

GEOESTUDIOS



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Geología

FACULTAD DE CIENCIAS
FÍSICAS Y MATEMÁTICAS
UNIVERSIDAD DE CHILE

The January 2021 Zonal Atmospheric River in central Chile: A non-fatal disaster

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**AGU FALL
MEETING**

Preface



Maipo river (-33.58/-70.45) 796 m a.s.l. 24th June 2020

Preface



Maipo river (-33.58/-70.45) 796 m a.s.l. 30th January 2021

The last ZAR

- 25-26th February 2017
- 0° isotherm over 4500 m a.s.l.
- 22.8 mm of rainfall. Intensity up to 5.7 mm/hr
- 8 fatalities because of landslides



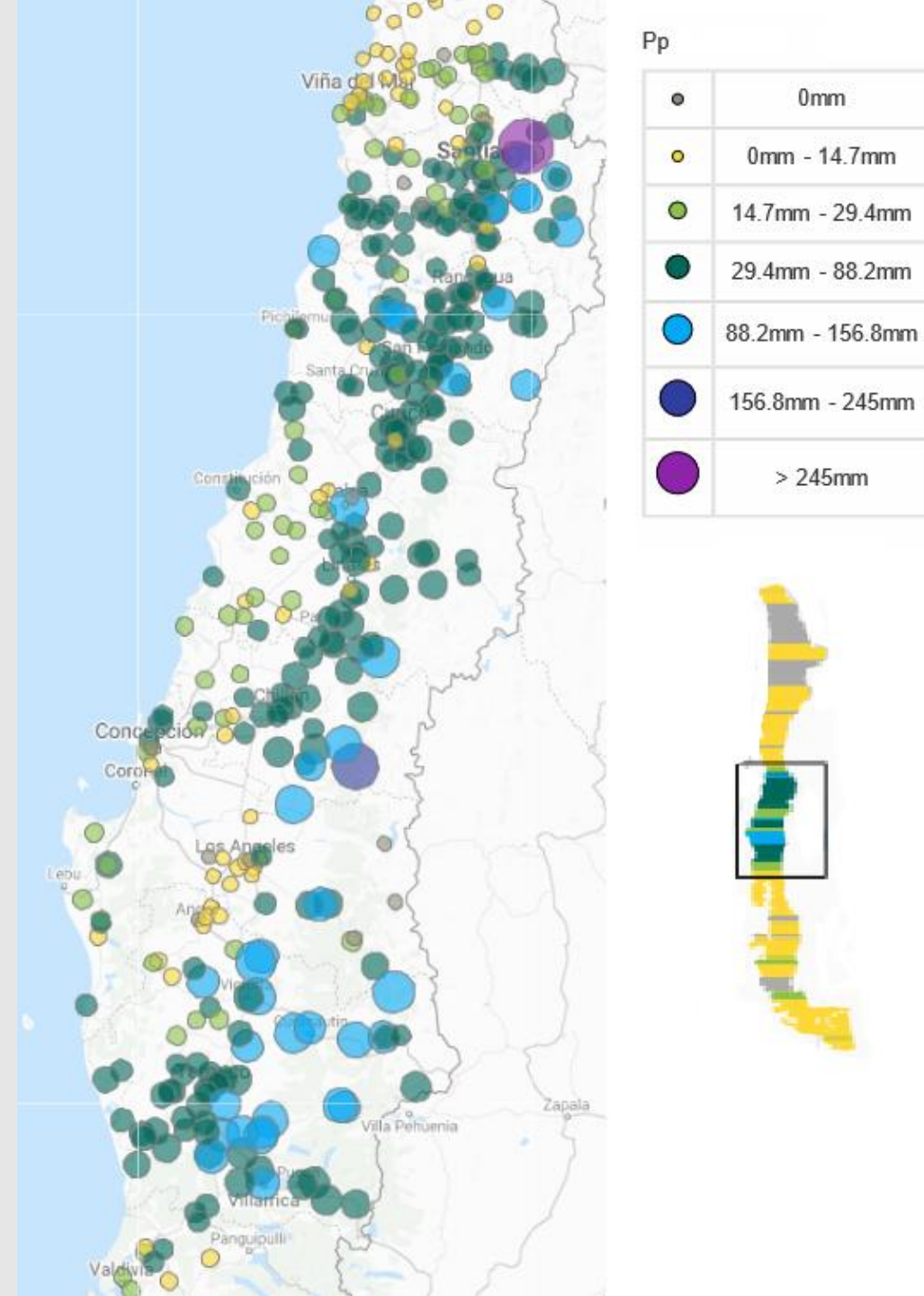
<http://www.soychile.cl/Santiago/Sociedad/2017/02/26/448970/Mas-de-mil-aislados-y-siete-desaparecidos-tras-alud-en-San-Jose-de-Maipo.aspx>

The event

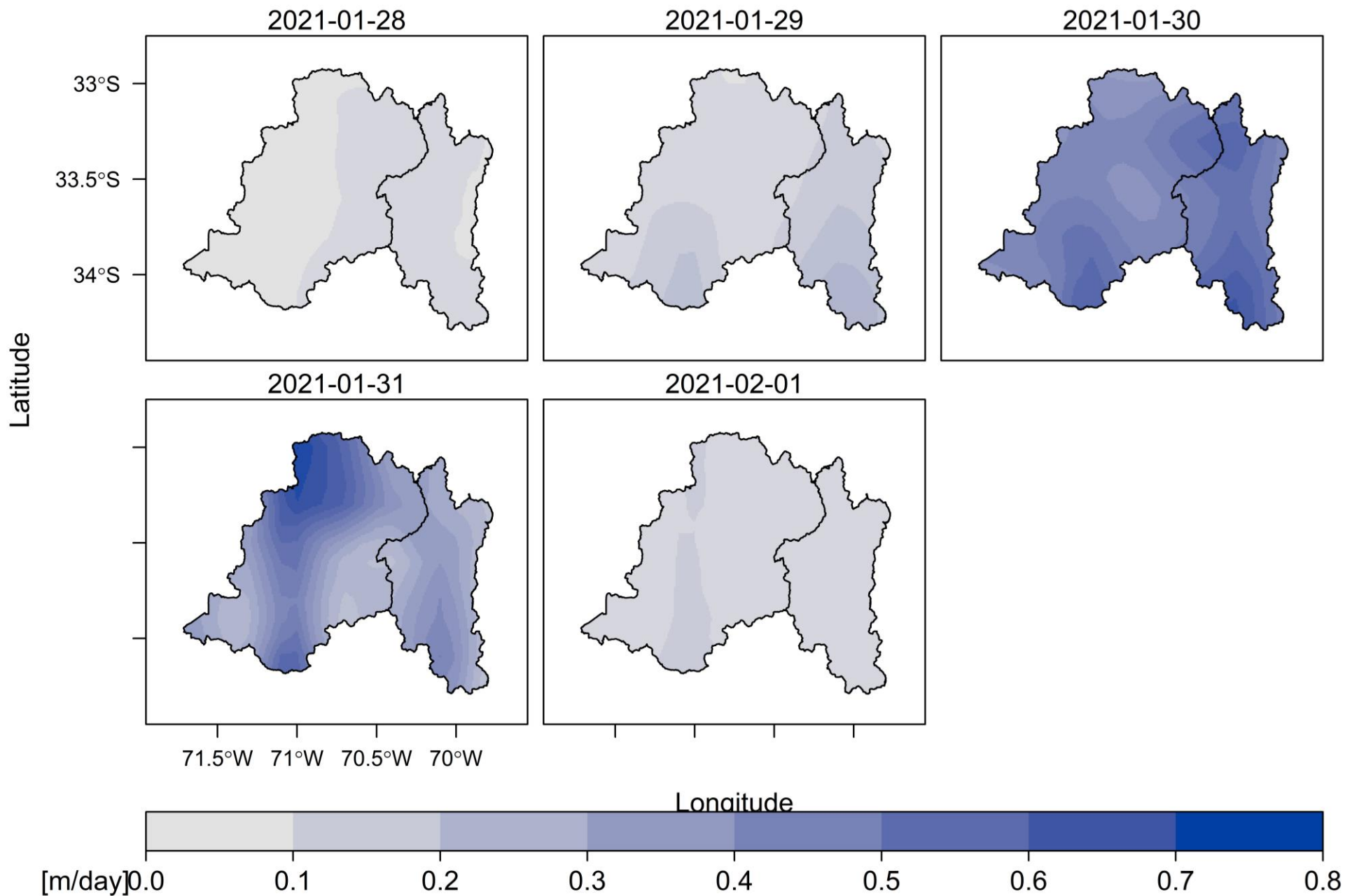


General overview

- ZAR on 28th-31st Jan. 2021
- Latitudinal range: -32° to -40°
- 0° isotherm: ~ 3700 m a.s.l.
- Cumulated Pp values over 120 mm

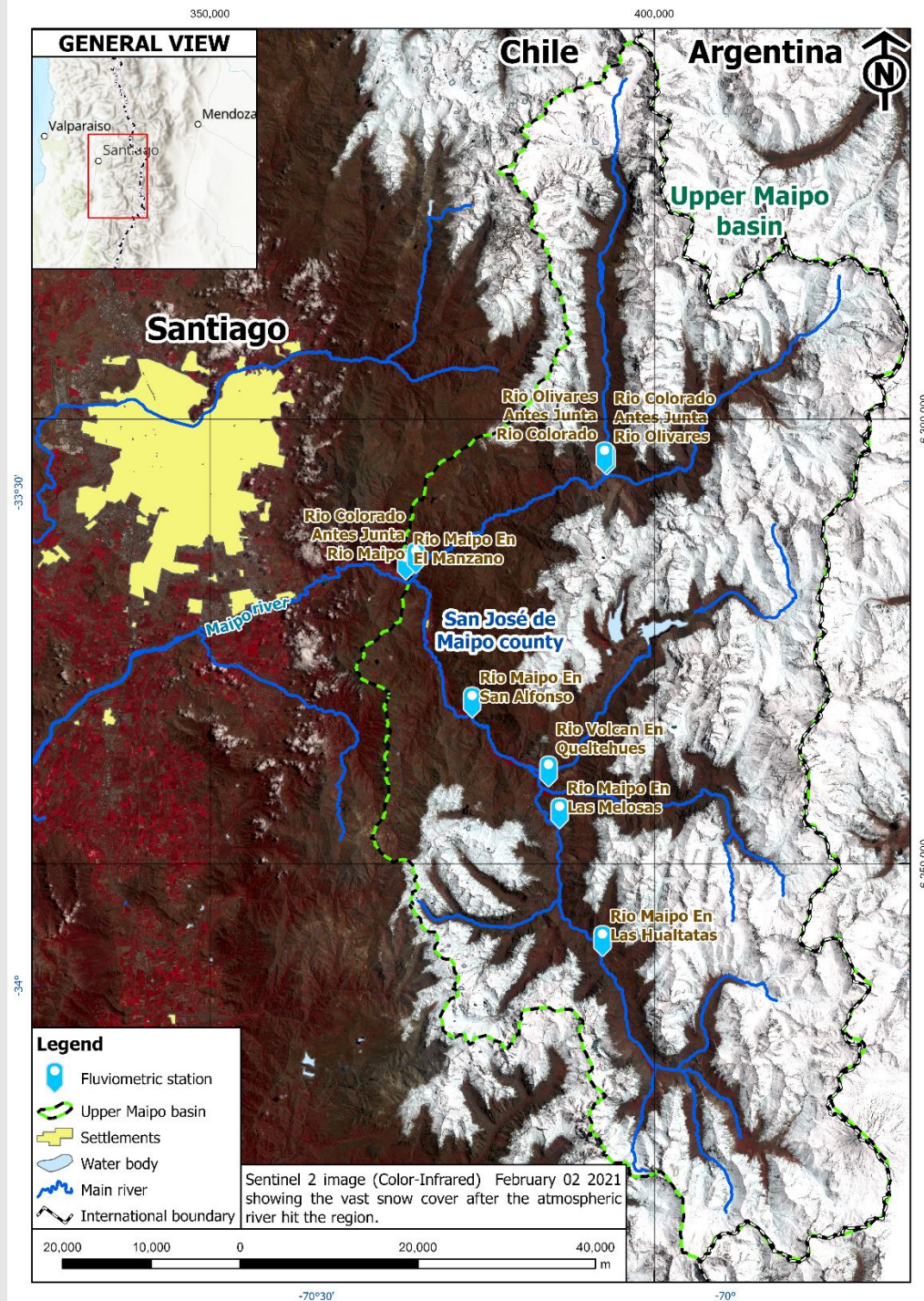


Daily precipitation

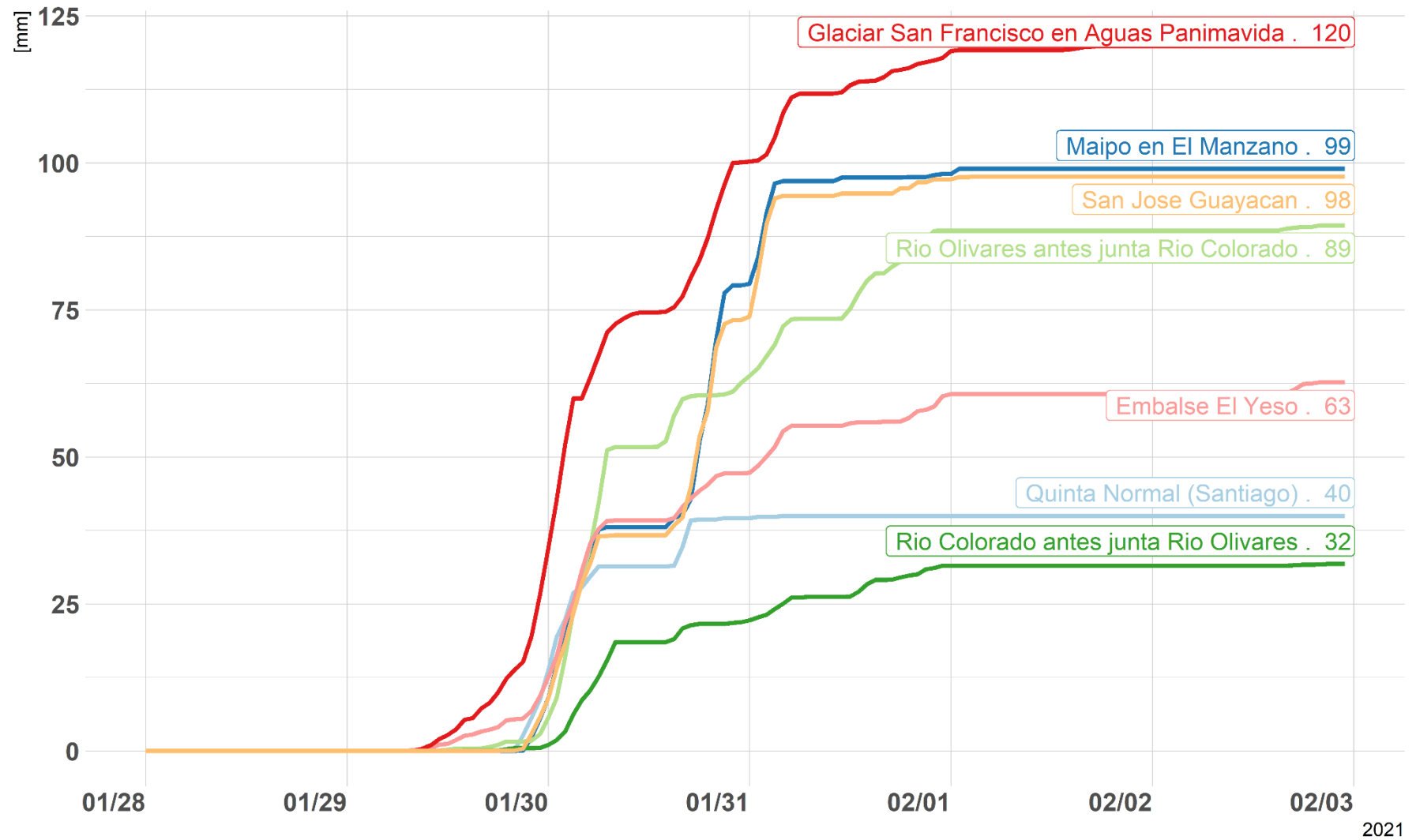


At a local scale:

- Heavy rainfall on 29th-31st Jan. 2021
- Snow line: 2800-3100 m a.s.l.
- Over 60 mm of precipitation
- Local maximum of 117 mm
- 60% of the basin was covered with snow in summer!!!

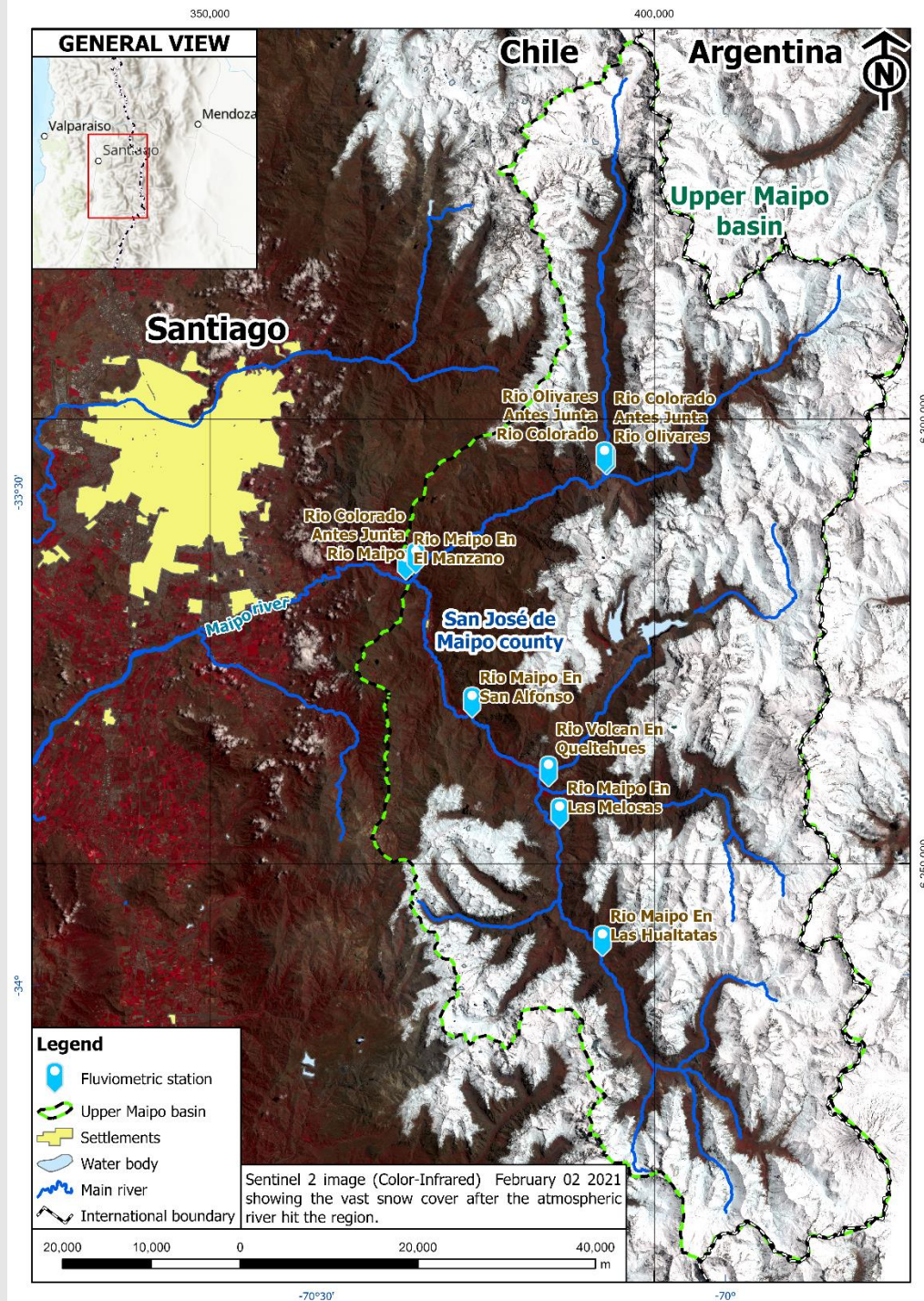


Accumulative precipitation

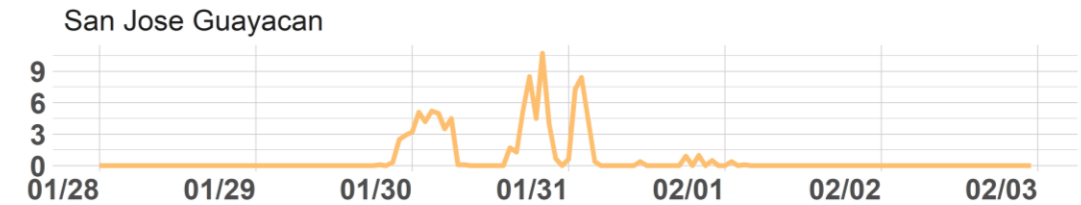
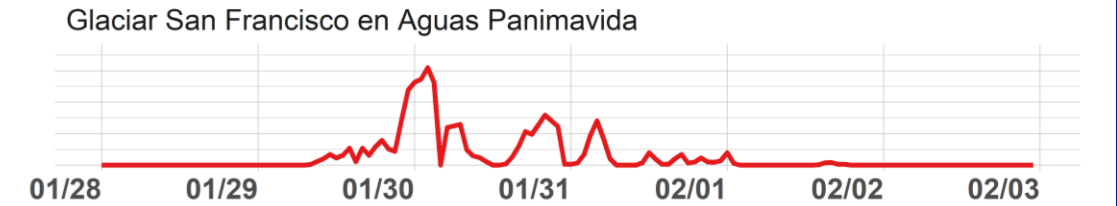
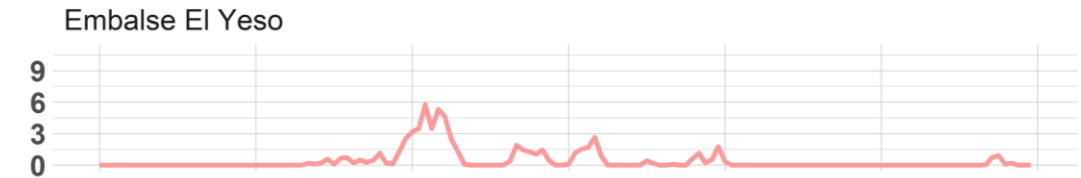
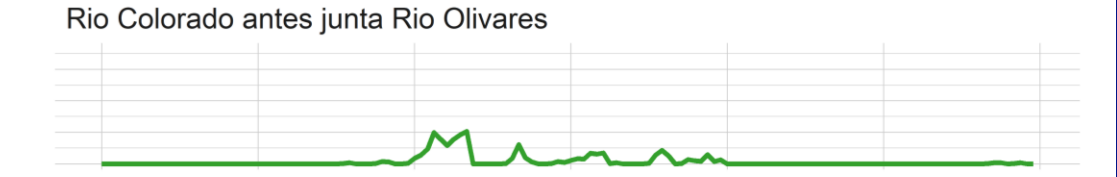
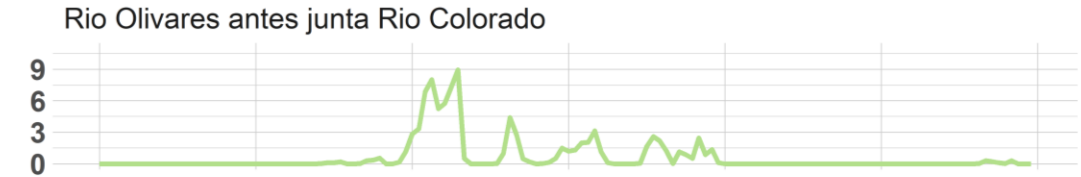
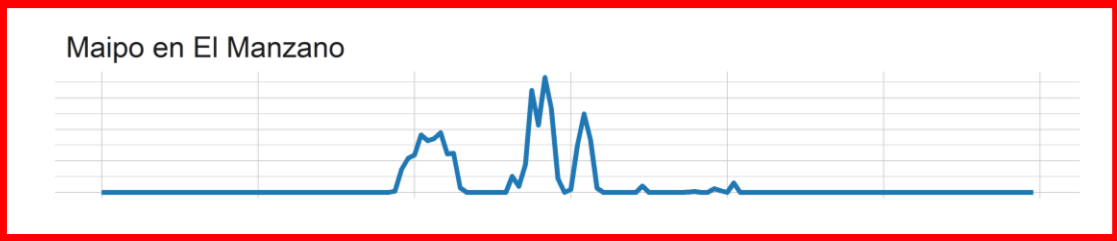
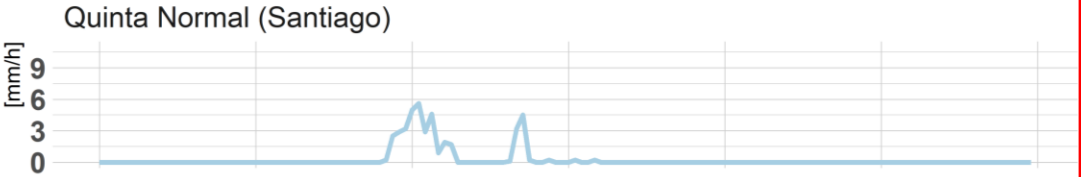


At a detailed scale

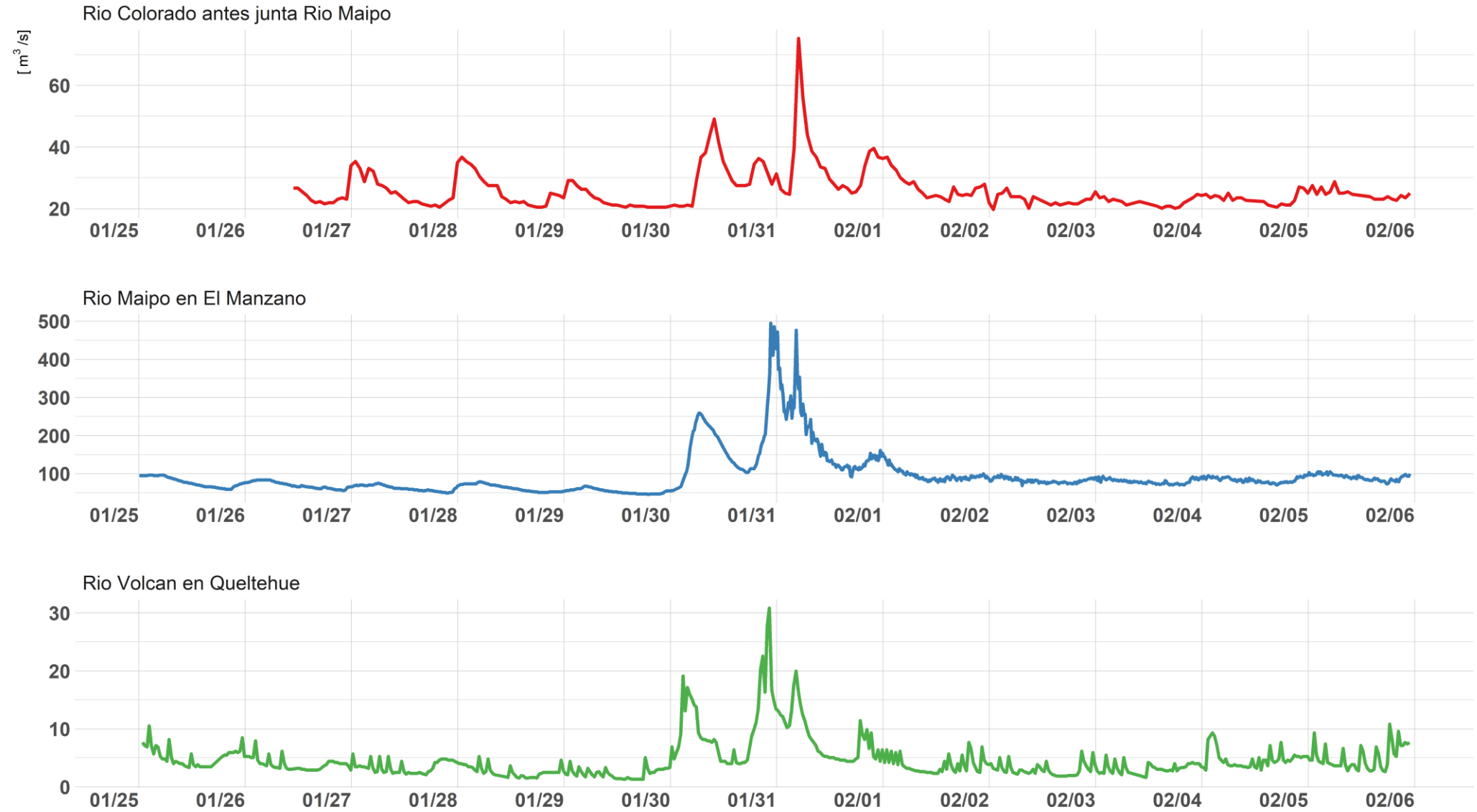
- 3 pulses accounted
- Maximum intensity of 11 mm/h
- Pre-event flow increased 8 times
- Increased turbidity of Maipo river after snow melted



Hourly precipitation



Runoff



2021

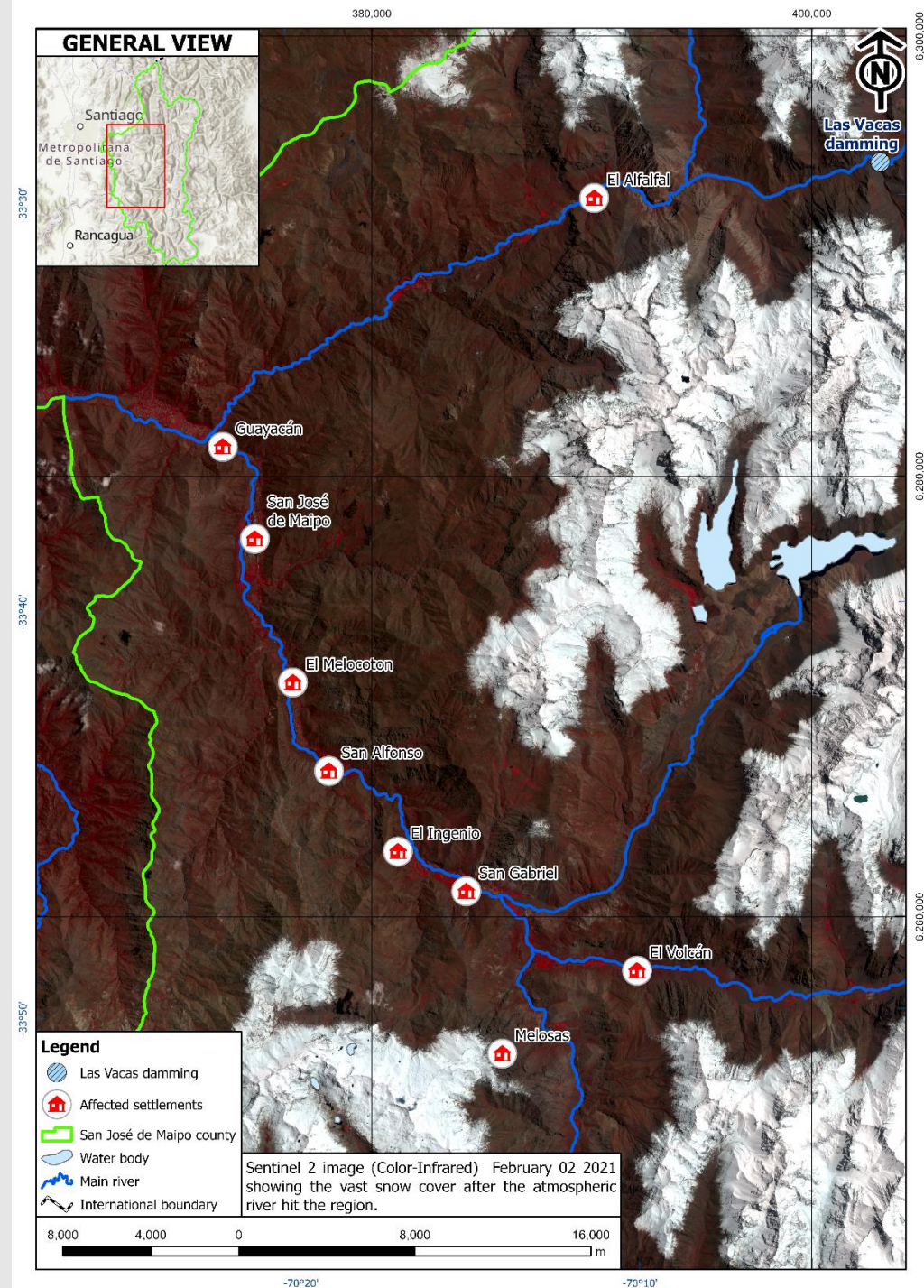
Landslides



Upper Maipo (-33.83/-70.05) 2132 m a.s.l. 1st May 2021

Landslides

- Over 120 landslides triggered
- Mostly debris flows.
- ~700 persons affected
- Hundreds of damaged homes
- 33 houses destroyed





<https://www.adnradio.cl/nacional/2021/02/01/cajon-del-maipo-asi-amanecio-san-alfonso-tras-aluvion-por-intensas-lluvias.html>



<https://codexverde.cl/greenpeace-por-aluviones-en-cajon-del-maipo-santiago-no-esta-preparado-para-estas-contingencias/>



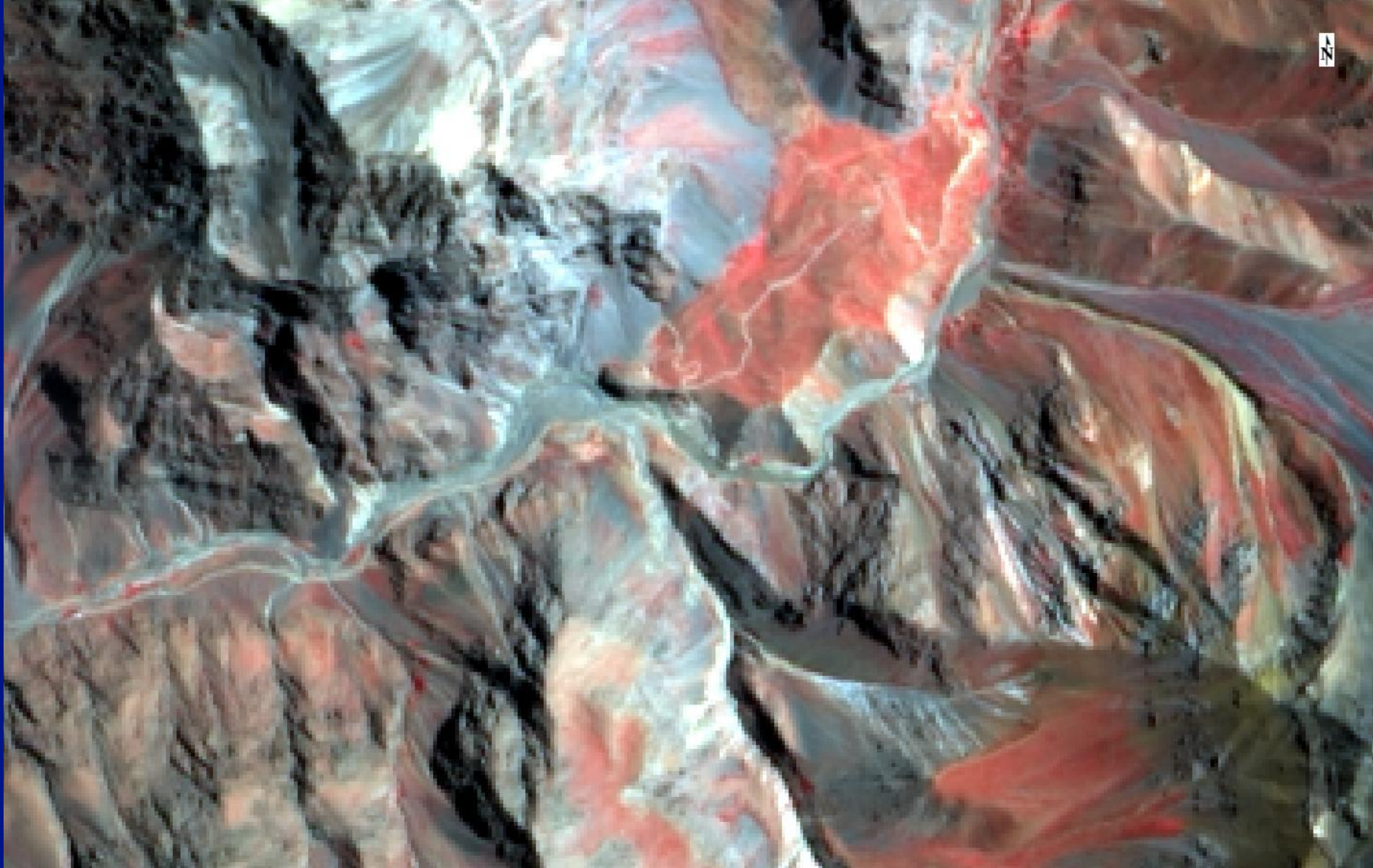
https://cooperativa.cl/noticias/pais/tiempo/san-jose-de-maipo-los-estragos-que-dejaron-los-aluviones-en-el-sector/2021-01-31/144348.html#gal_id&slide=foto_14

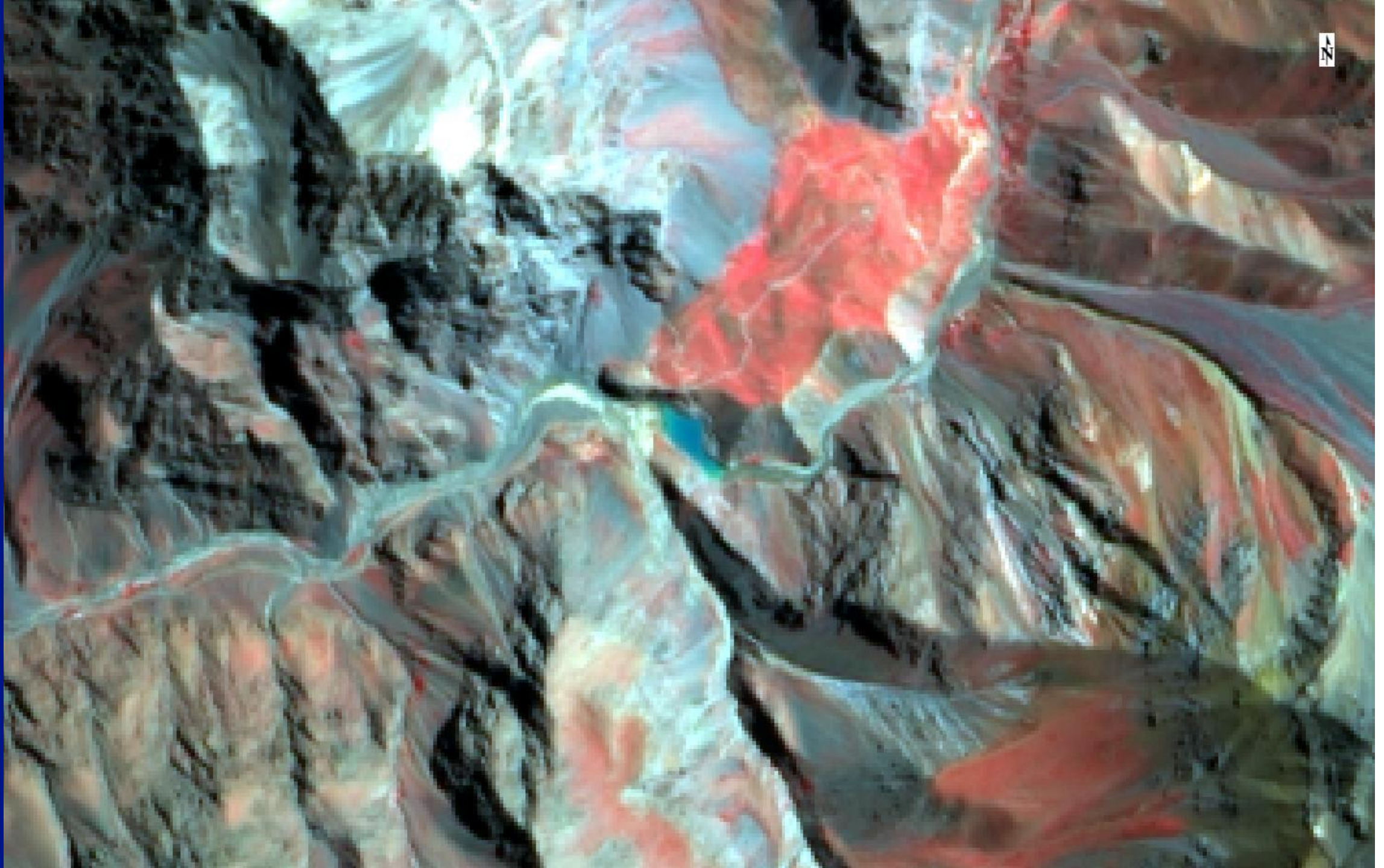


<https://www.adnradio.cl/nacional/2021/02/01/cajon-del-maipo-asi-amanecio-san-alfonso-tras-aluvion-por-intensas-lluvias.html>



Estero Las Vacas. SERNAGEOMIN (2021)



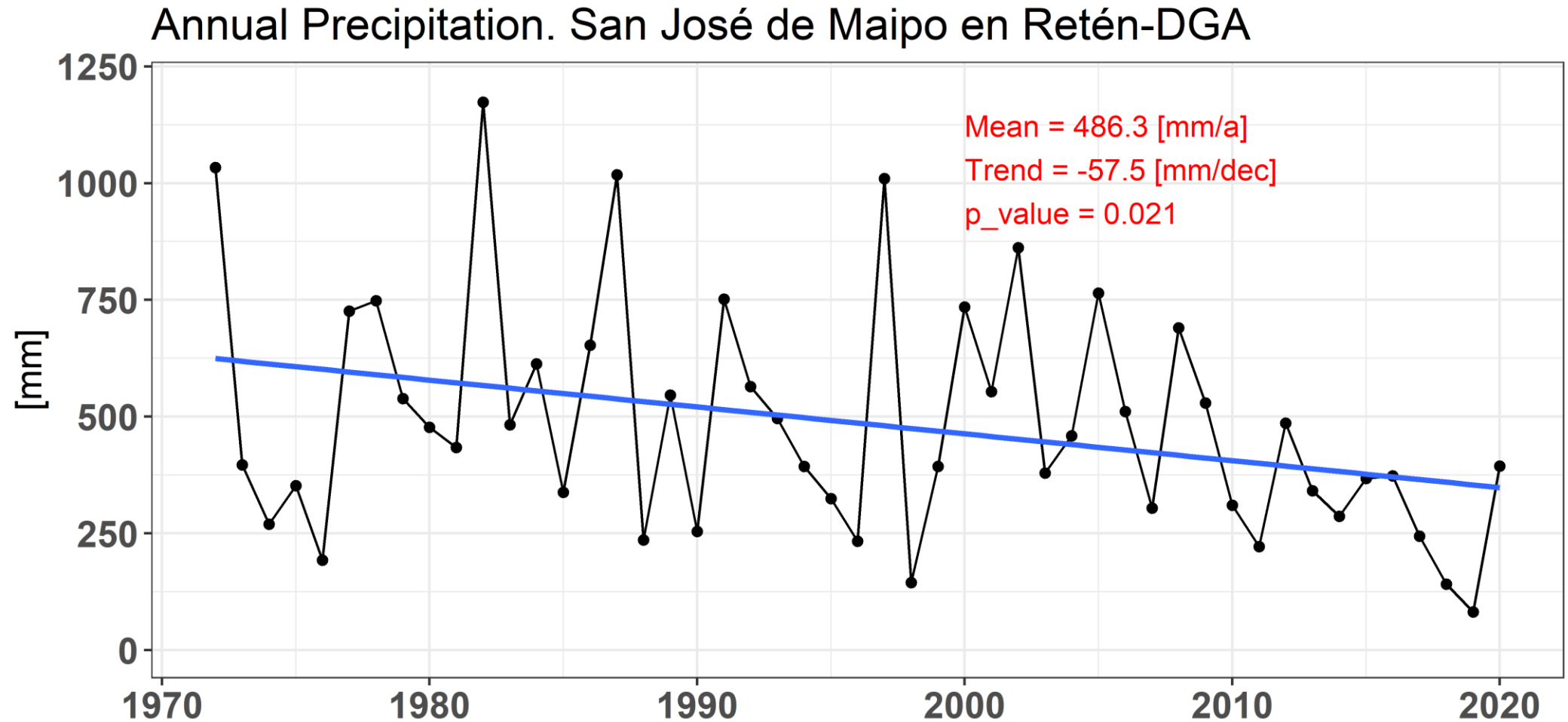


Final remarks



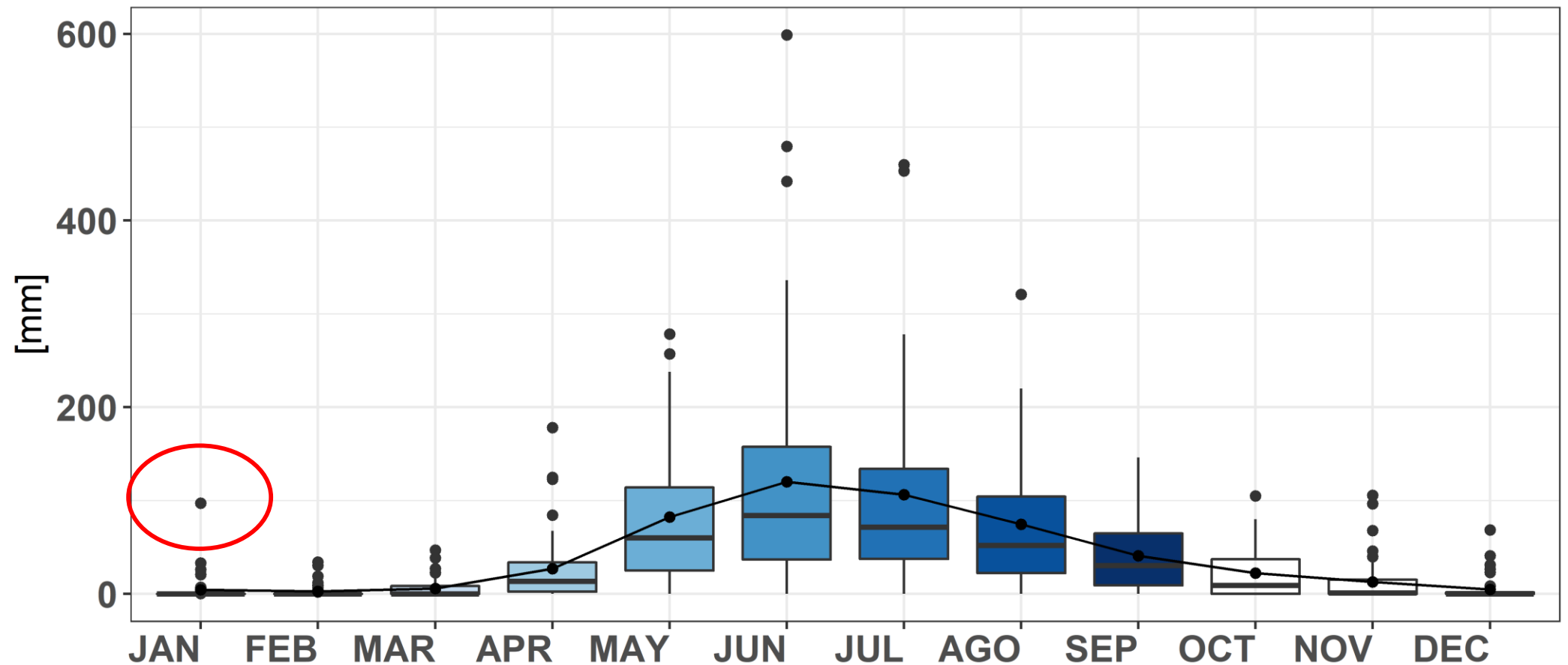
El Volcán (-33.82/-70.18) 1425 m a.s.l. 1st May 2021

Precipitation is decreasing



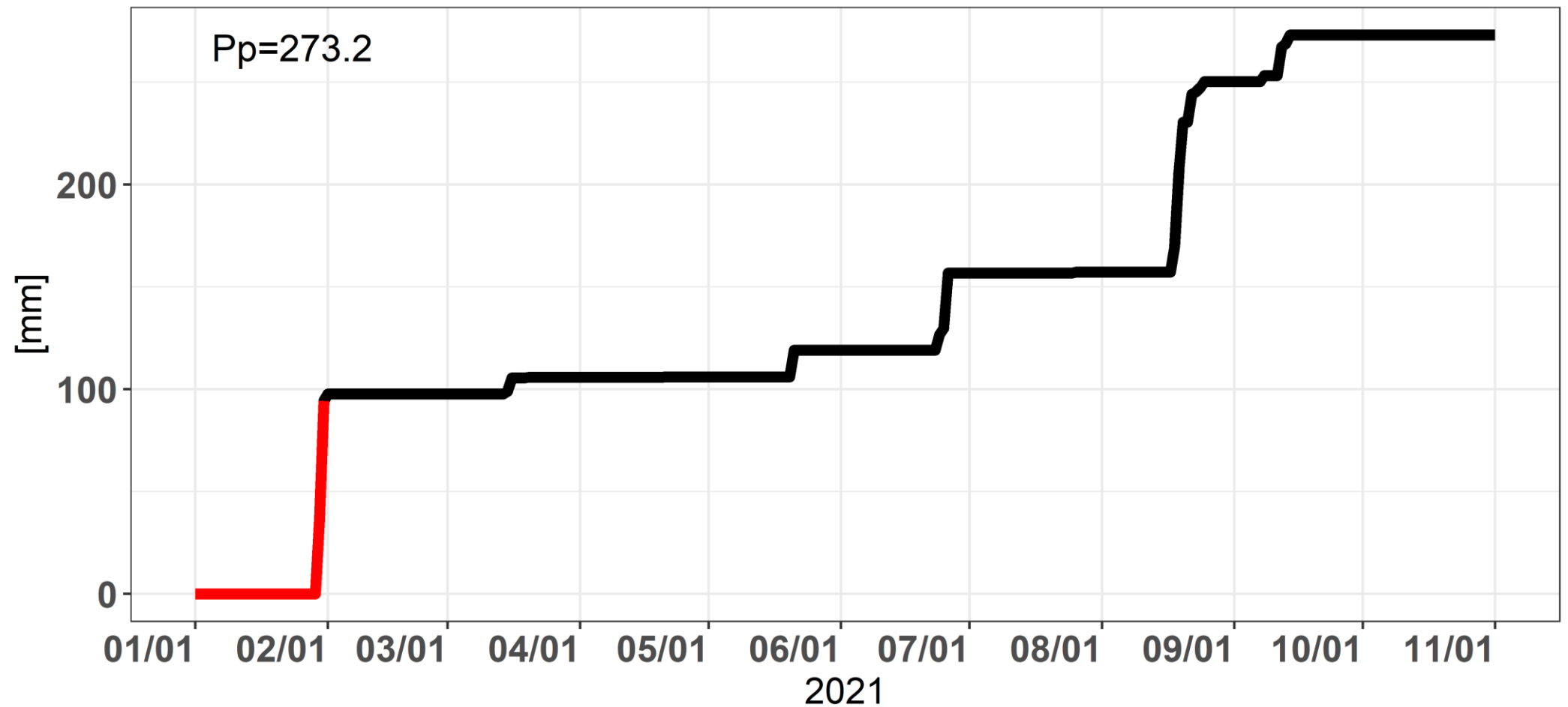
A regular summer: 1970-2020

Monthly precipitation. San José de Maipo en Retén-DGA



A substantial contribution

Accumulative precipitation 2021. San José Guayacán - DMC

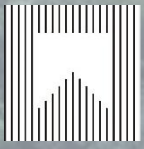


Lessons learned

- Accurately forecasted event
- Warning systems do work
- Need to reduce exposure: San José de Maipo, El Melocoton and San Alfonso

Final remarks

- Do we need more ZARs with less risk involved?
- Did COVID-19 help avoiding any casualties?
- Are we prepared for the next ZAR?



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