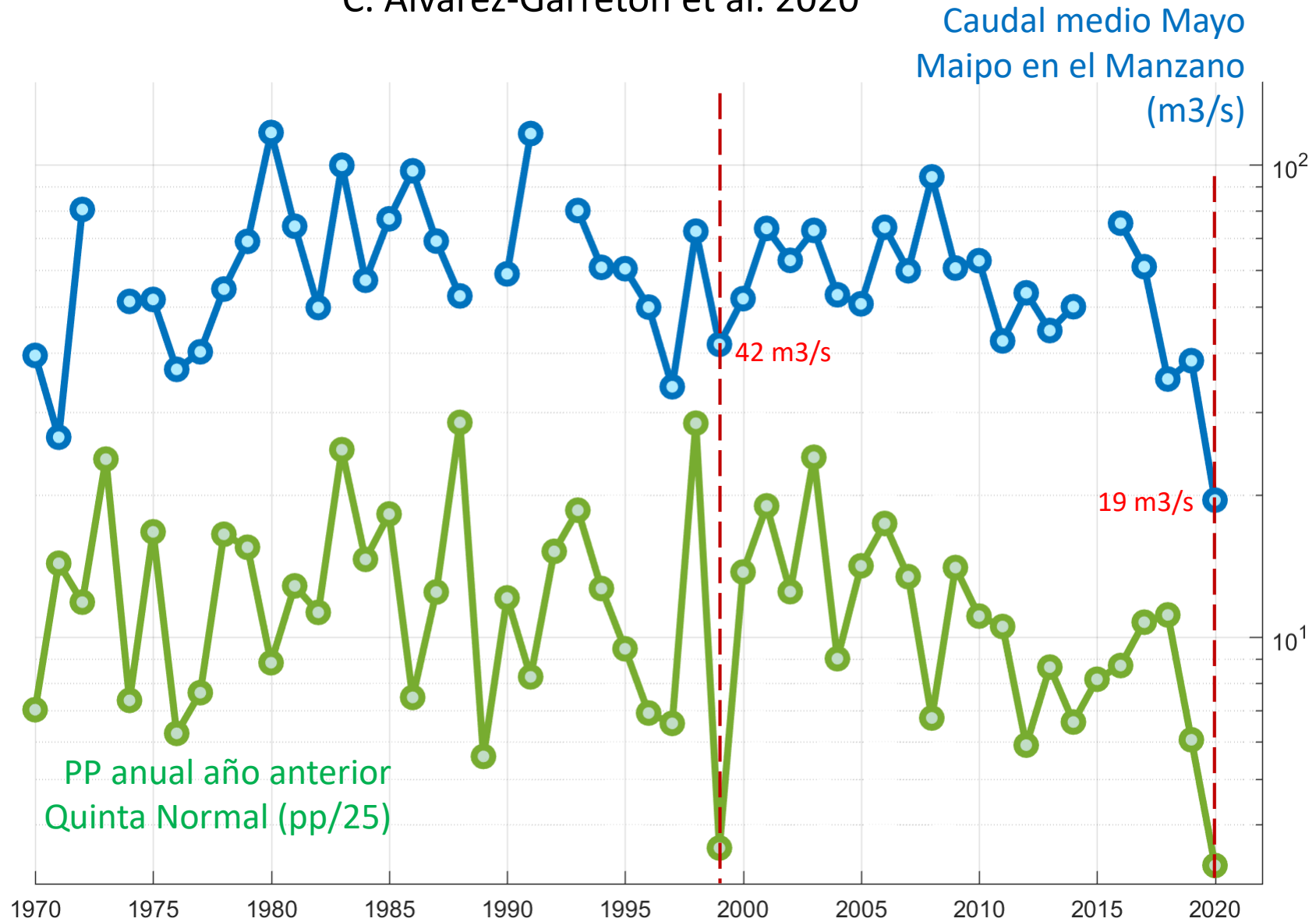


Híper sequías históricas

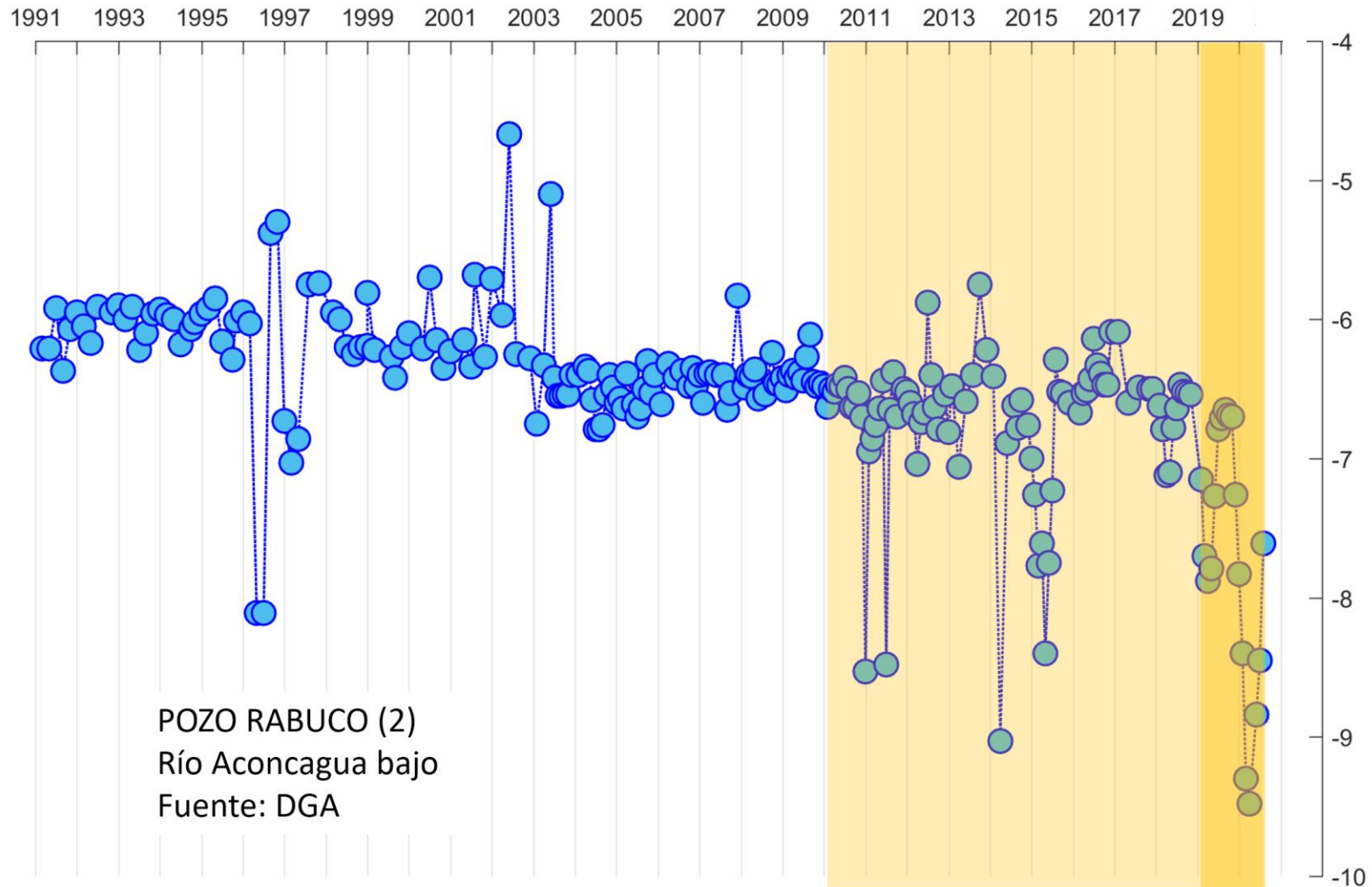


Híper sequía y memoria hidrológica

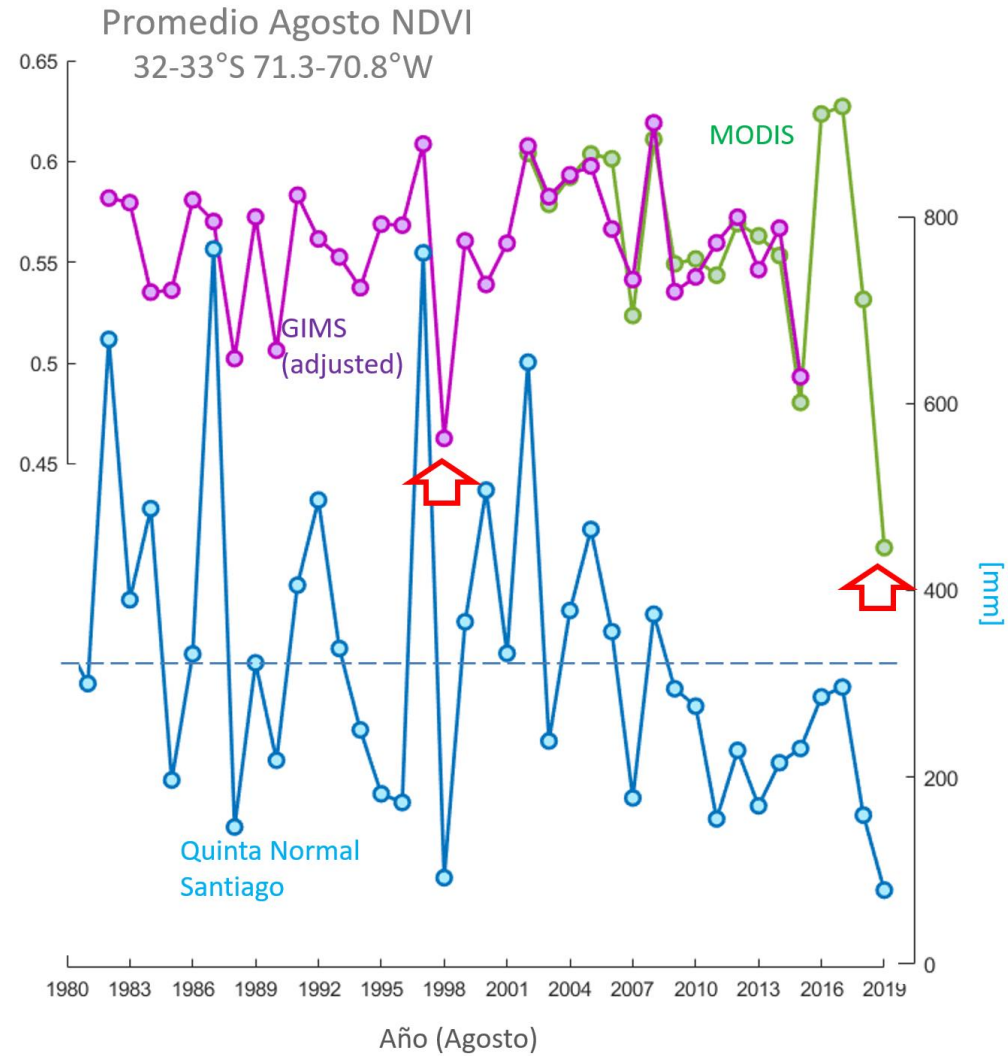
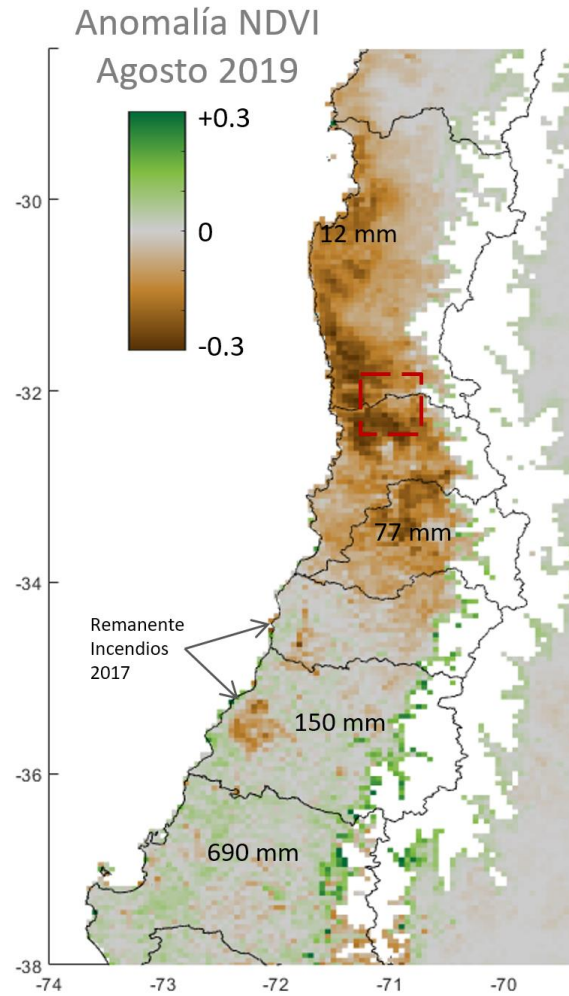
C. Alvarez-Garreton et al. 2020



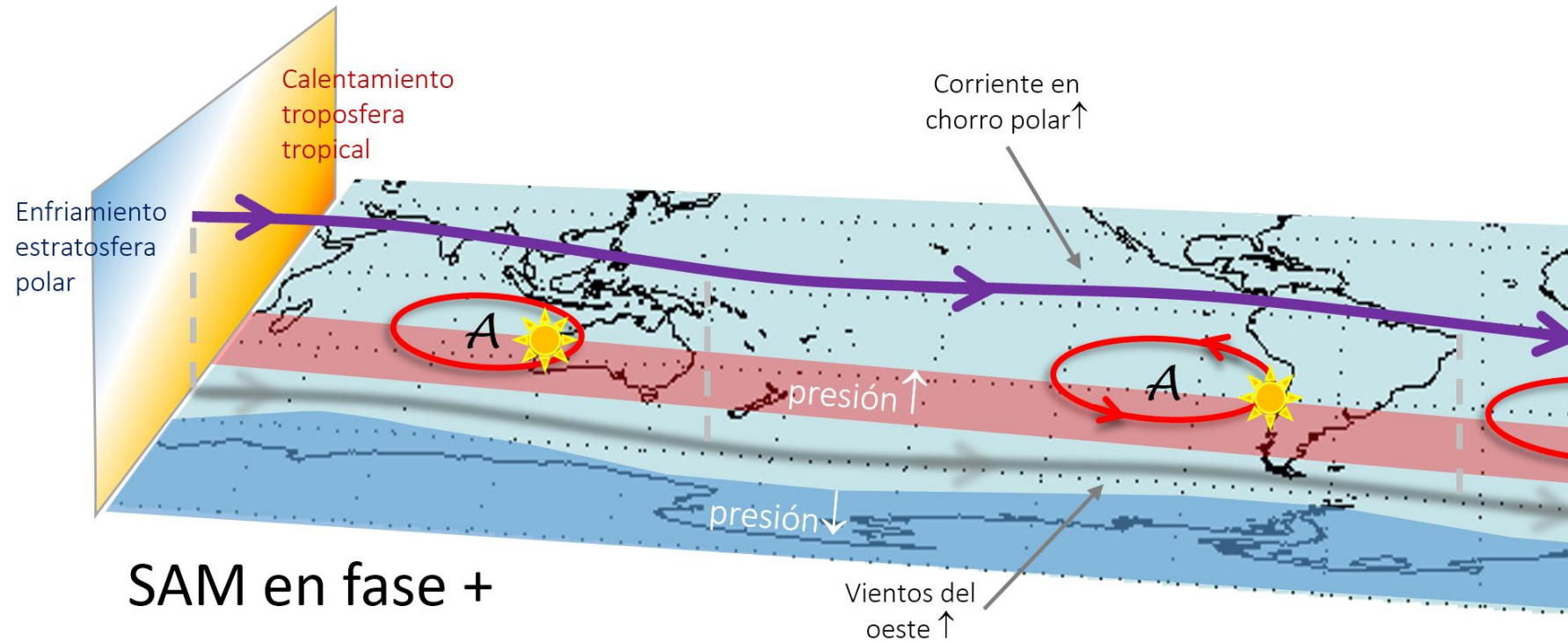
Híper sequía y memoria hidrológica



Híper sequía y memoria hidrológica

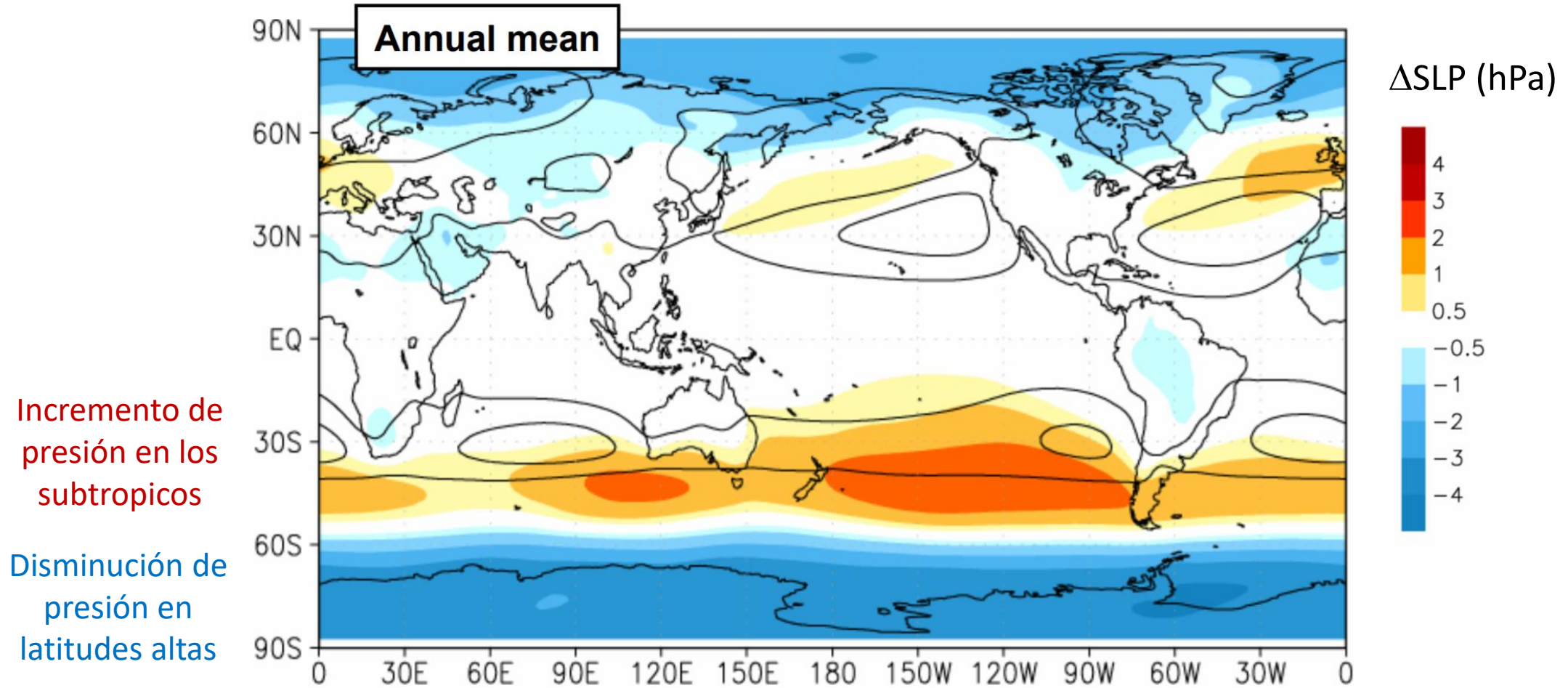


Y como viene la mano? No maten al mensajero....

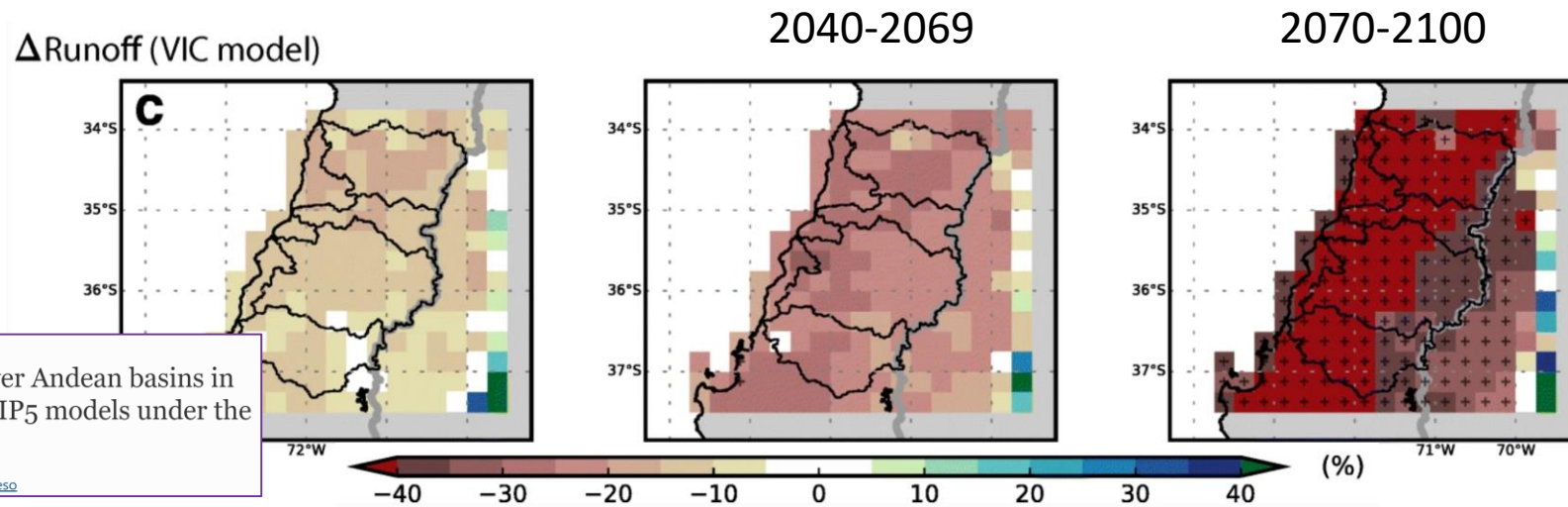


Y como viene la mano?

Promedio multi-modelo cambio de PNM entre clima actual y fin de siglo (bajo RCP8.5)



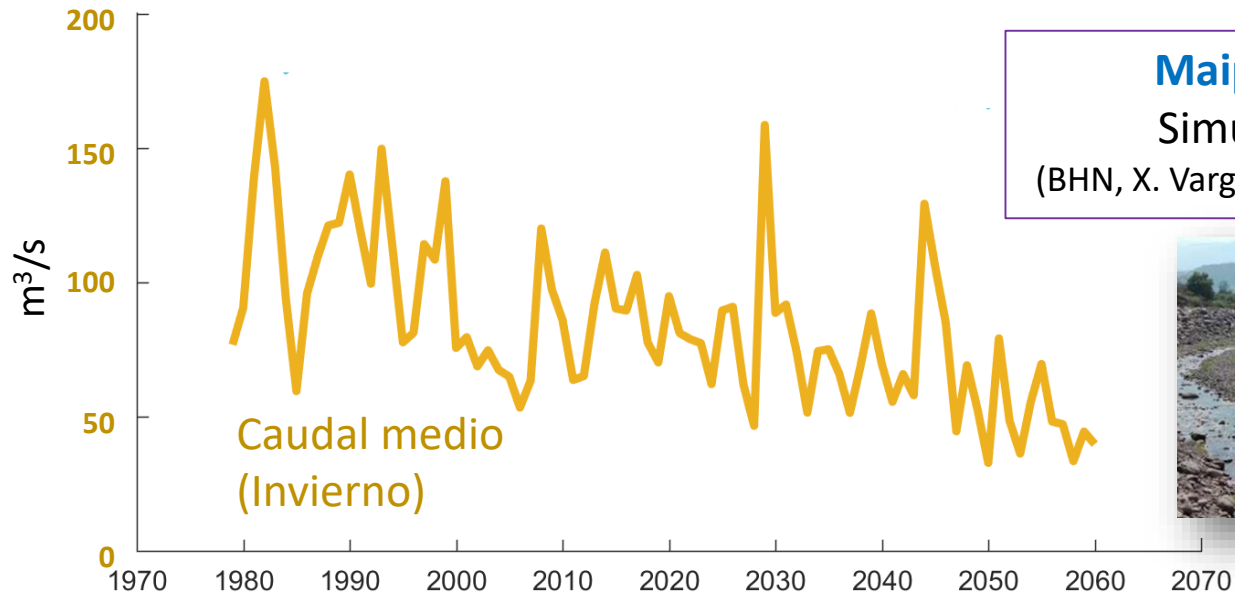
Y como viene la mano?



Published: 03 September 2018

Projected hydroclimate changes over Andean basins in central Chile from downscaled CMIP5 models under the low and high emission scenarios

[Deniz Bozkurt](#) [Maisa Rojas](#), [Juan Pablo Boisier](#) & [Jonás Valdivieso](#)



Maipo en el Manzano

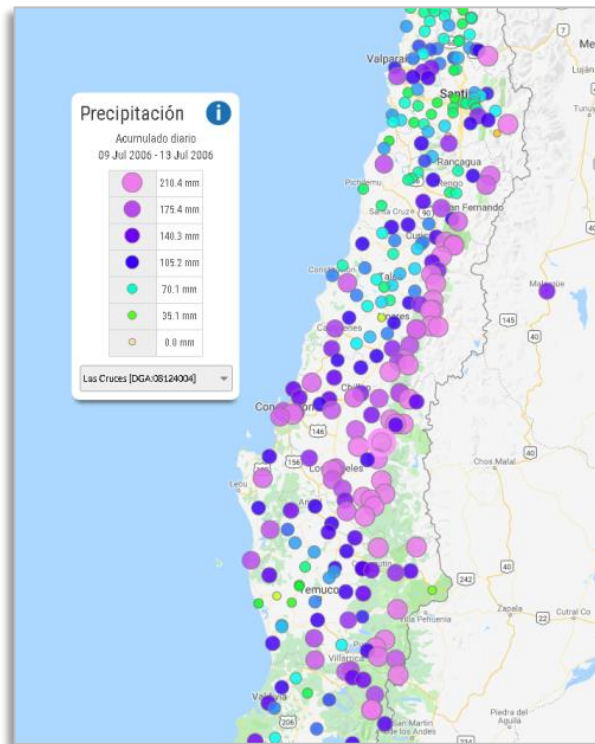
Simulaciones VIC-IPSL

(BHN, X. Vargas, E. Muñoz, P. Mendoza UCH)



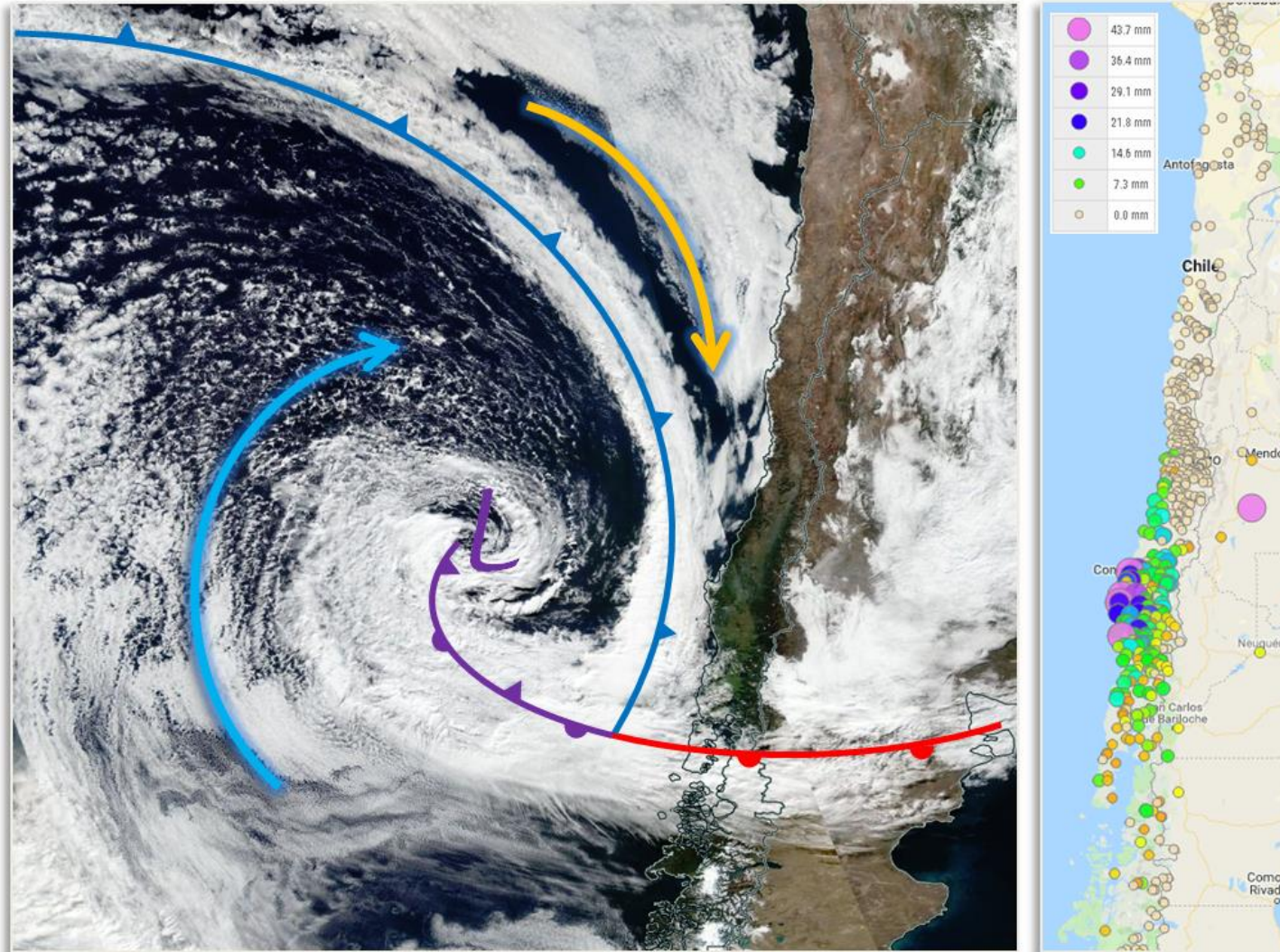
Gigantes

Las grandes tormentas pluviales durante los meses de invierno (lluvias >200 mm en 1-3 días, caudales >2 mil m³/s en desembocadura) en Chile central (25-45°S) han causado cientos de fatalidades, graves daños a la infraestructura y grandes pérdidas económicas.



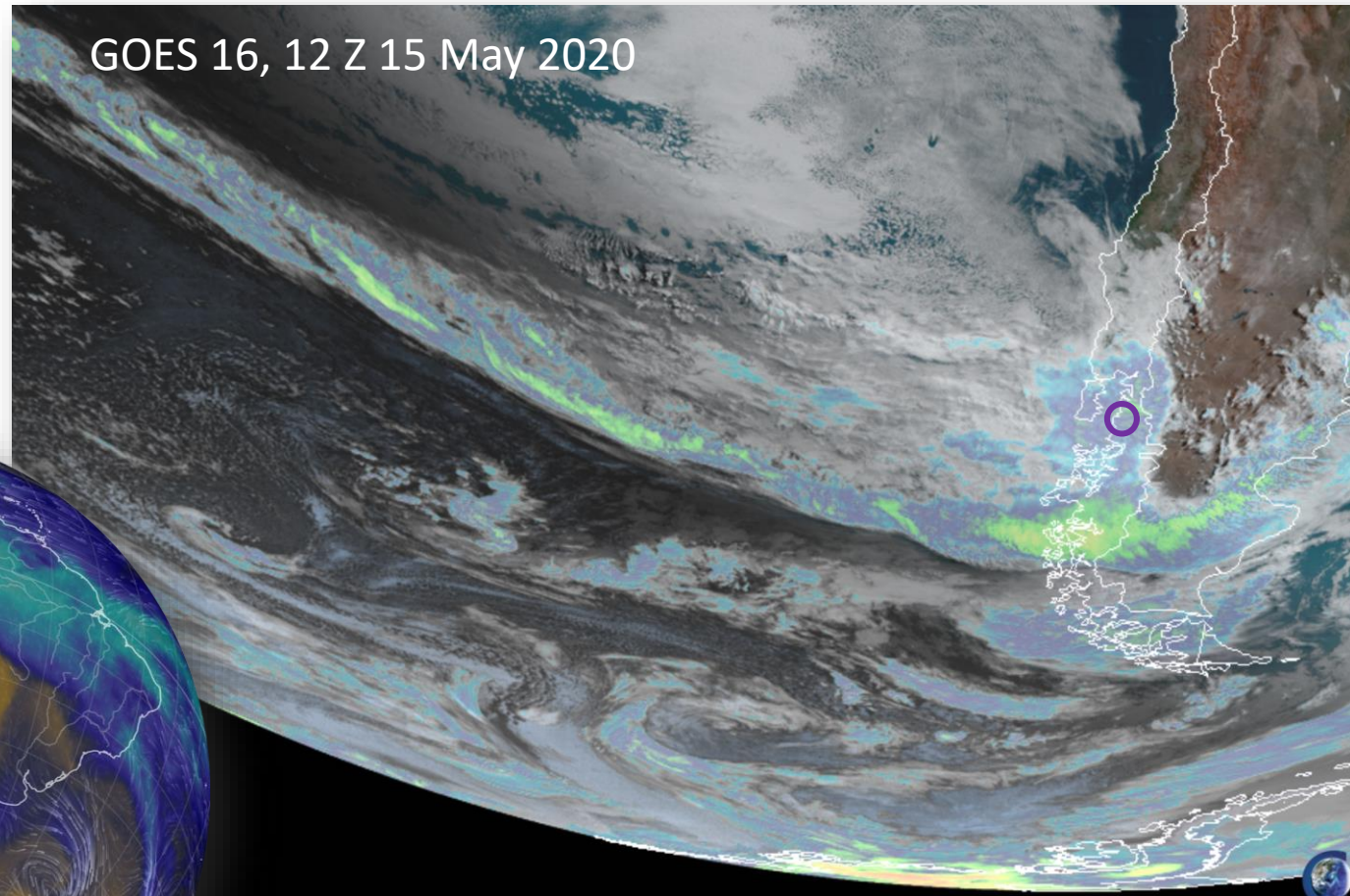
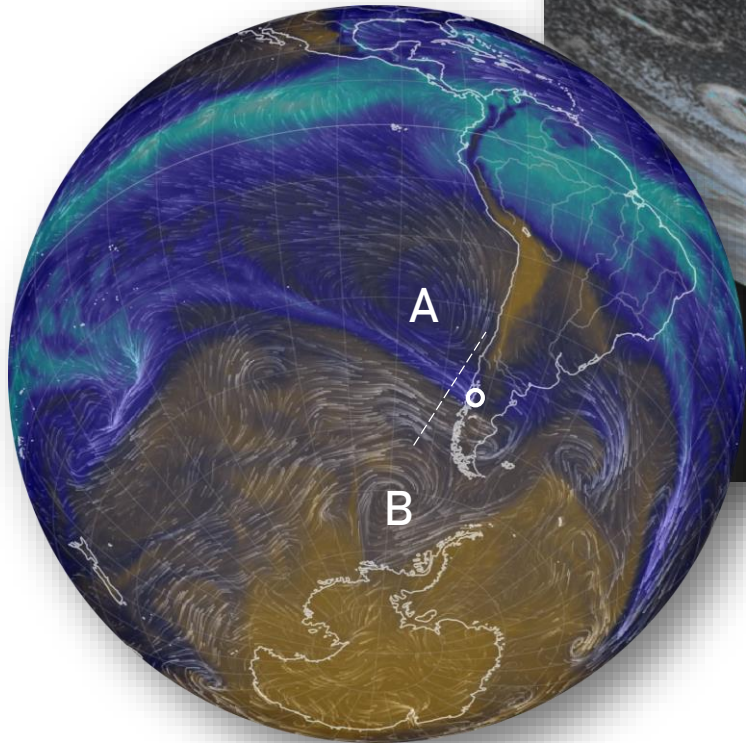
Gigantes

Grandes tormentas pluviales / crecidas

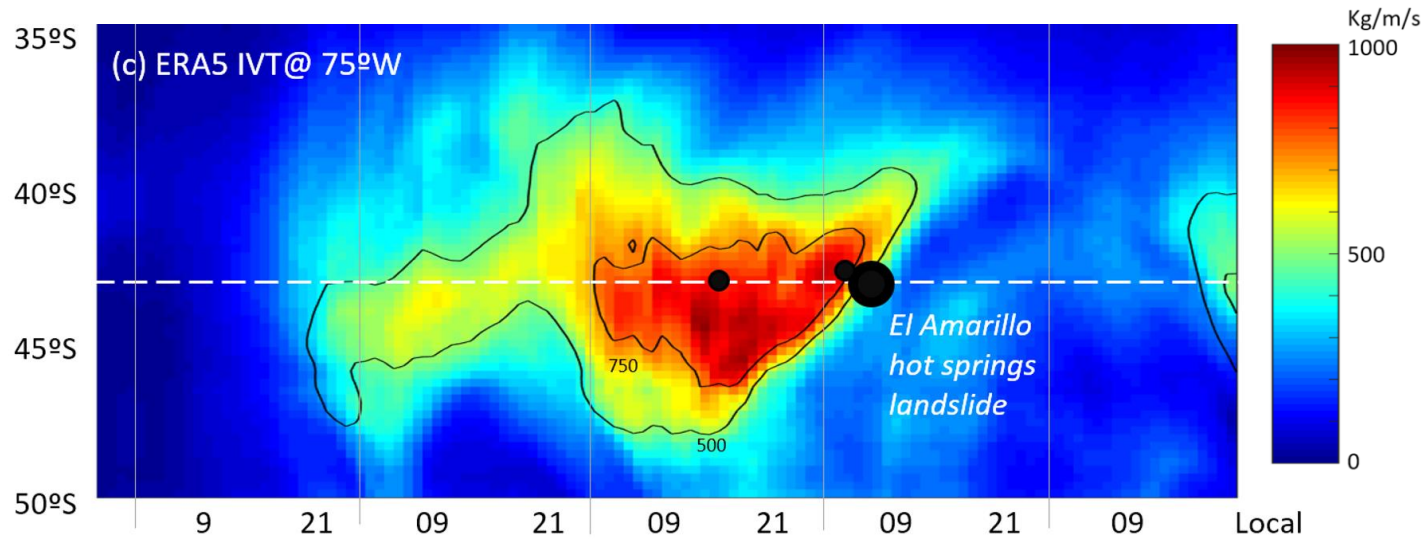


Este sistema no se ve taaaan terrible.....

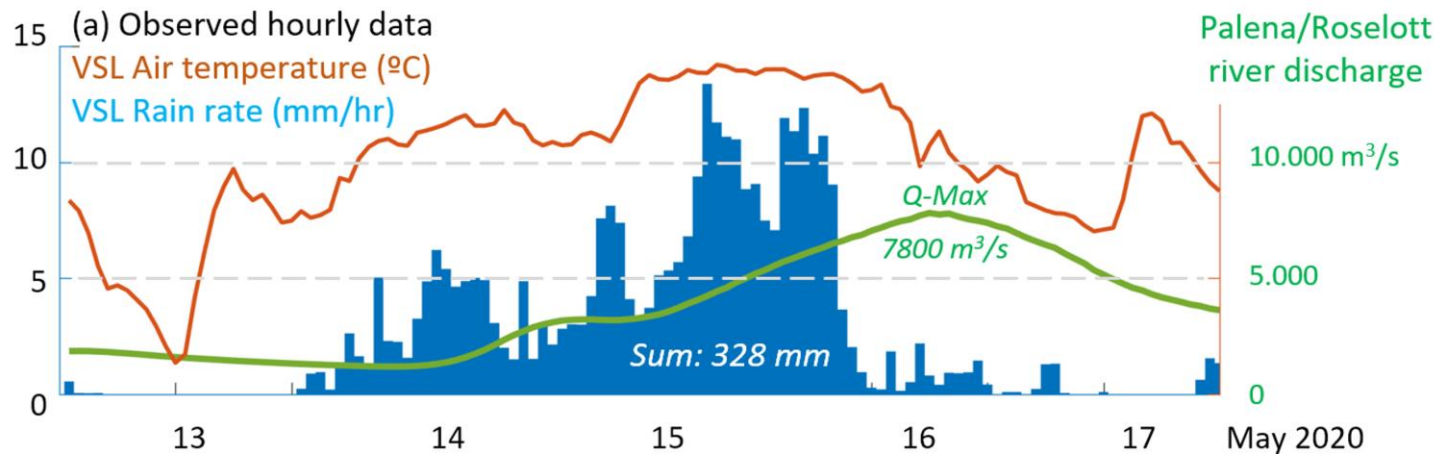
GFS 500 hPa wind +
Precipitable Water



Este sistema no se ve taaaan terrible....toma!



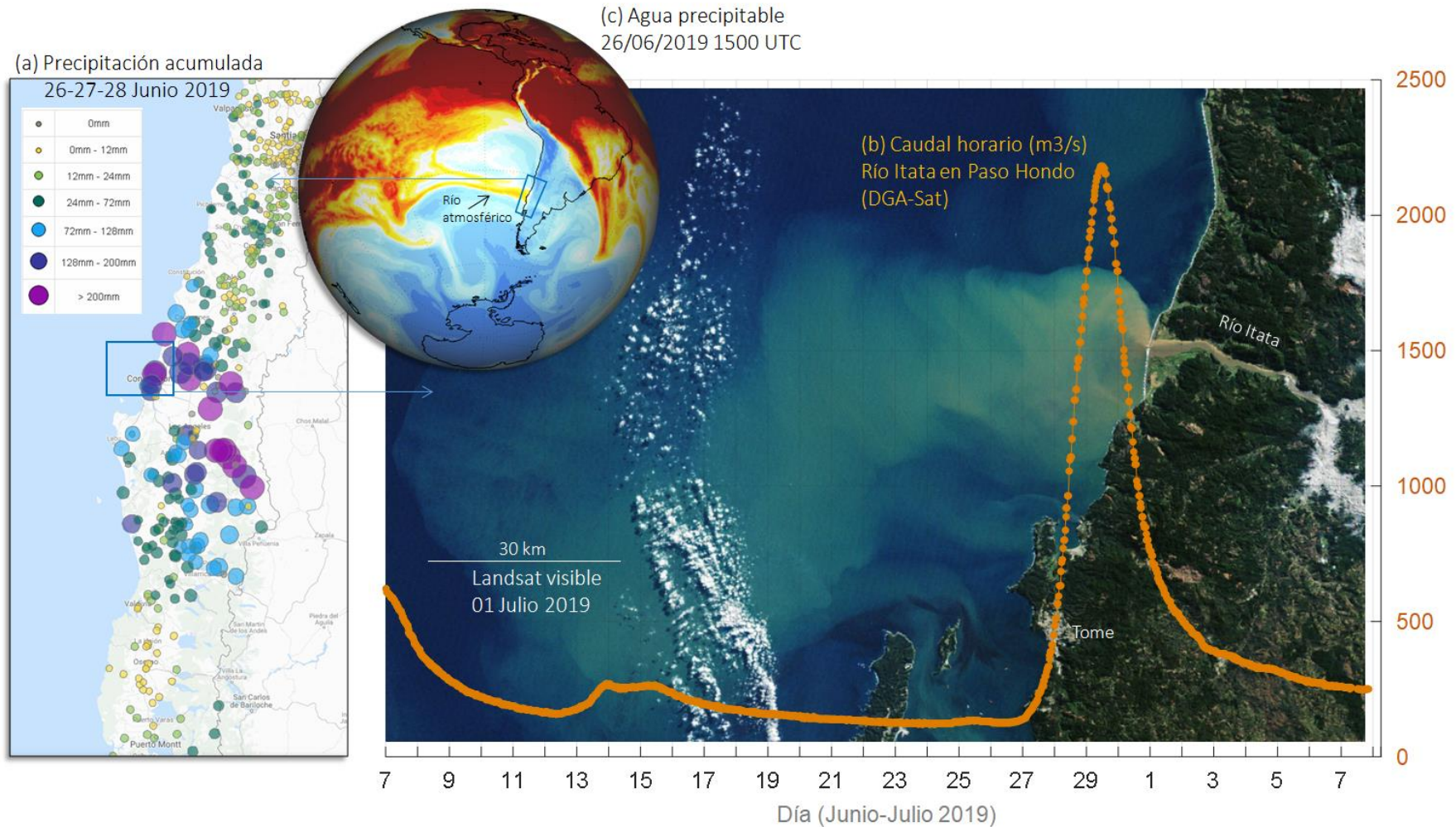
$$\vec{IVT} = \frac{1}{g} \int_{p_{sfc}}^{100hPa} q \vec{V} dp$$



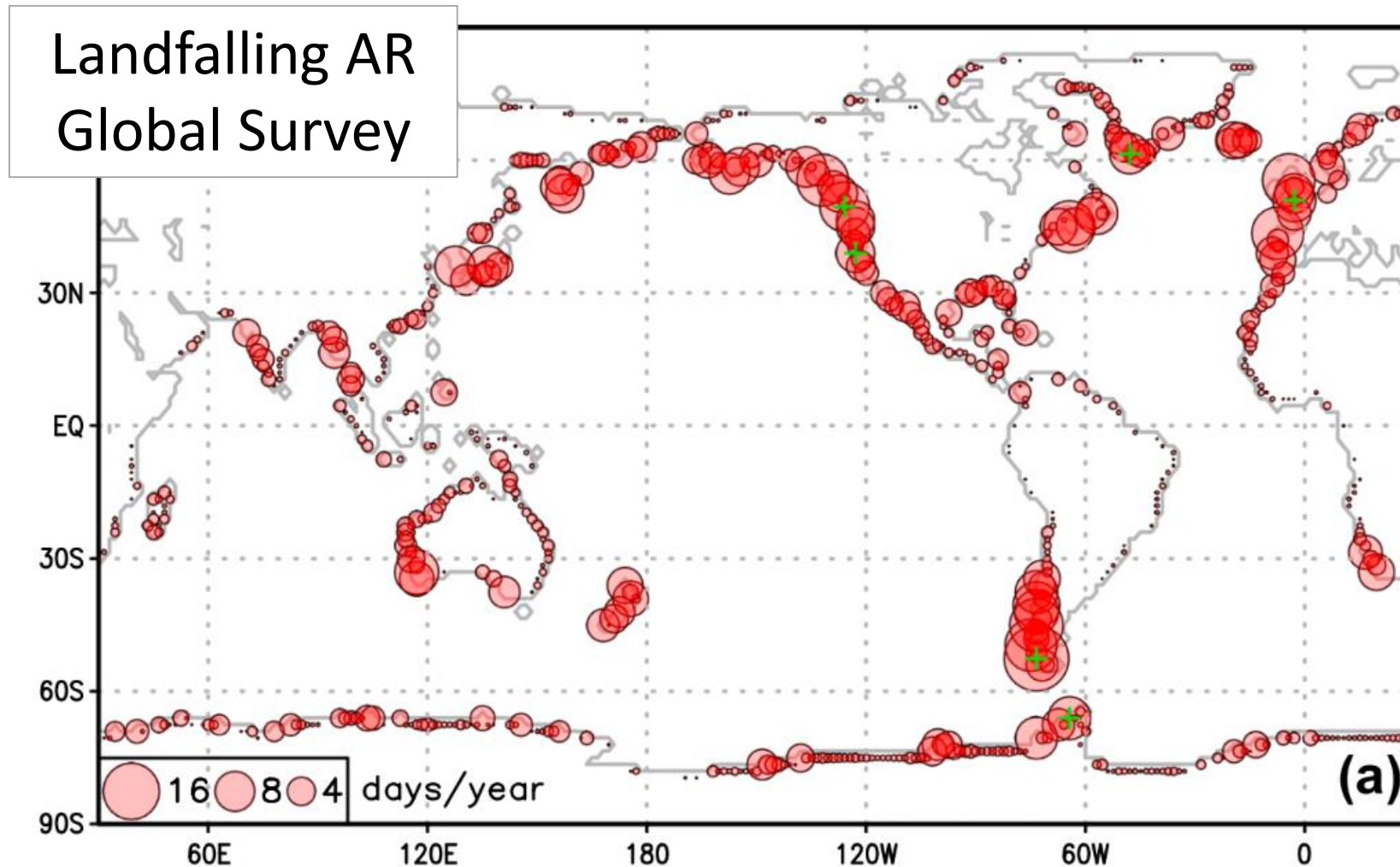
Knowing your enemy: landslides and ARs in western Patagonia



Aun en durante la Mega Sequia una tormenta grande es posible...aunque menos probable



Conociendo al enemigo: Ríos atmosféricos / tormentas cálidas



Conociendo al enemigo: Ríos atmosféricos / tormentas cálidas

JOURNAL OF HYDROMETEOROLOGY

Extreme Daily Rainfall in Central-Southern Chile and Its Relationship with Low-Level Horizontal Water Vapor Fluxes

RAÚL A. VALENZUELA AND RENÉ D. GARREAUD

Department of Geophysics, Center for Climate and Resilience Research, University of Chile, Santiago, Chile

(Manuscript received 13 February 2019, in final form 30 May 2019)

JOURNAL OF HYDROMETEOROLOGY

Impacts of Atmospheric Rivers on Precipitation in Southern South America

MAXIMILIANO VIALE

Instituto Argentino de Nivología, Glaciología y Ciencias Ambientales, CCT-CONICET, Mendoza, Argentina, and Departamento de Geofísica, Universidad de Chile, Santiago, Chile

RAÚL VALENZUELA AND RENÉ D. GARREAUD

Departamento de Geofísica, and Centro del Clima y la Resiliencia, Universidad de Chile, Santiago, Chile

F. MARTIN RALPH

Center for Western Weather and Water Extremes, Scripps Institution of Oceanography, University of California, San Diego, La Jolla, California

(Manuscript received 16 January 2018, in final form 5 September 2018)

JOURNAL OF HYDROMETEOROLOGY

Warm Winter Storms in Central Chile

R. GARREAUD

Department of Geophysics, and Center for Climate and Resilience Research, University of Chile, Santiago, Chile

(Manuscript received 10 September 2012, in final form 1 February 2013)

 **frontiers**
in Earth Science

ORIGINAL RESEARCH
published: 28 July 2020
doi: 10.3389/feart.2020.00261

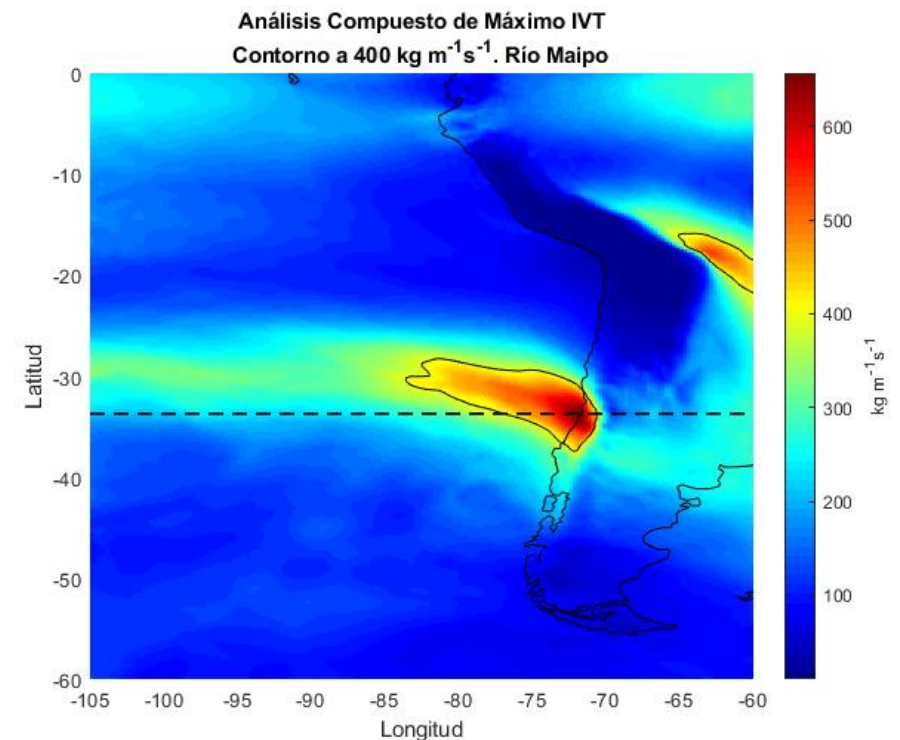
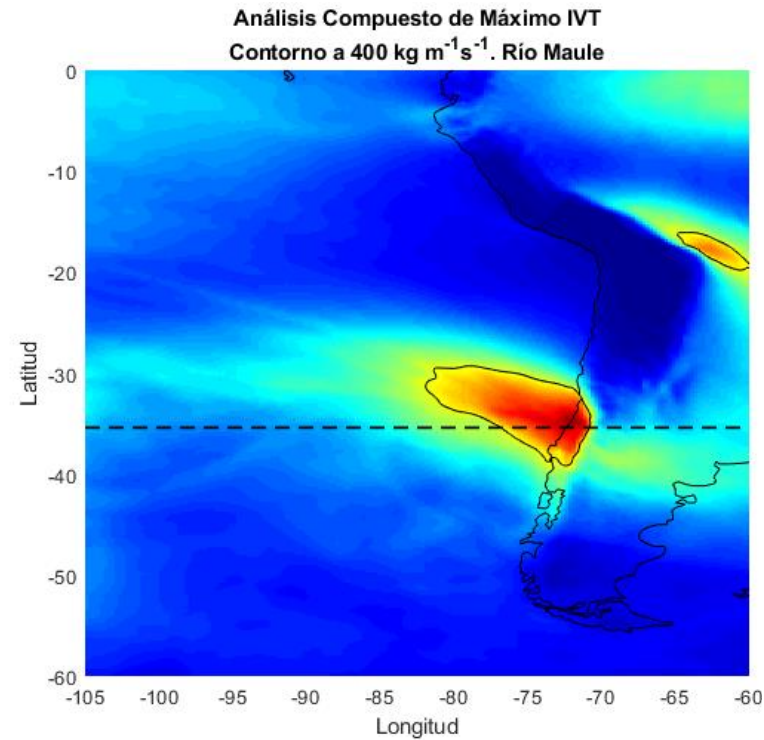
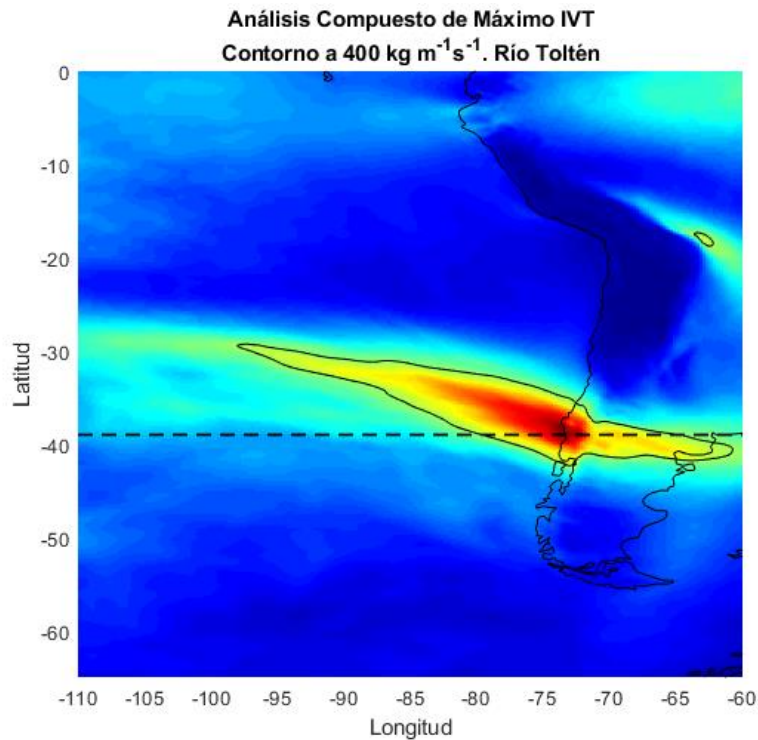


Atmospheric Rivers Contribution to the Snow Accumulation Over the Southern Andes (26.5° S–37.5° S)

Felipe Saavedra^{1*}, Gonzalo Cortés², Maximiliano Viale³, Steven Margulis⁴ and James McPhee^{1,5}

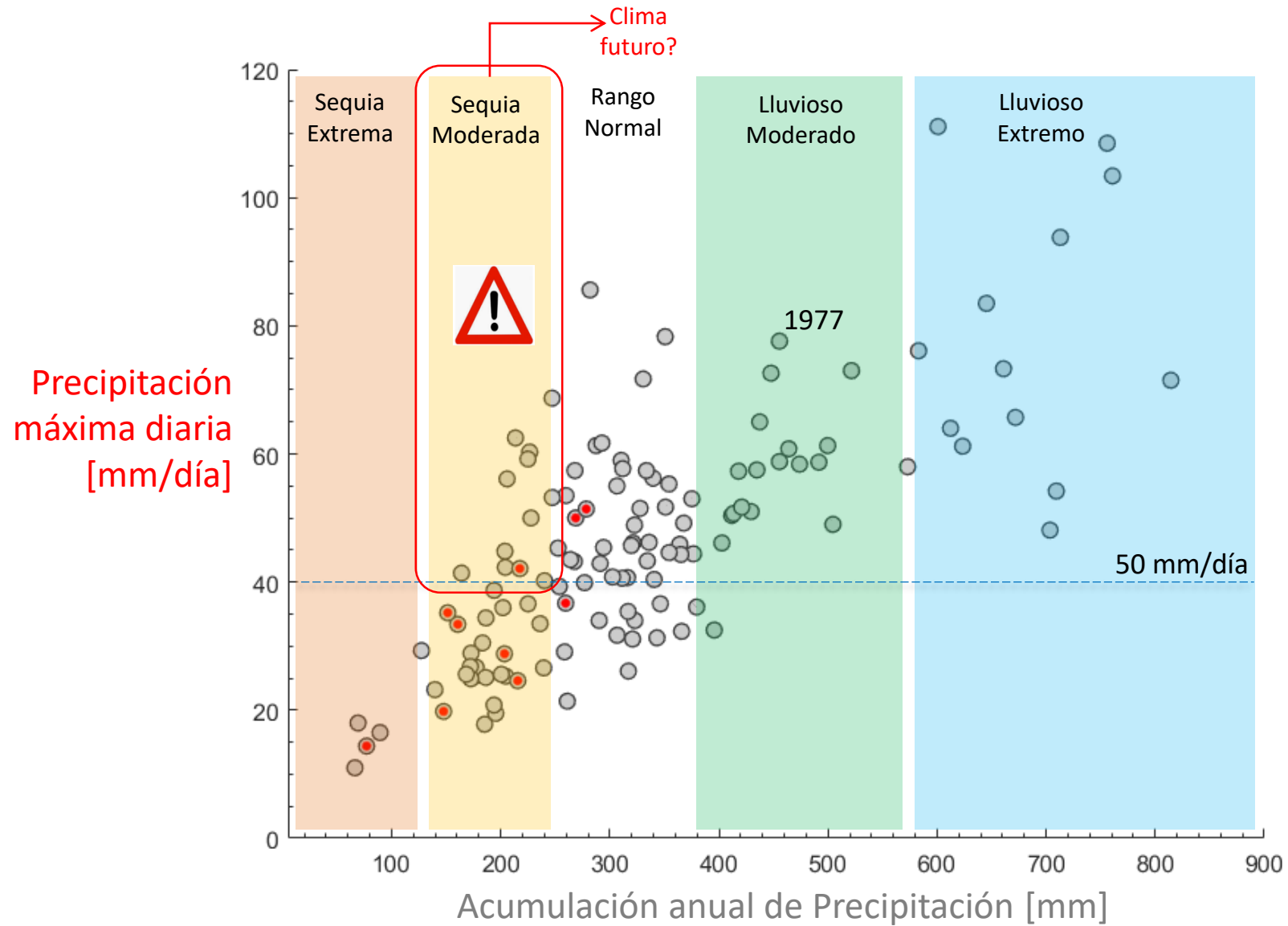
Patrones sinópticos asociados a crecidas máximas anuales

En cada caso cuenca bajo un fuerte RA y sector cálido del frente frío



$$\vec{\text{IVT}} = \frac{1}{g} \int_{p_{\text{sfc}}}^{100\text{hPa}} q \vec{\nabla} dp$$

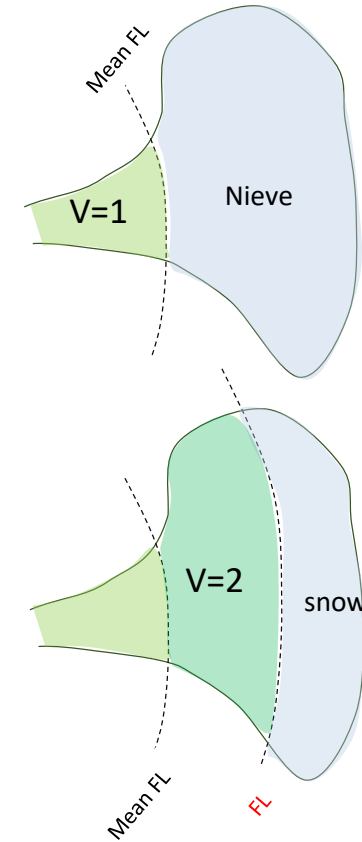
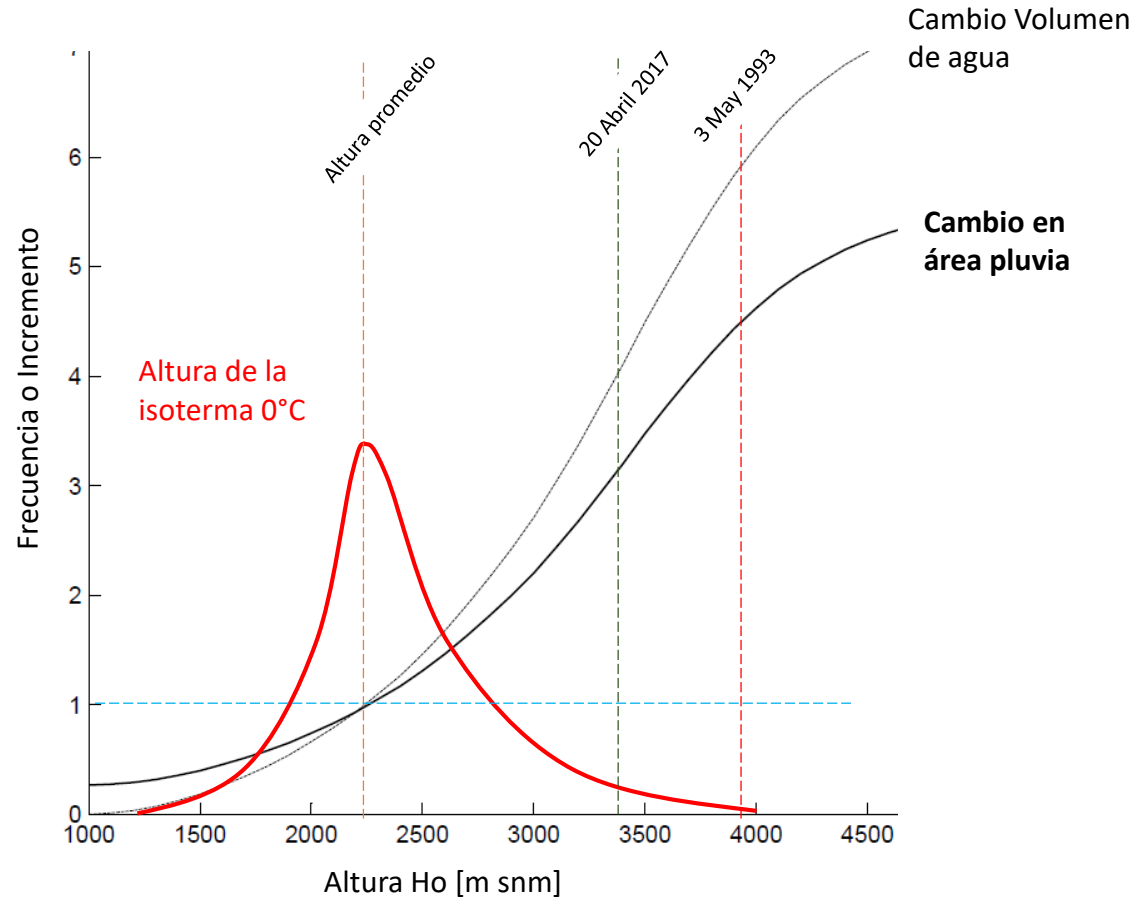
Estación Quinta Normal – Santiago (DMC) 1893-2019





En las tormentas en Chile central la temperatura (isoterma 0°C) juega un rol muy importante

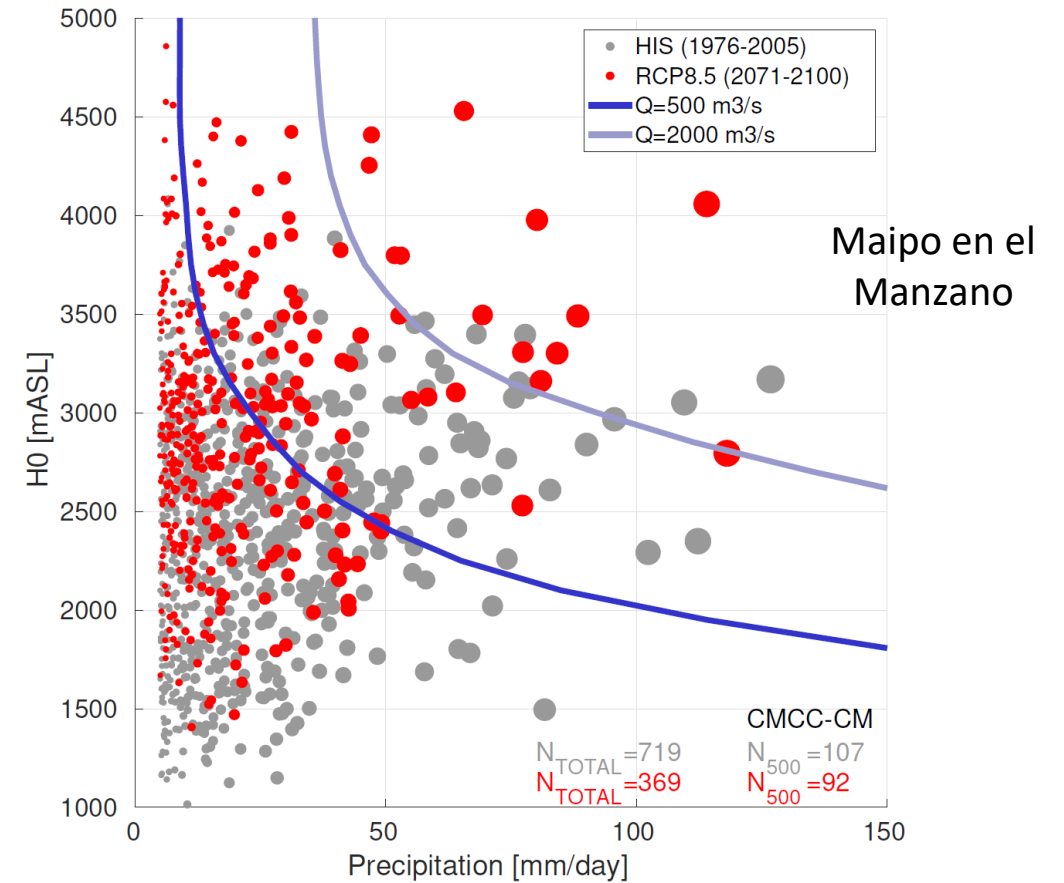
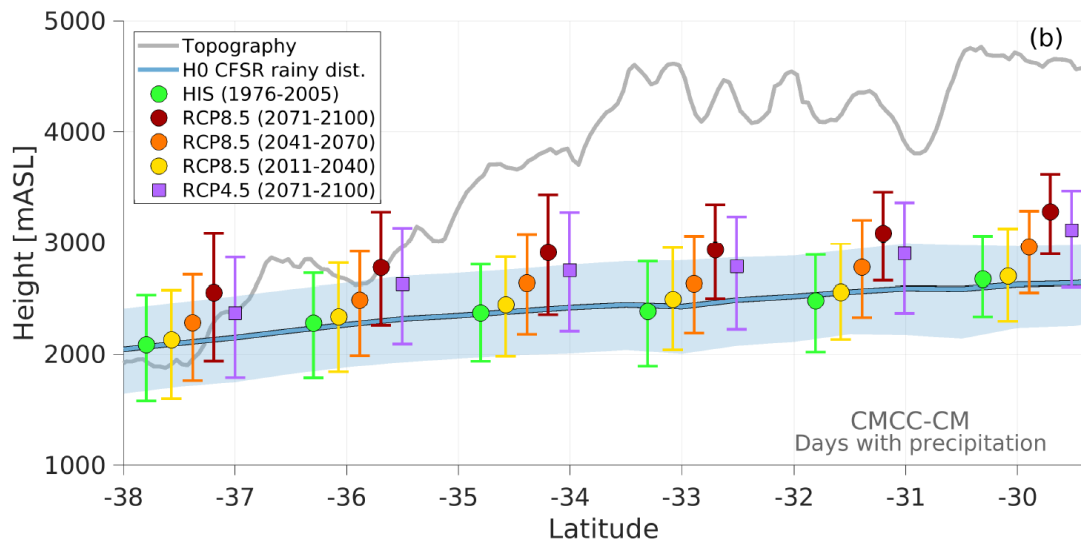
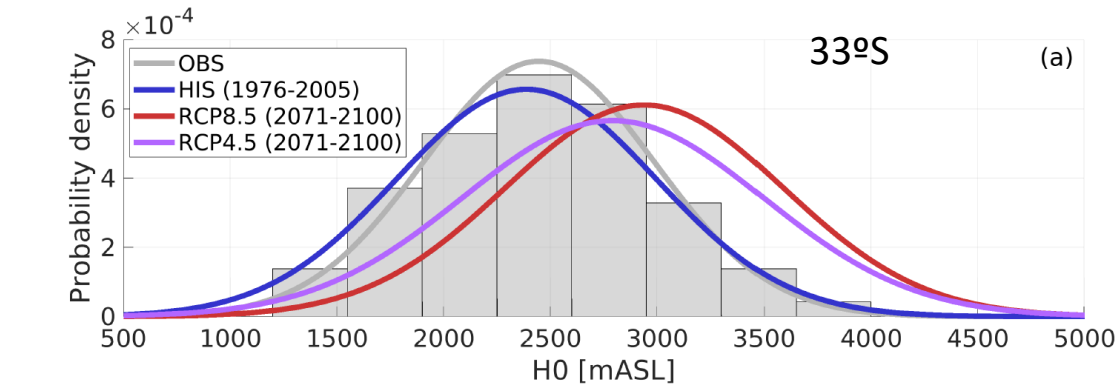
Cuenca del río Maipo en el Manzano



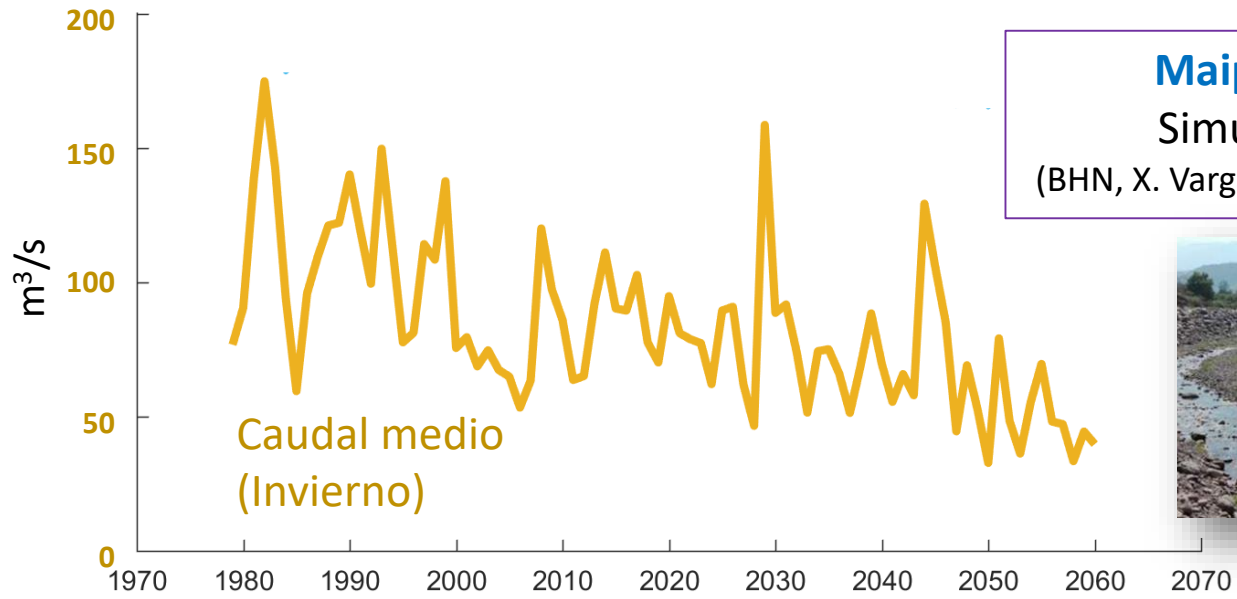
Están cambiando las tormentas?



Proyección de H0 en tormentas del futuro e impacto hidrológico (primera aproximación)



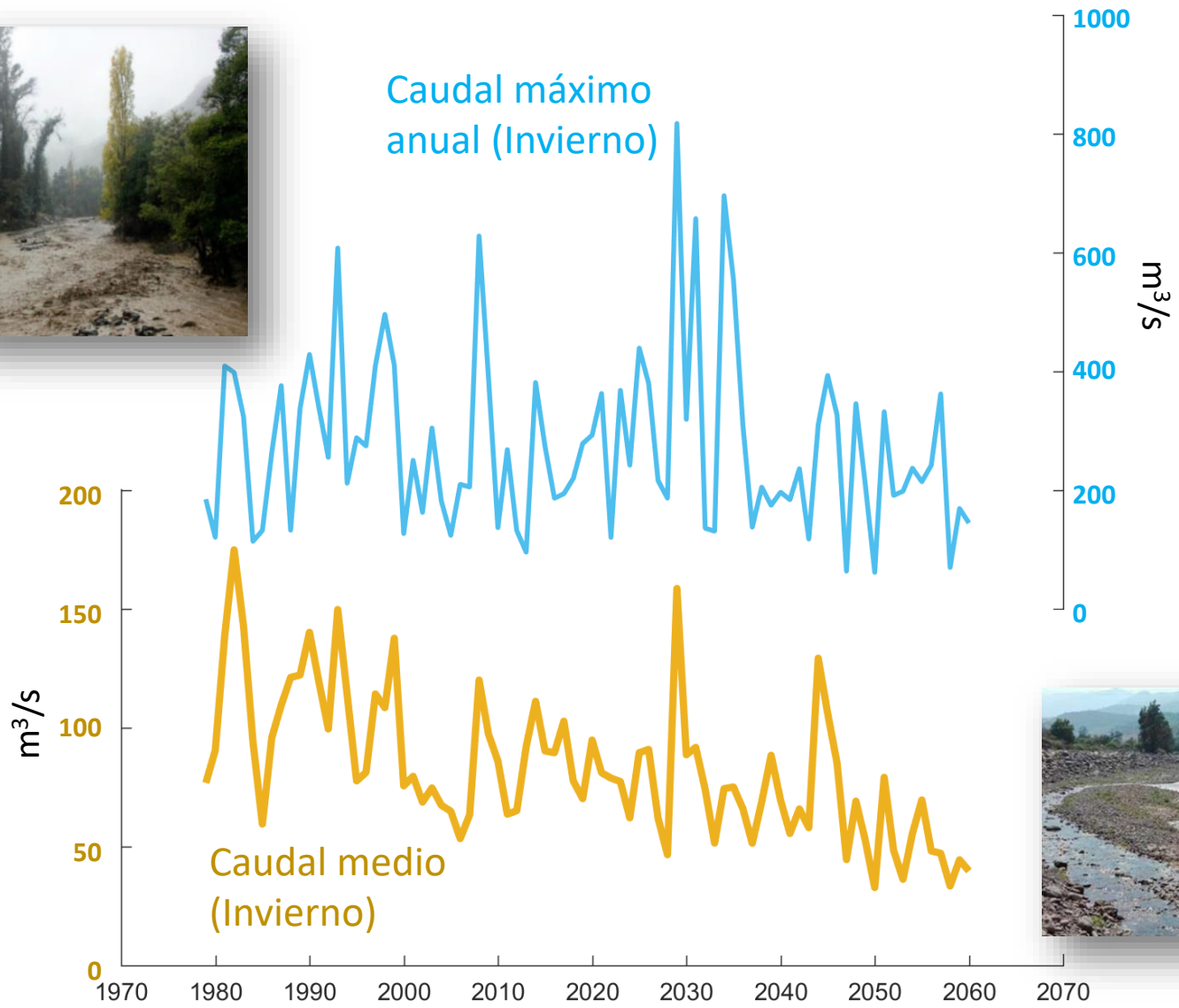
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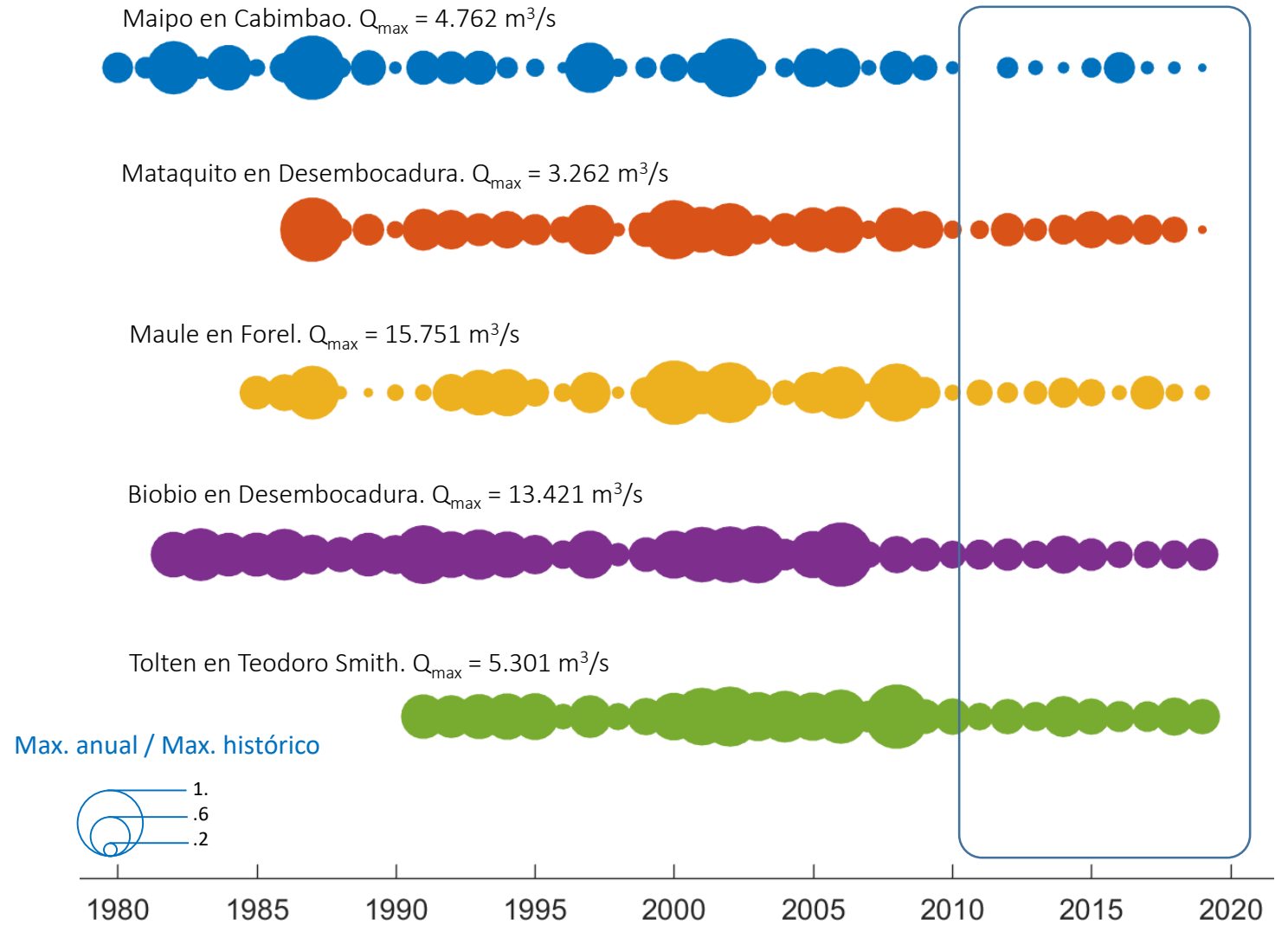


Y como viene la mano?



Perdimos los Gigantes

Por ahora....

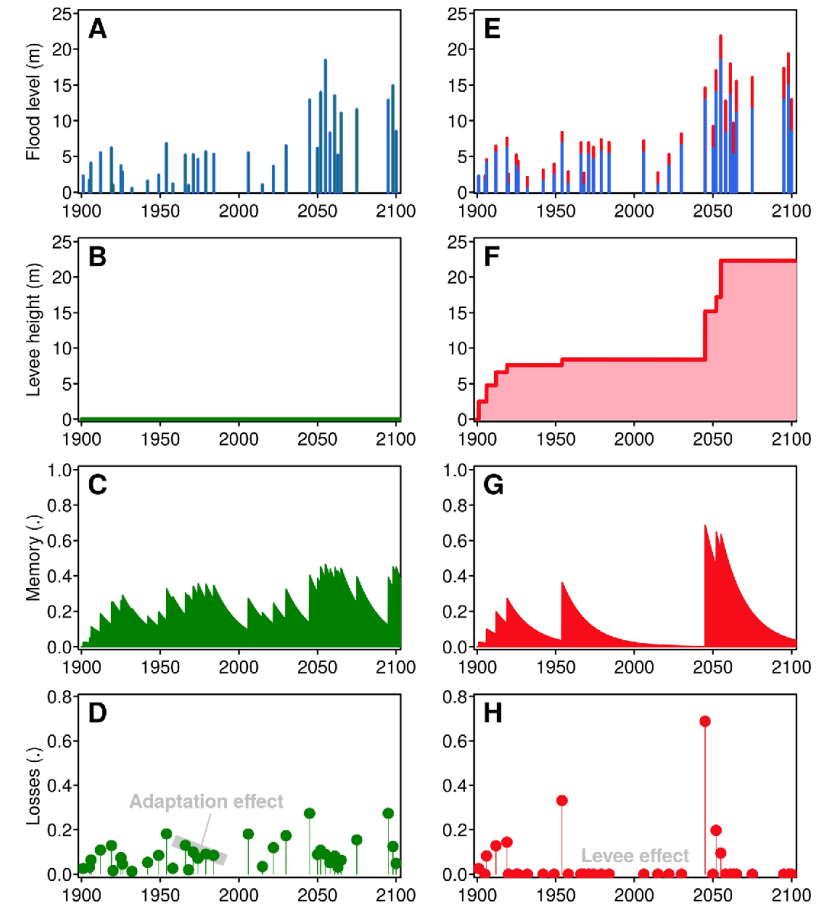
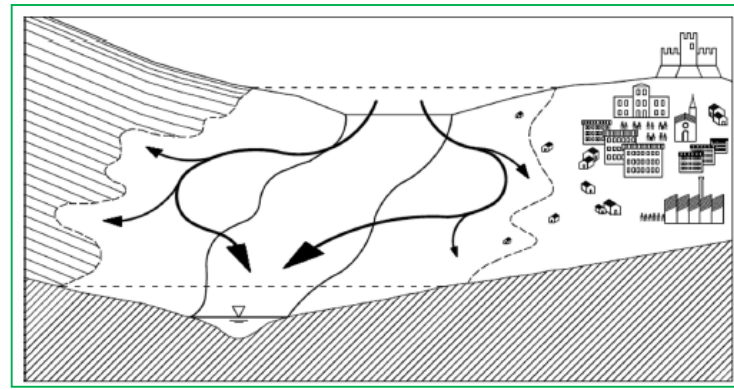
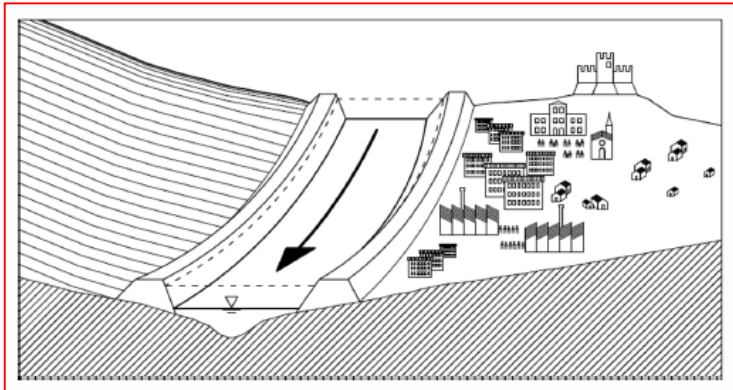


Perdimos los Gigantes Por ahora....

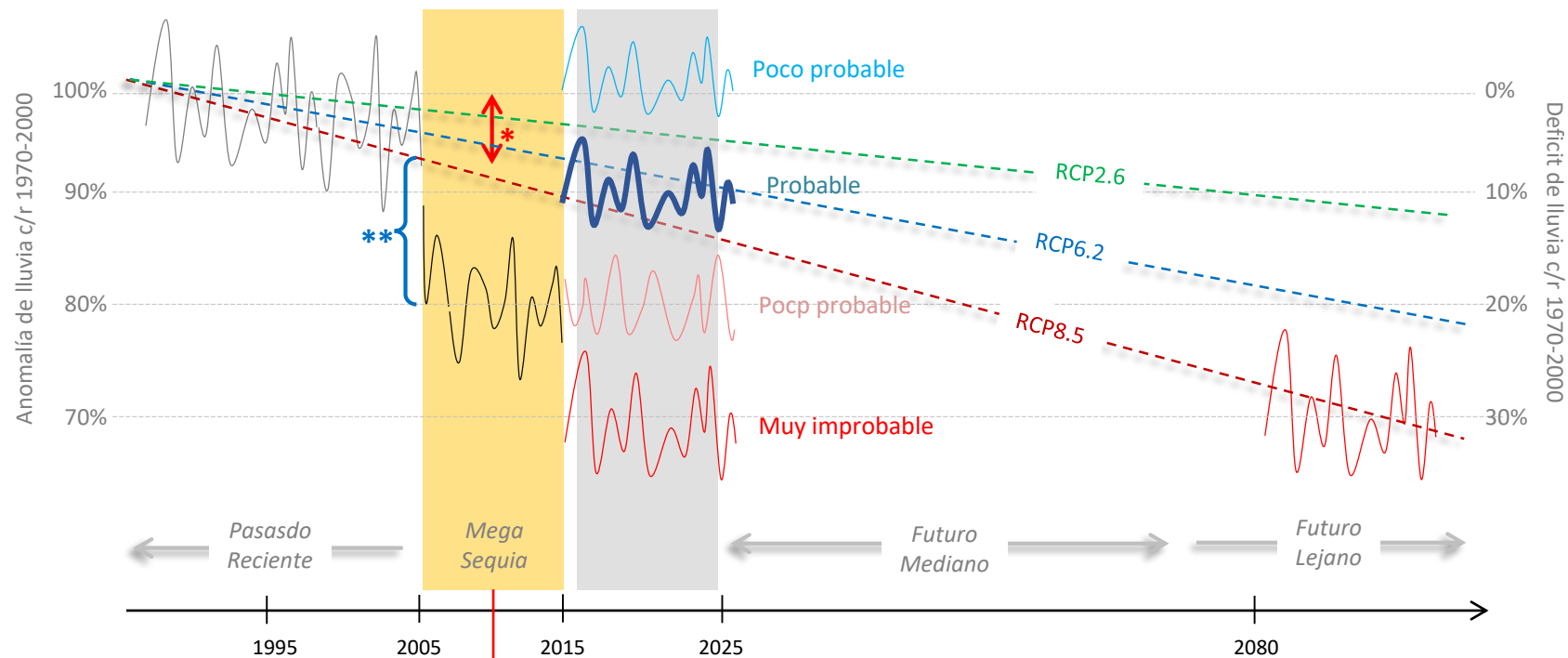
Efecto “represa” y Socio-hidrología

Debates—Perspectives on socio-hydrology: Capturing feedbacks between physical and social processes

Giuliano Di Baldassarre¹, Alberto Viglione², Gemma Carr³, Linda Kuil³, Kun Yan⁴,
Luigia Brandimarte^{1,4}, and Günter Blösch^{2,3}



La Mega Sequía en Chile central Llego el futuro? Aun no....



Causas de la Mega Sequía

(*) Antropogenica

(**) Natural (ENSO, PDO, Internal)