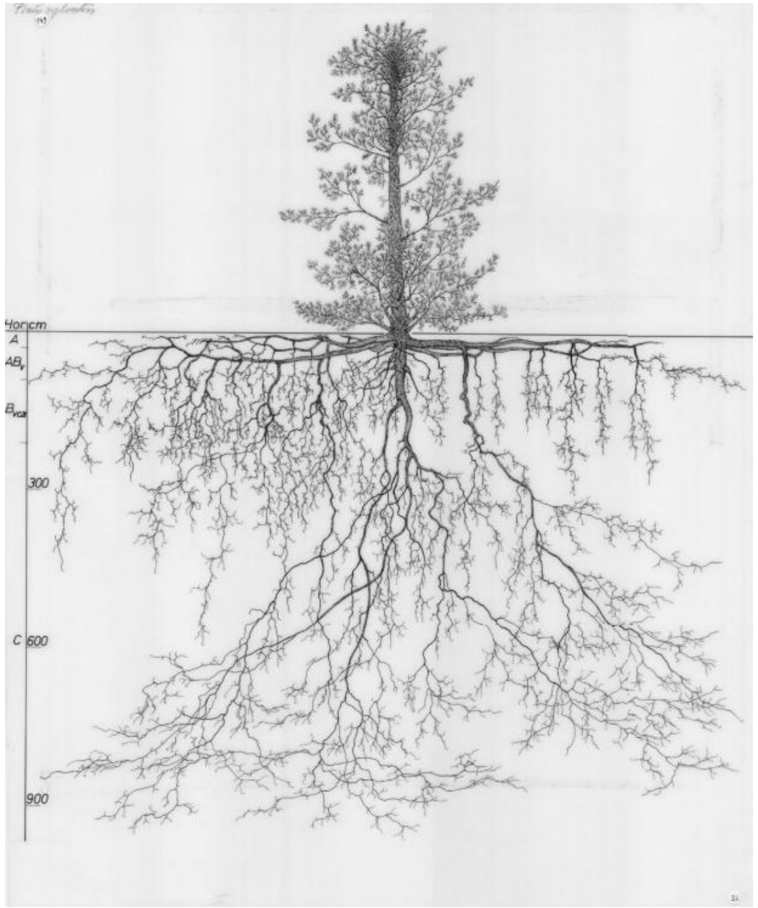


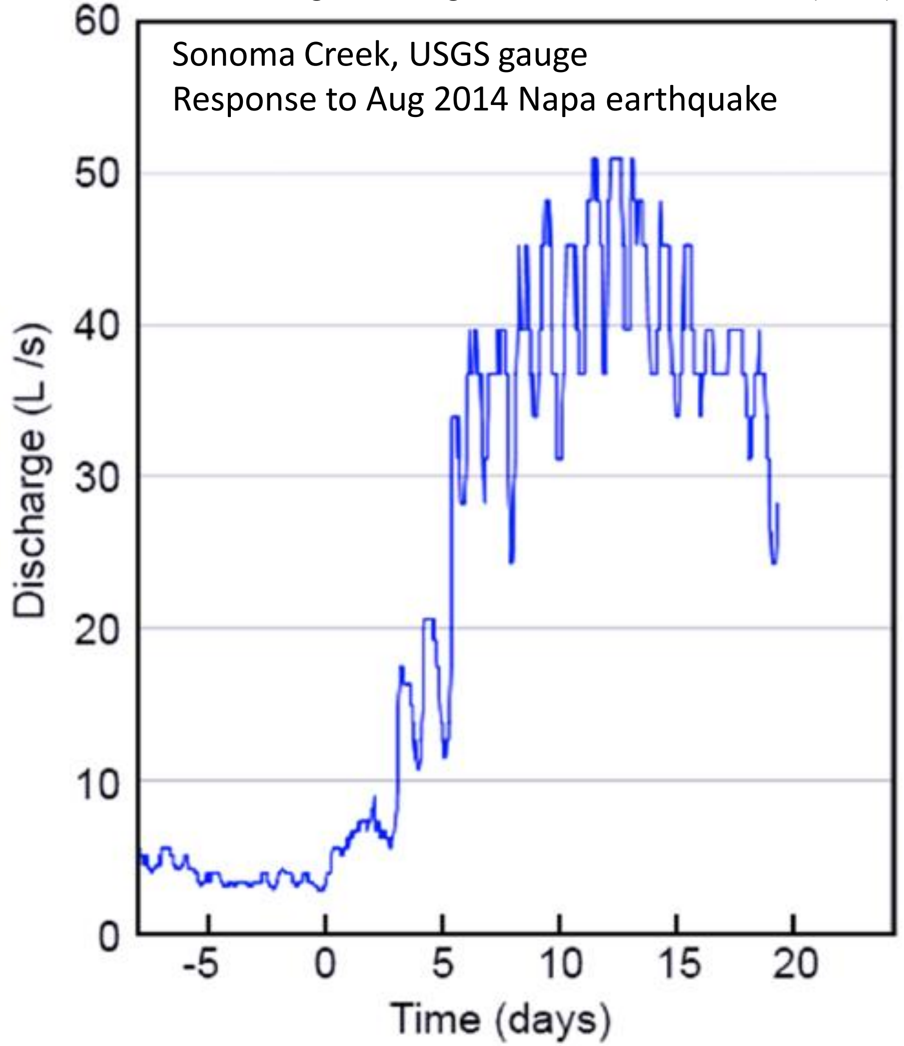
Trees talk tremor – Wood anatomy and $\delta^{13}C$ reveal contrasting tree-growth responses to earthquakes

Michael Manga and Christian Mohr
UC Berkeley, University of Potsdam

with Oliver Korup (UP), Gerhard Helle (GFZ), Ingo Heinrich (DAI), Laura Giese (BfG)

One common hydrological response to earthquakes is an increase in stream discharge

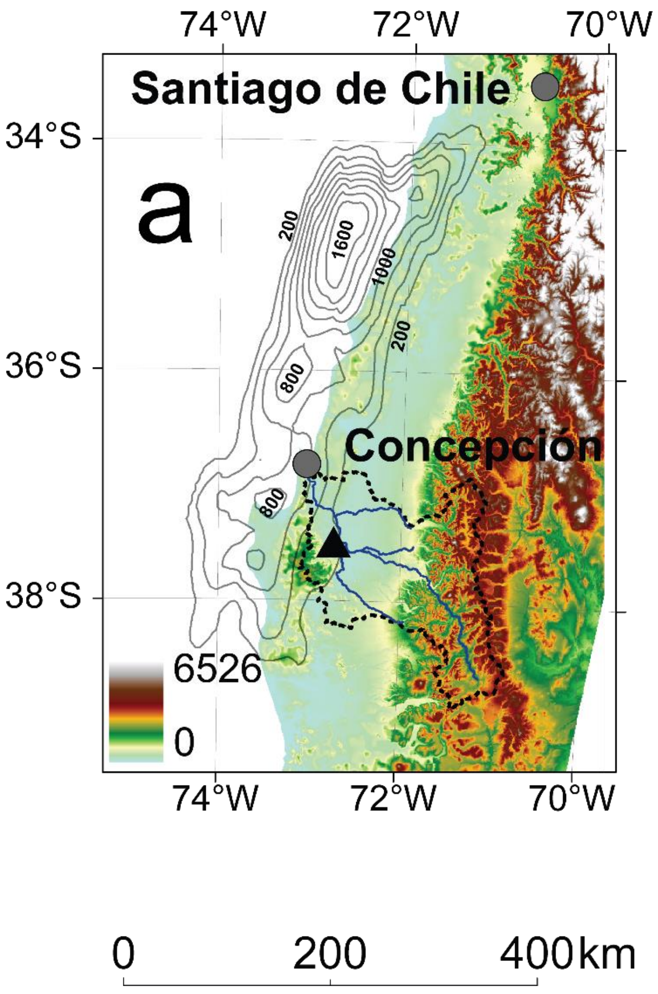
Wang and Manga, *Nature Communications* (2016)

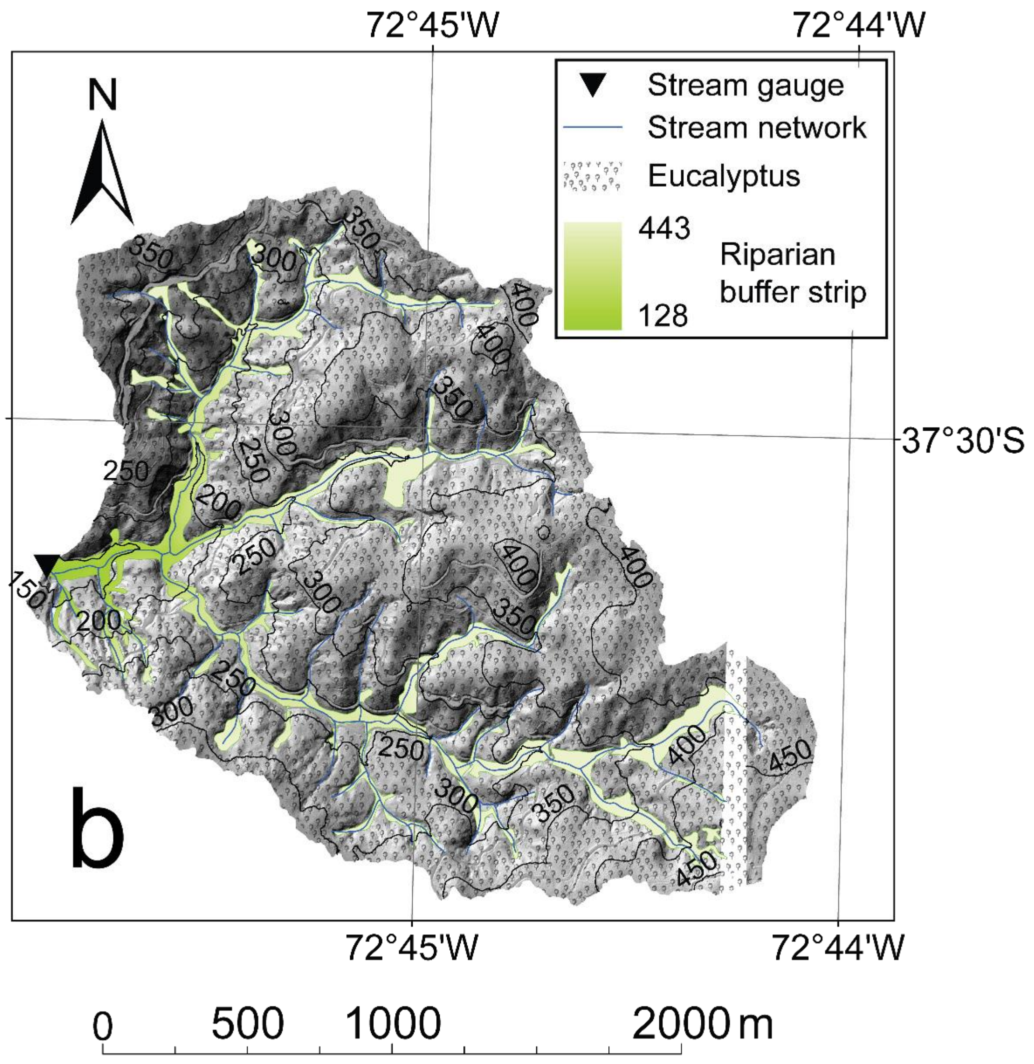


Response can be explained by increased permeability

Are these hydrological responses recorded in tree rings?

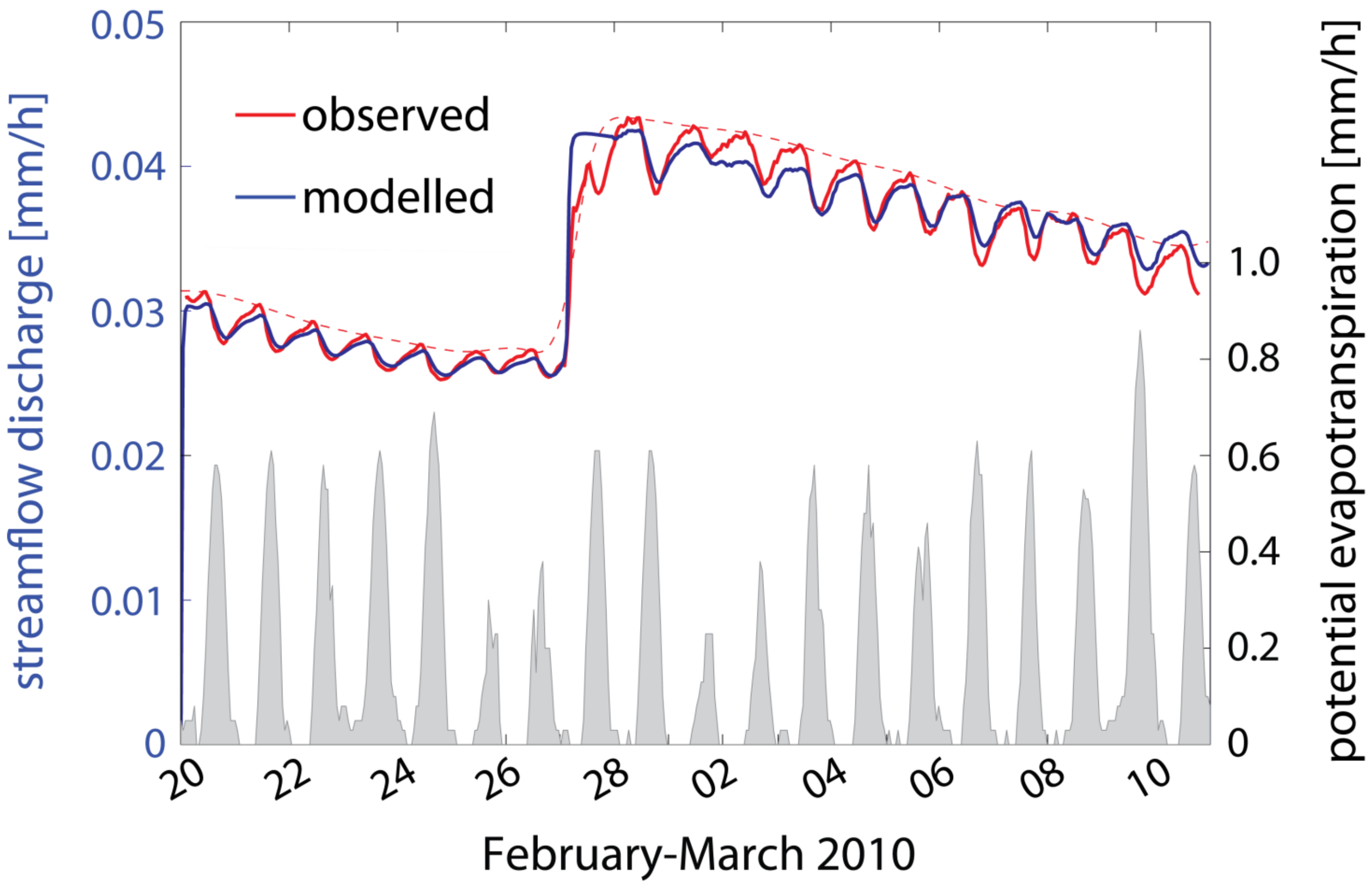
Case study: responses to M8.8 2010 Maule event

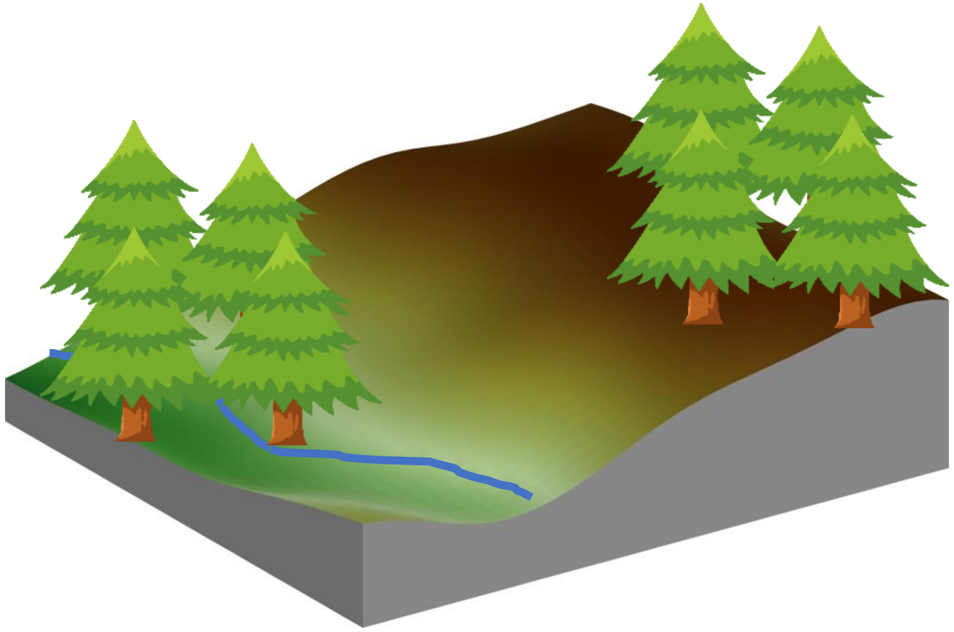




Case study: responses to M8.8 2010 Maule event

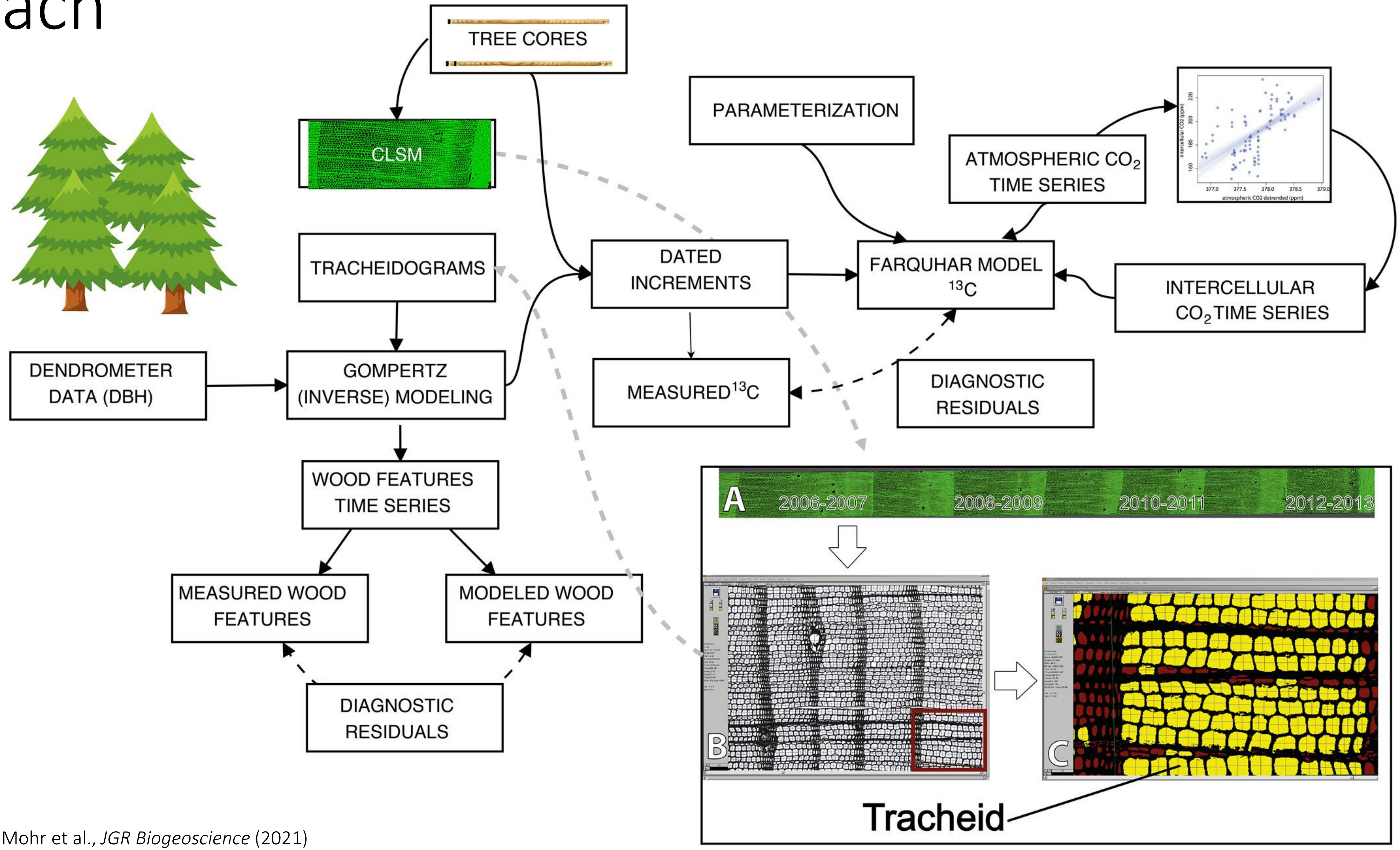
Mohr et al., *Geology* (2015)





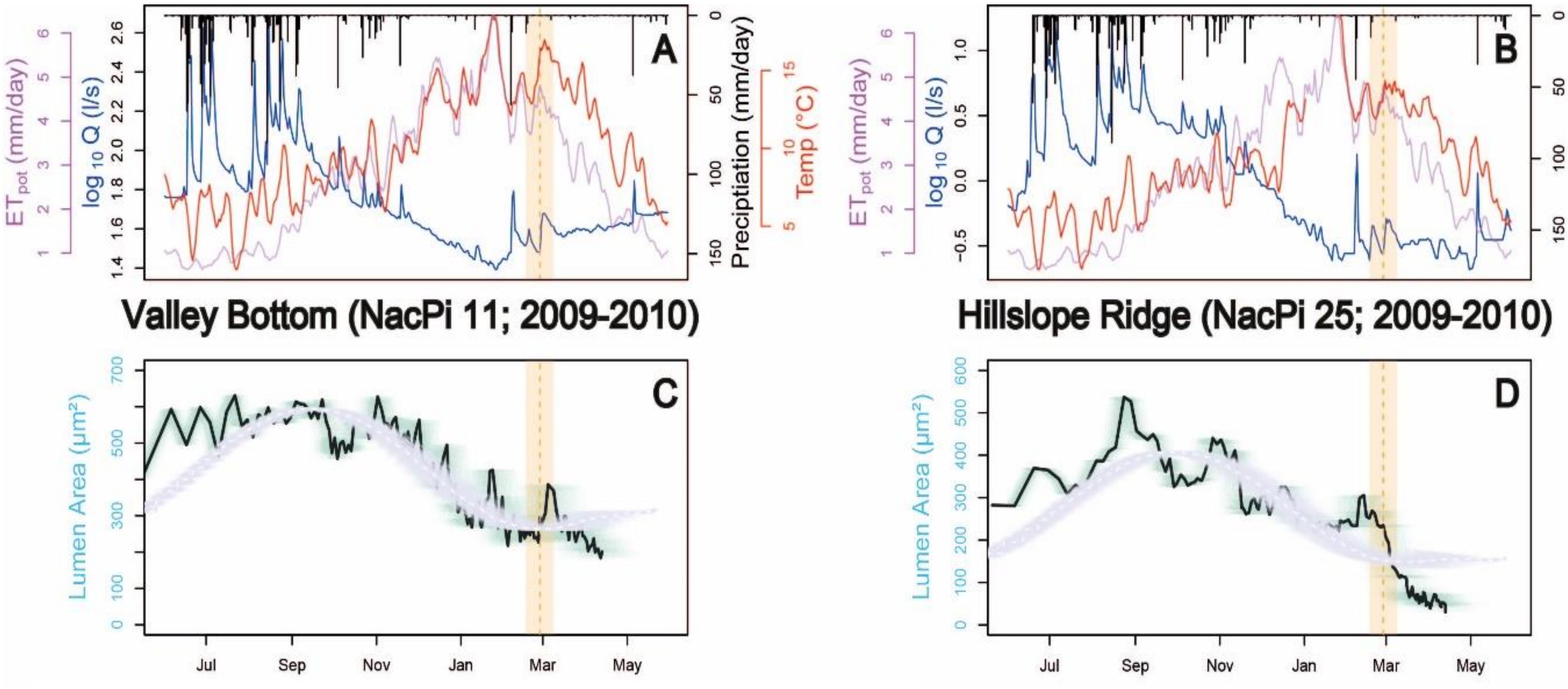
Hypothesis: Trees on ridges are water stressed, trees in valley bottoms have access to more water

Approach



Mohr et al., *JGR Biogeoscience* (2021)

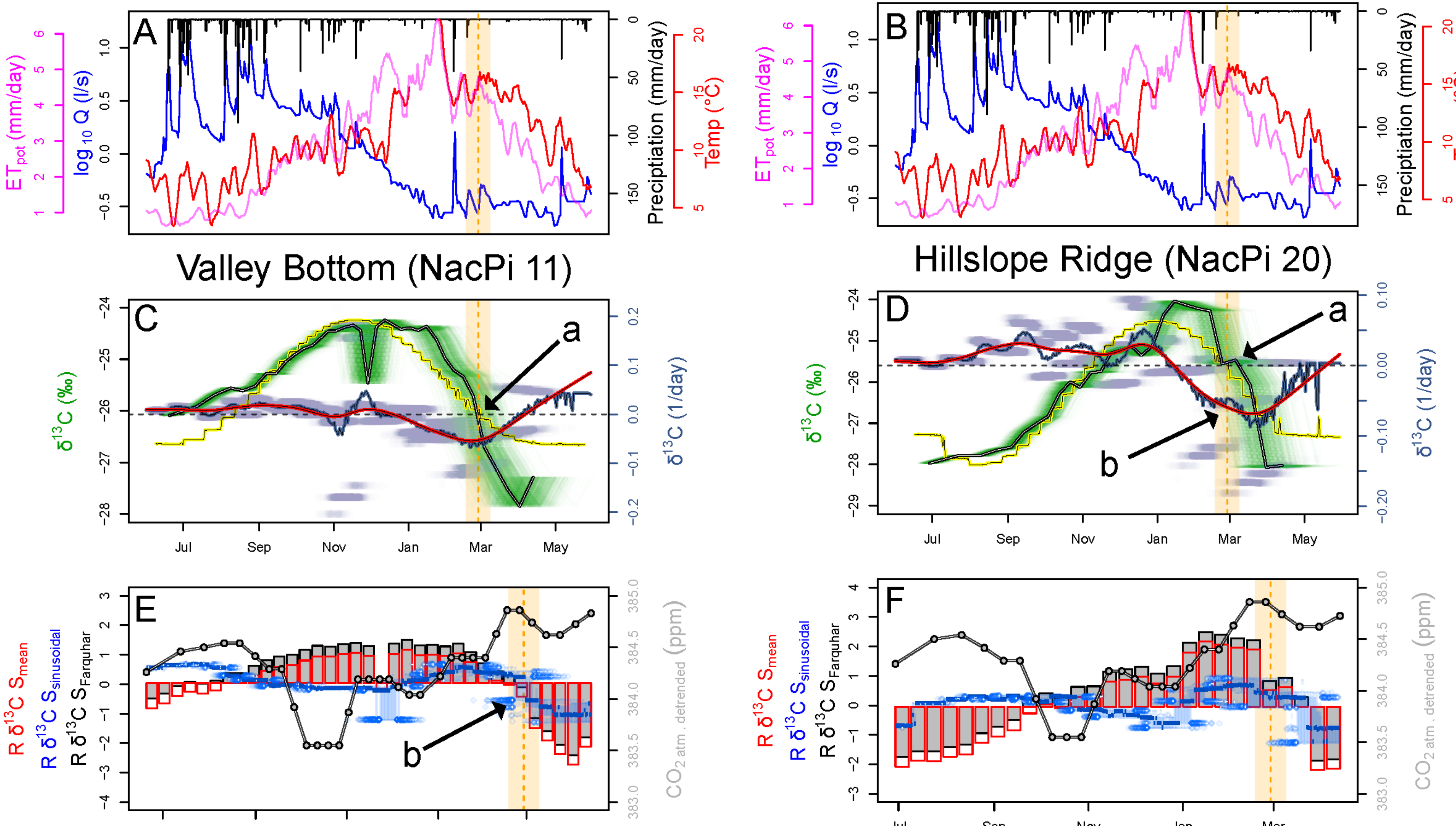
Lumen area



Increase in LA along the valley bottom, and decrease in LA along the ridge

Mohr et al., *JGR Biogeoscience* (2021)

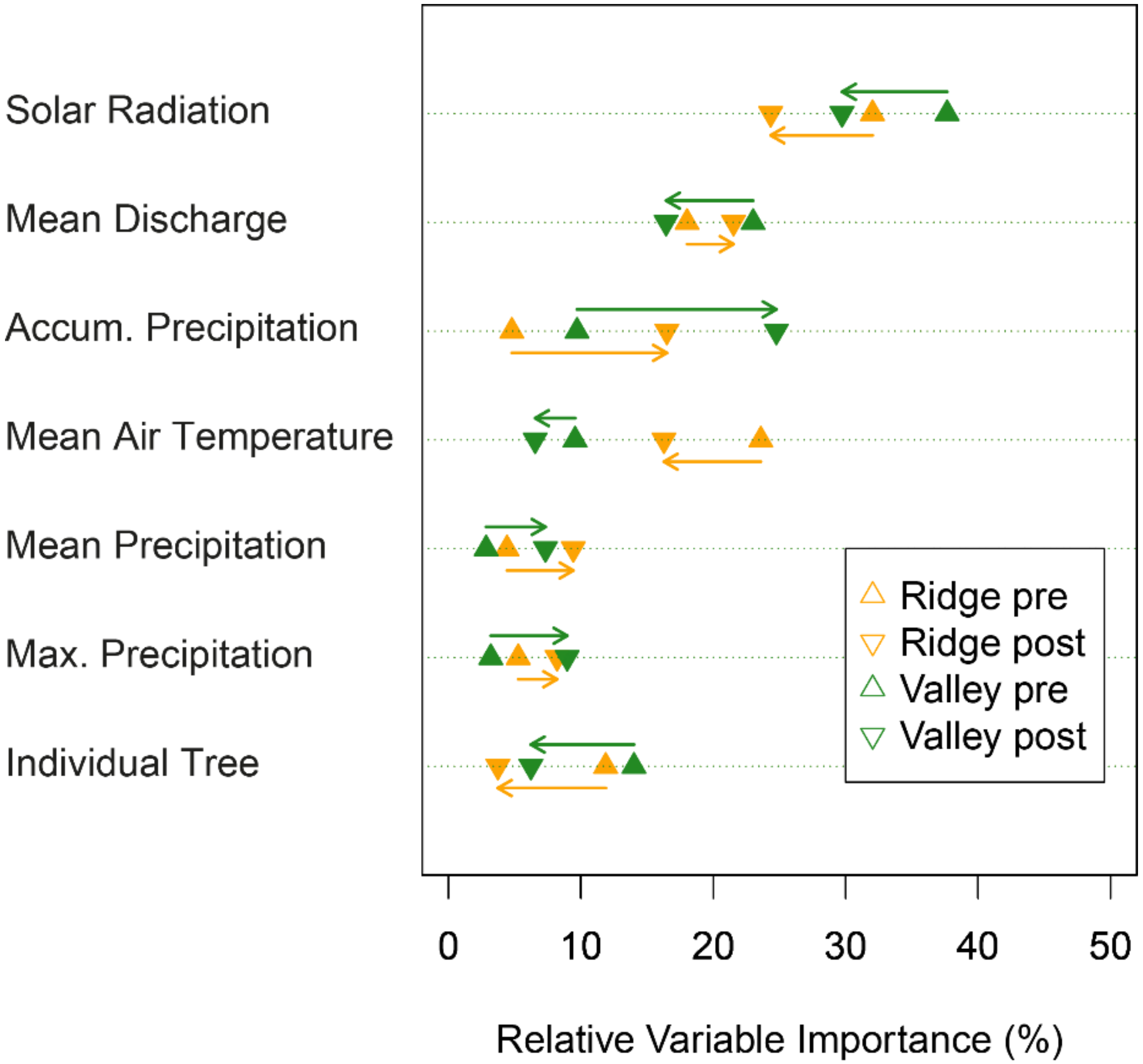
$\delta^{13}C$

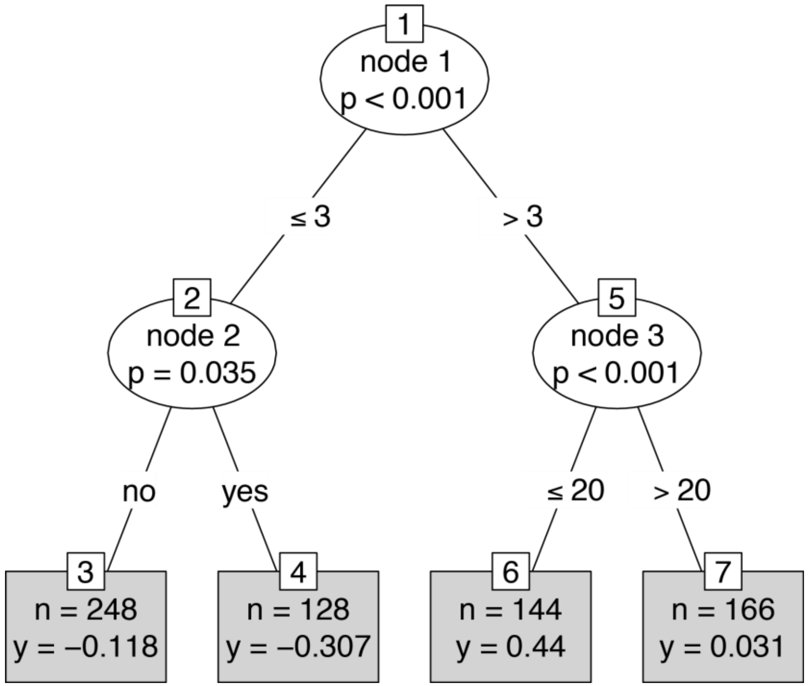


Decrease in $\delta^{13}C$ along the valley bottom, and transient increase in $\delta^{13}C$ along the ridge following the Maule EQ

Mohr et al., *JGR Biogeoscience* (2021)

Role of environmental parameters





Post-seismic discharge becomes more important along the ridge, but less important along the valley bottom with respect to pre-seismic conditions.

Mohr et al., *JGR Biogeoscience* (2021)

Summary

- Tree ring carbon isotopes and wood anatomic features suggest ecohydrological controls on tree growth following earthquakes

- Tree growth slightly increases along the valley bottoms but decrease along the ridges

- Signals are weak, potentially only discernable in environments with water limited tree growth

- Tree ring responses are consistent with physics-based models of ‘earthquake hydrology’