



Flood Production

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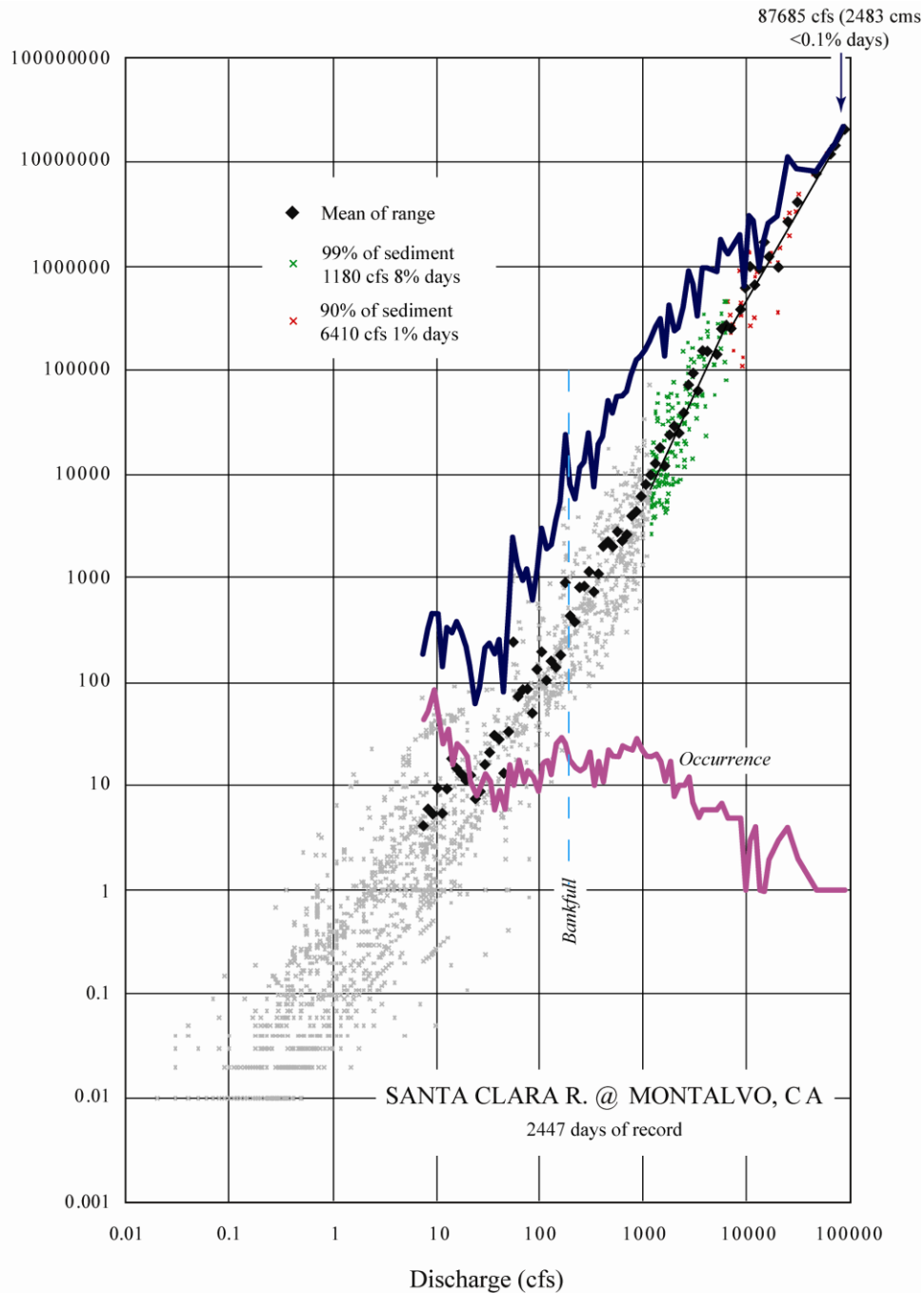
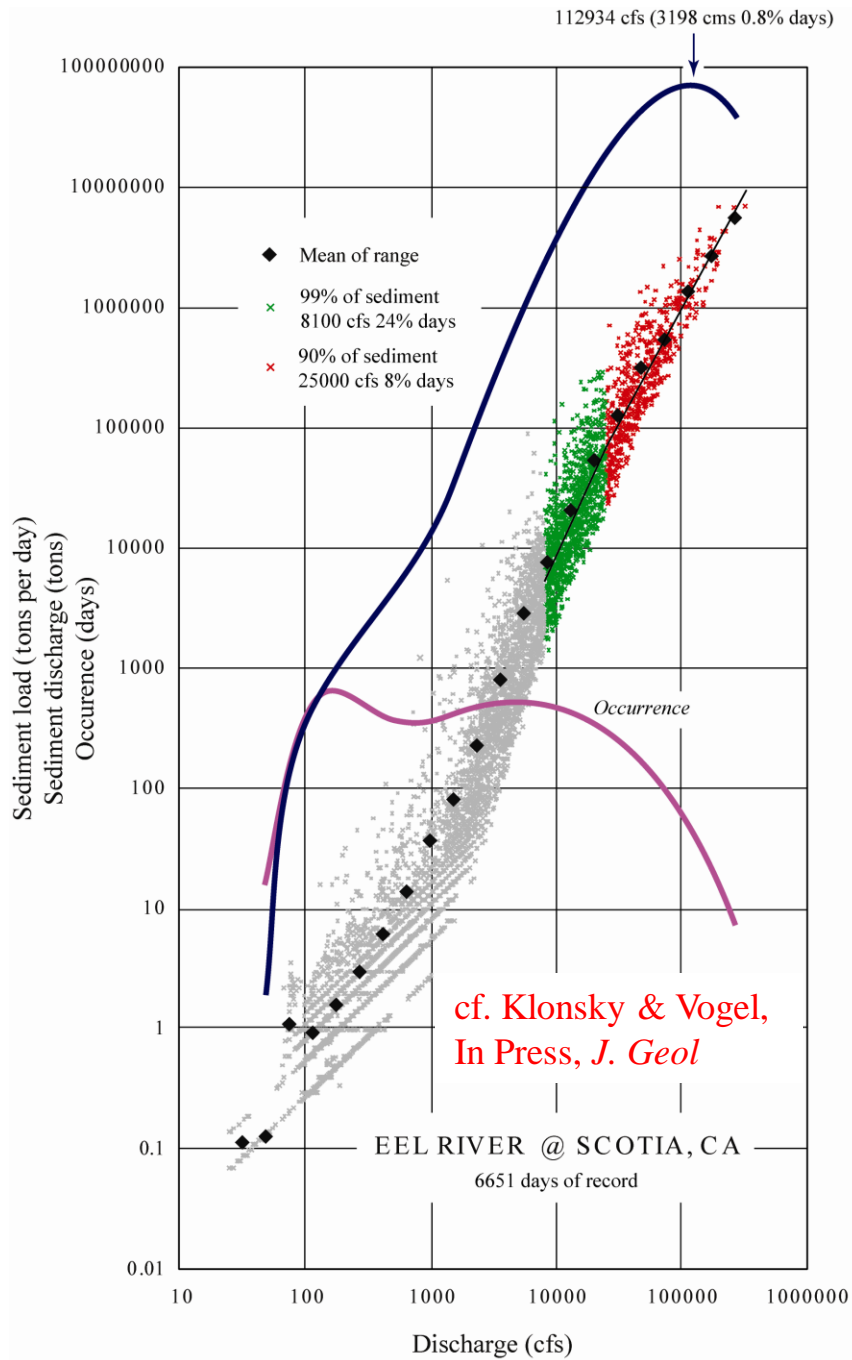
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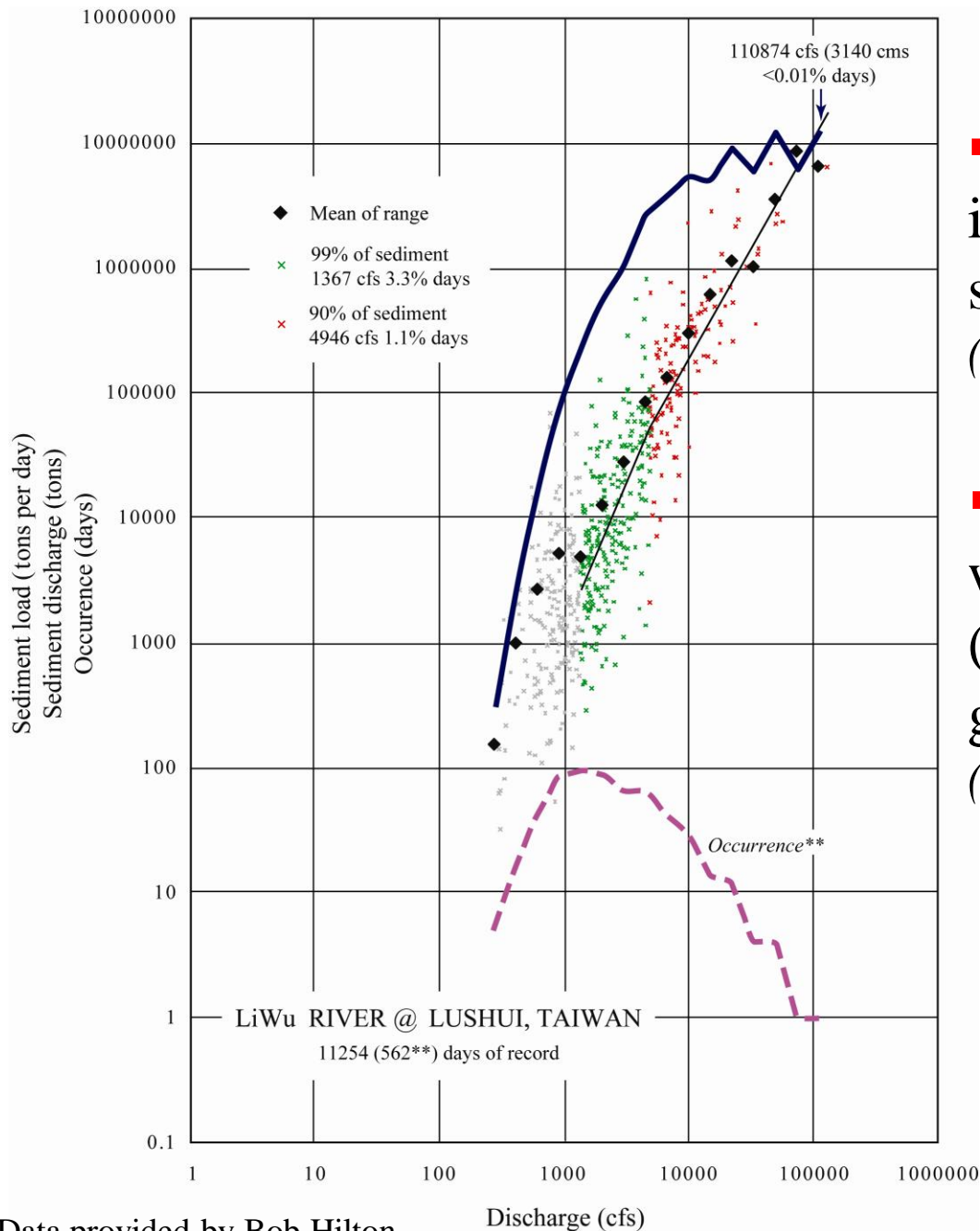
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Road Map

- ❑ **Magnitude and frequency** of floods (effectiveness)
 - flood: any storm-generated peak in river discharge
- ❑ Rivers draining **Pacific Rim Steeplands**
- ❑ **Suspended sediment (+C)**



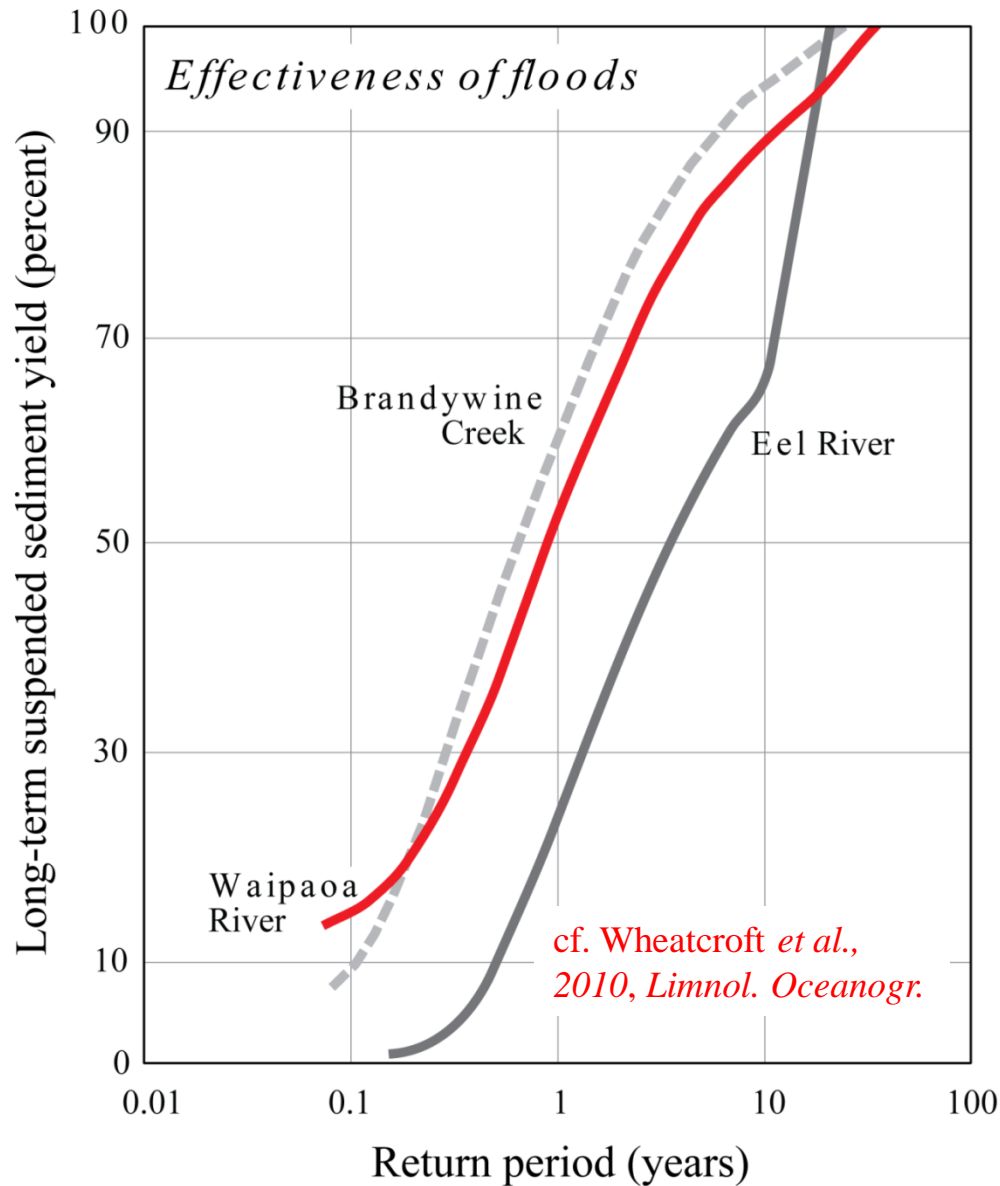


■ Frequent events of moderate intensity transport most sediment

(Wolman & Miller, 1960)

■ *Not* in steepland rivers where mass movements (rather than surface wash) generate most sediment

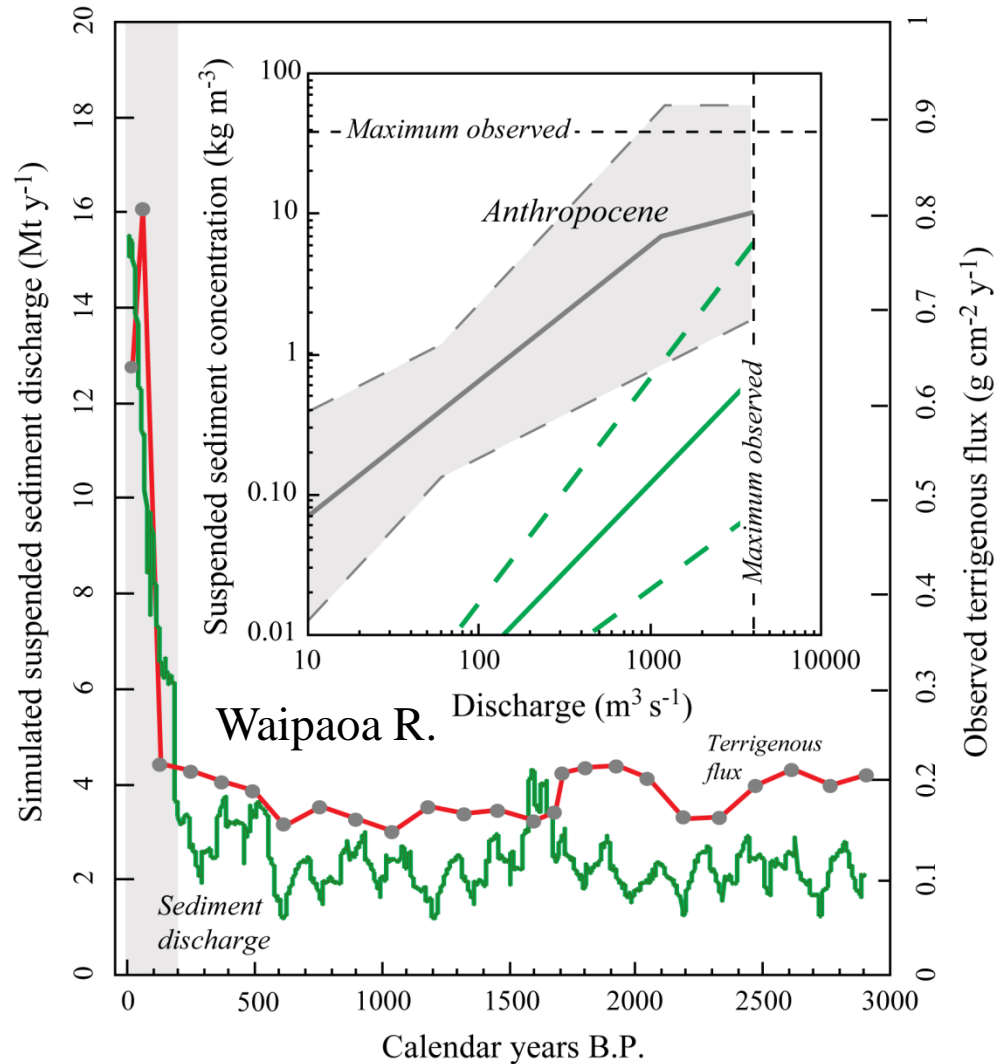
(Pain & Hoskin, 1970)



- *However*, in the Waipaoa the most effective flow is **0.23** times the mean annual flood! (*Hicks et al., 2000 - cf. Wolman & Miller, 1960*)

- **Why?** Brandywine: 46% urban, 26% agricultural land; Rio Puerco: overgrazed

- Waipaoa: <3% of indigenous vegetation remains intact




Did human interference distort Wolman & Miller's view of event effectiveness?

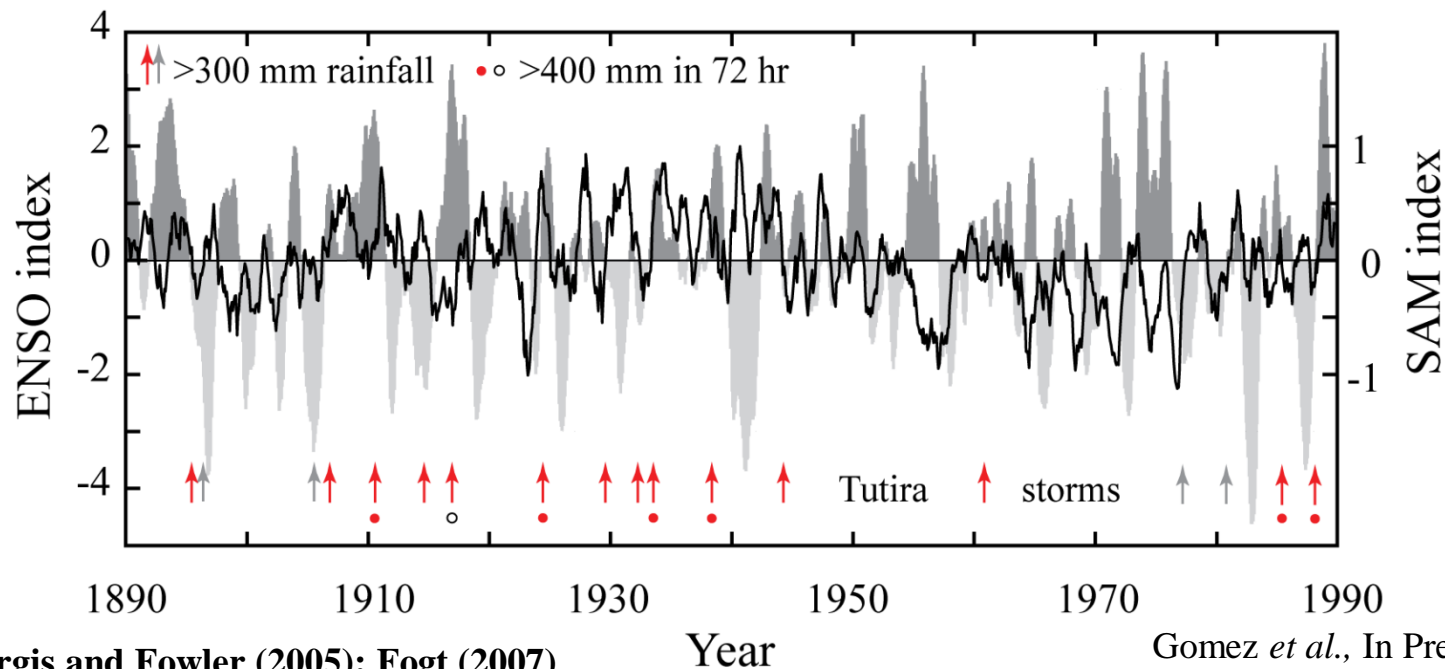
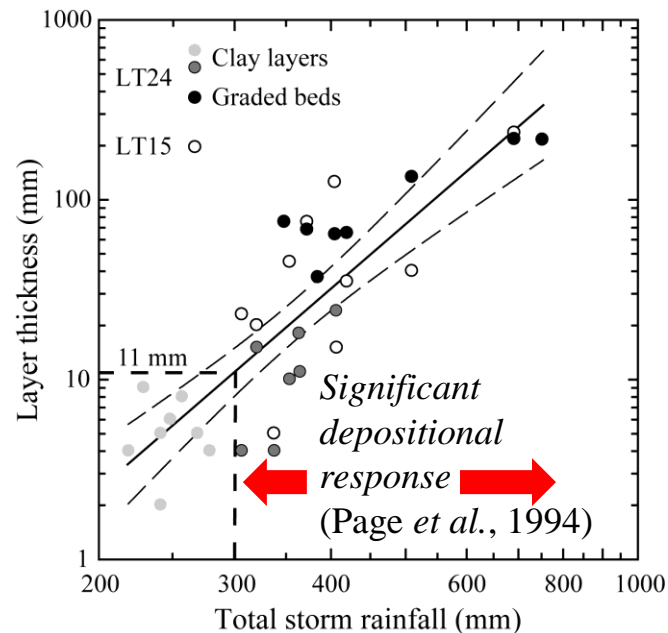
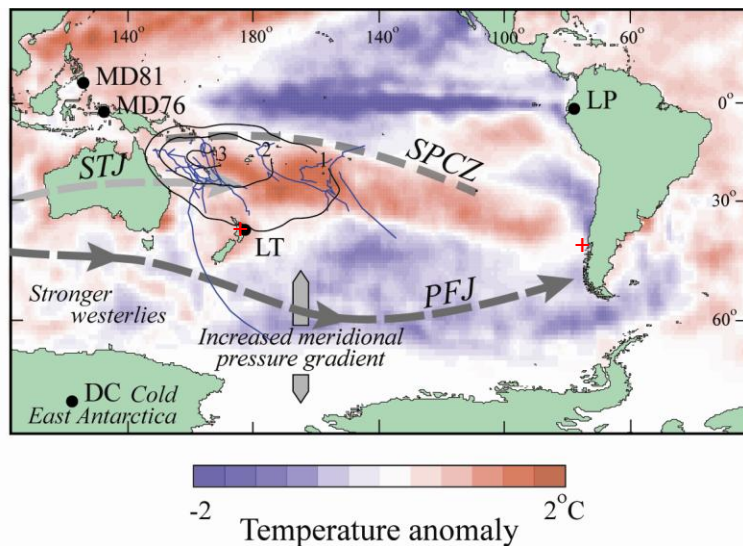
In the Eel River:

'River discharge correlates strongly with precipitation for the period of record, and it is not obvious from the hydrological data alone that land-use activities have impacted runoff and sediment transport in the [Eel River] basin as a whole.'

(Sommerfield & Nittrouer, 1999, *Marine Geol.*)

La Niña / +SAM

ENSO

 SAM

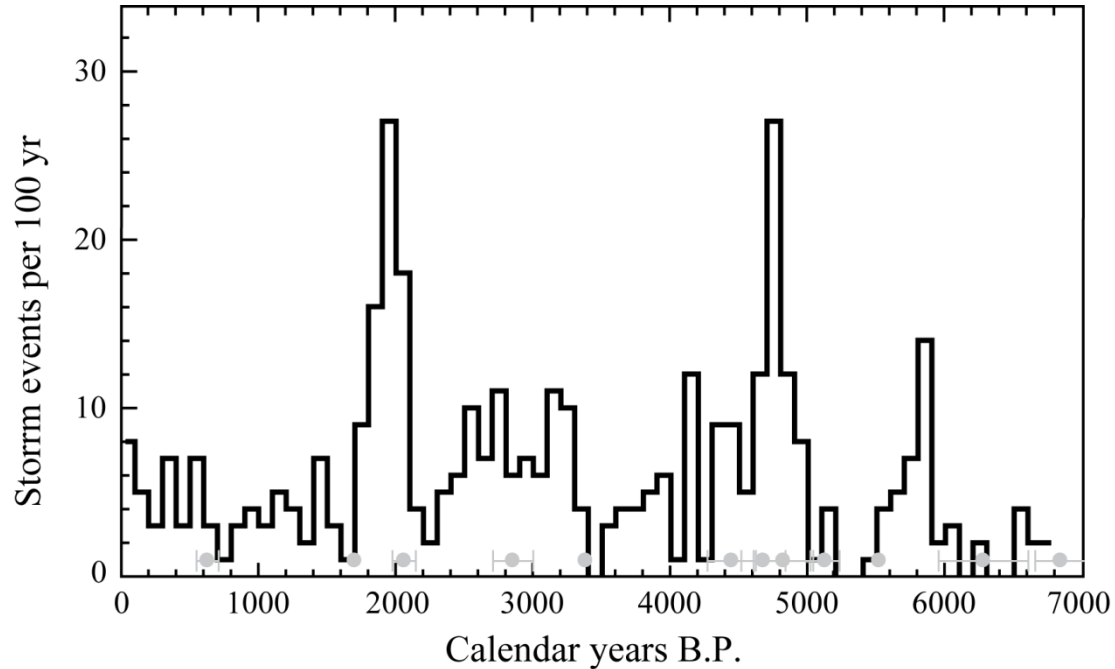


after: Gergis and Fowler (2005); Fogt (2007)

Gomez et al., In Press, *Holocene*

Lake Tutira

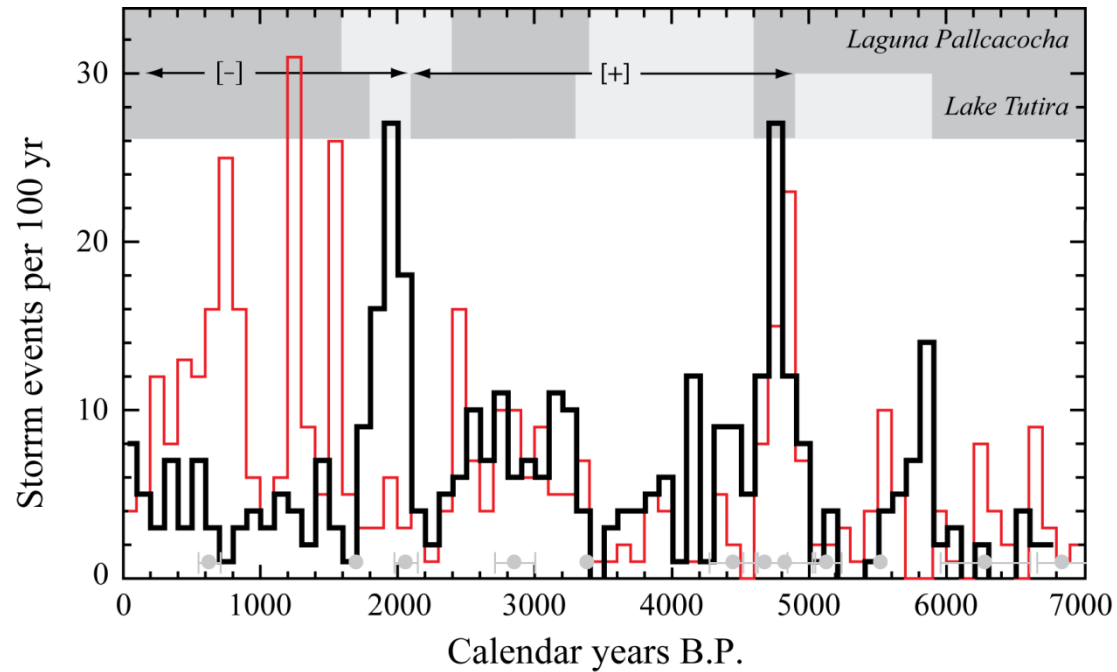
397 large events (*total storm rainfall* ≥ 300 mm, 100 yr bins)

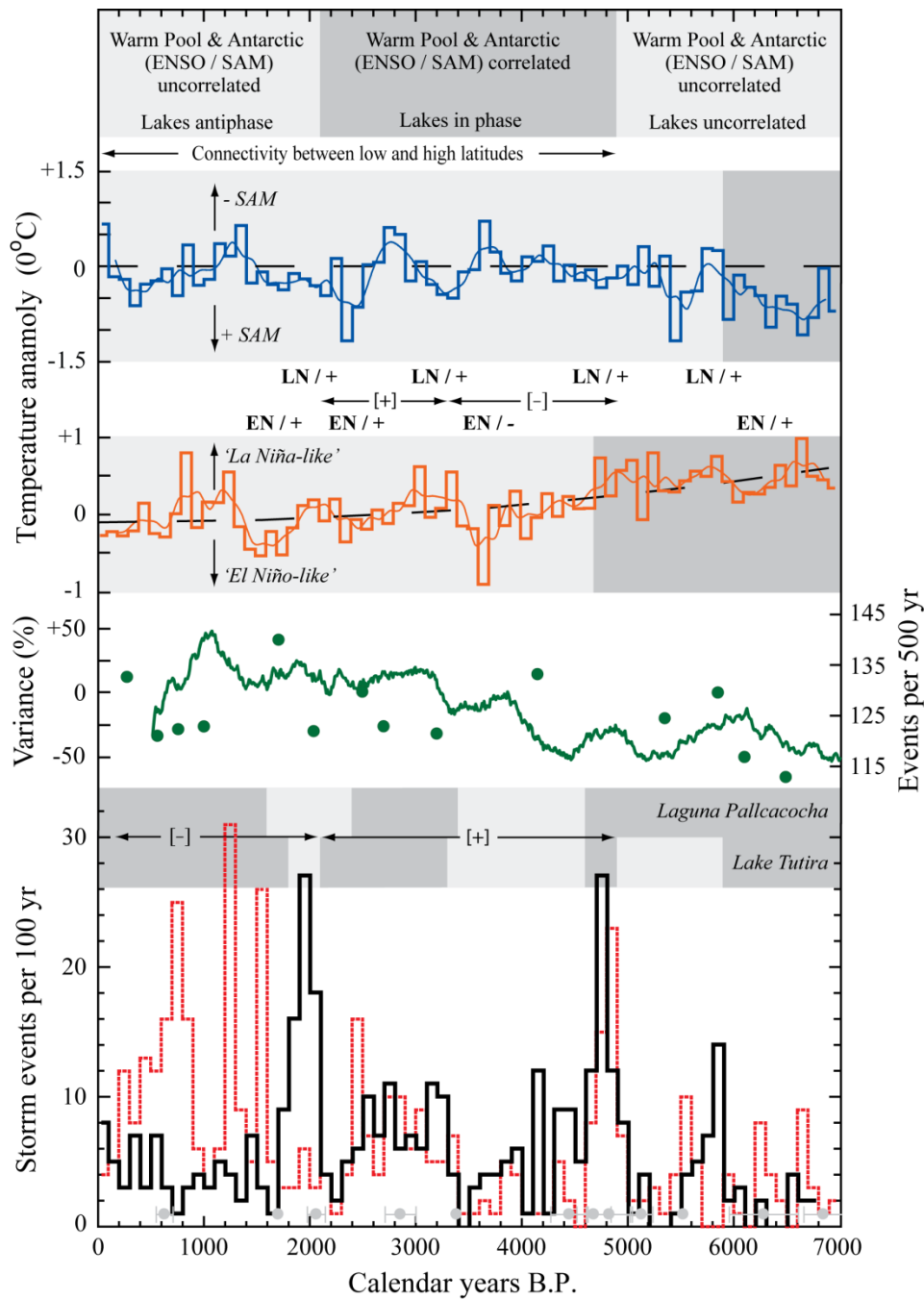


see: Page et al. (2010); Orpin et al. (2010) for complete record

Gomez *et al.*, In Press, *Holocene*

La Niña (Tutira, NZ) vs El Niño (Pallcacocha, Ecuador)





EPICA Dome C (E. Antarctica)

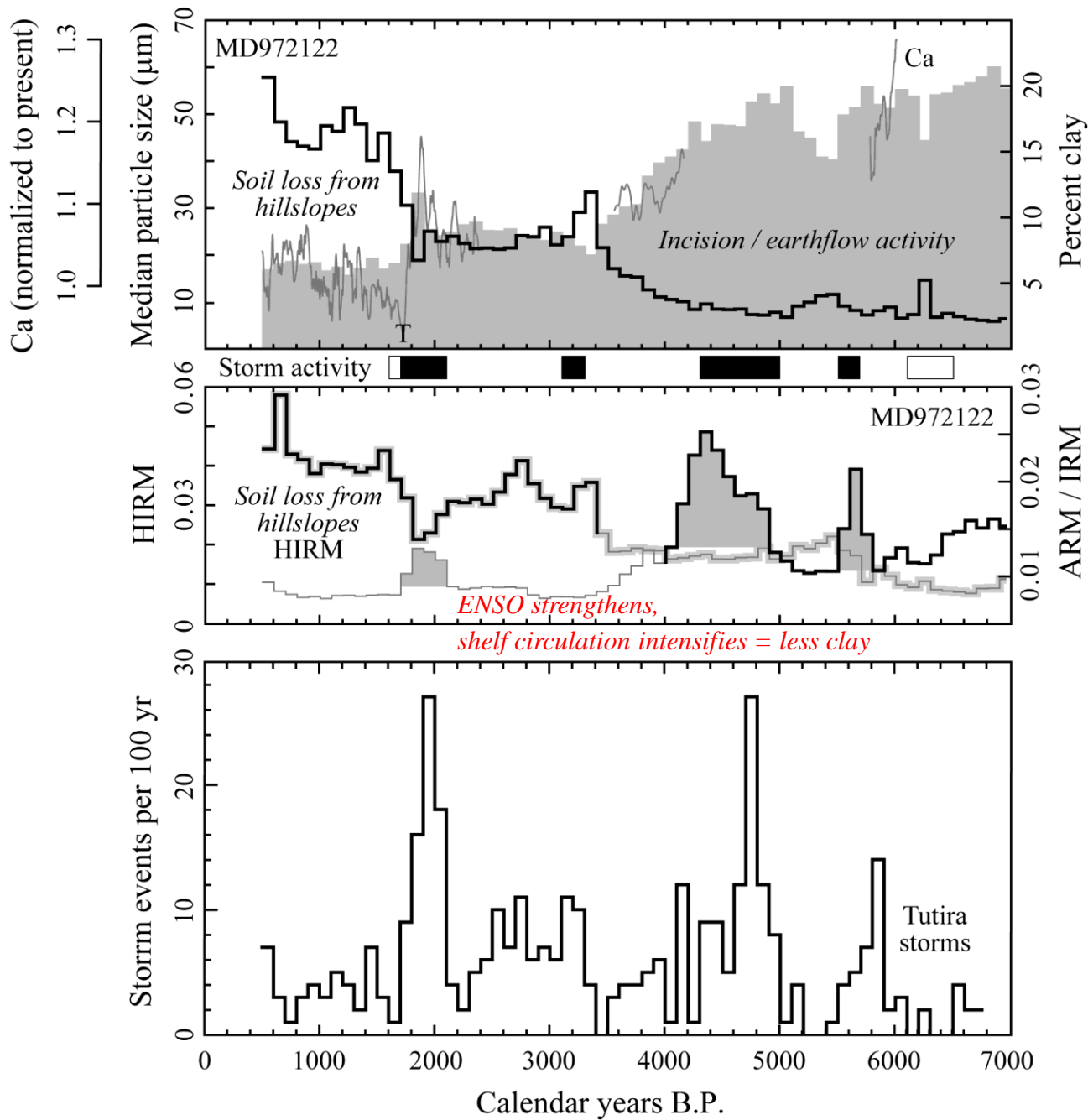
(SAM signal, stable isotope paleothermometry, Masson-Delmotte *et al.*, 2004, *Holocene*)

Warm Pool

(ENSO signal, Mg/Ca paleothermometry, Stott *et al.*, 2004, *Nature*)

ENSO

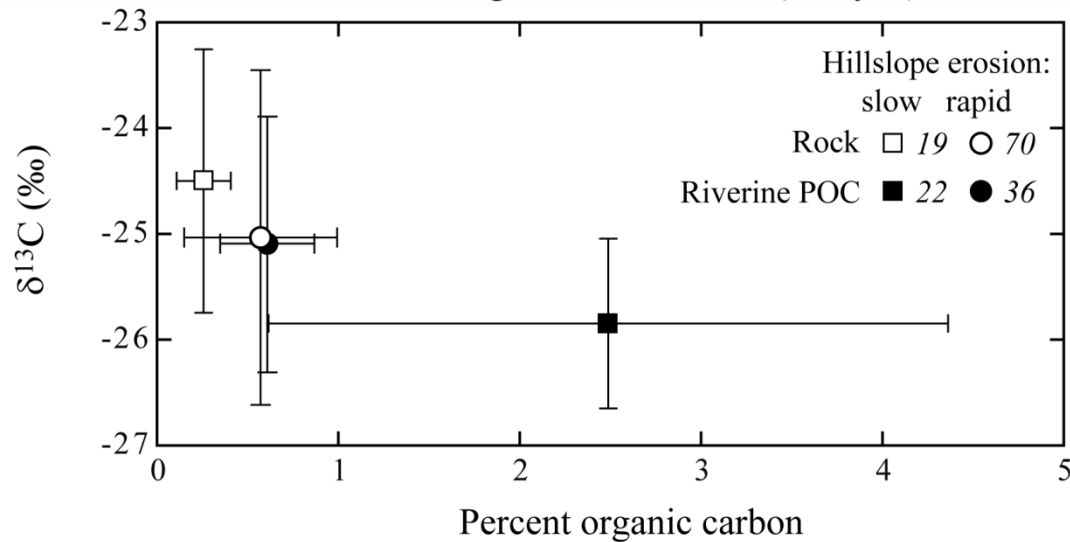
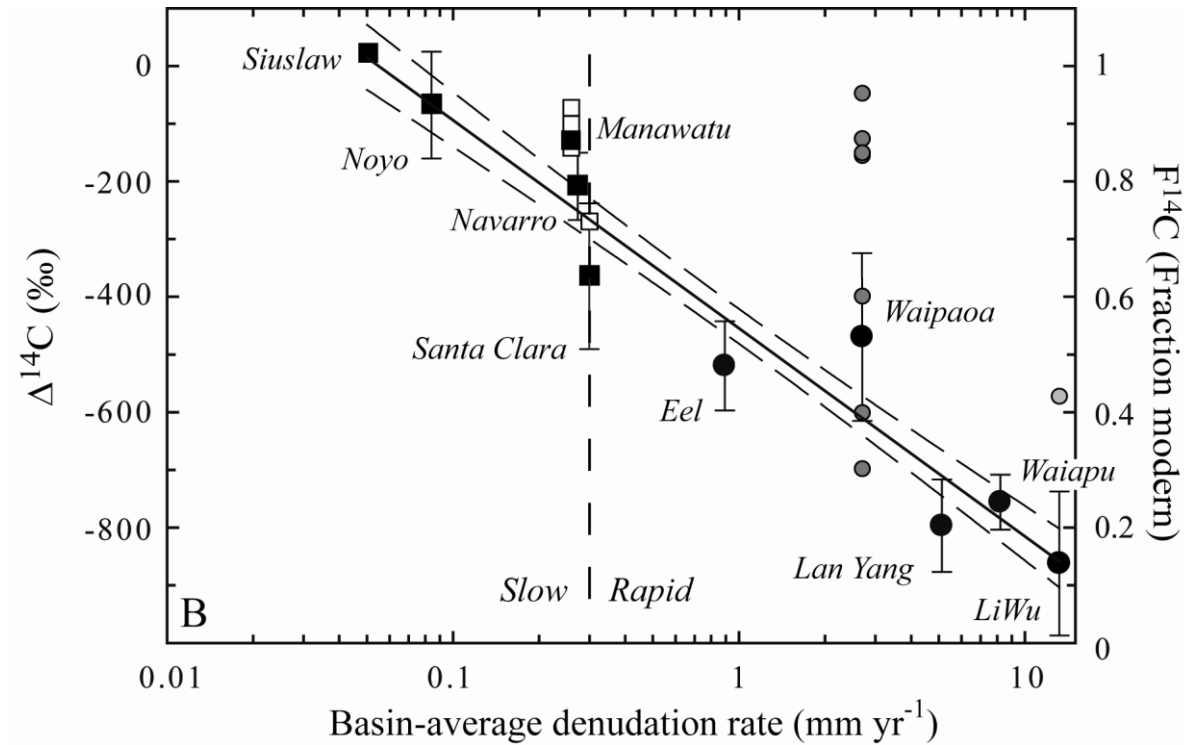
(frequency (Zebiak-Cane model) & variance (corals Cobb *et al.*, 2003, *Nature and many others*)

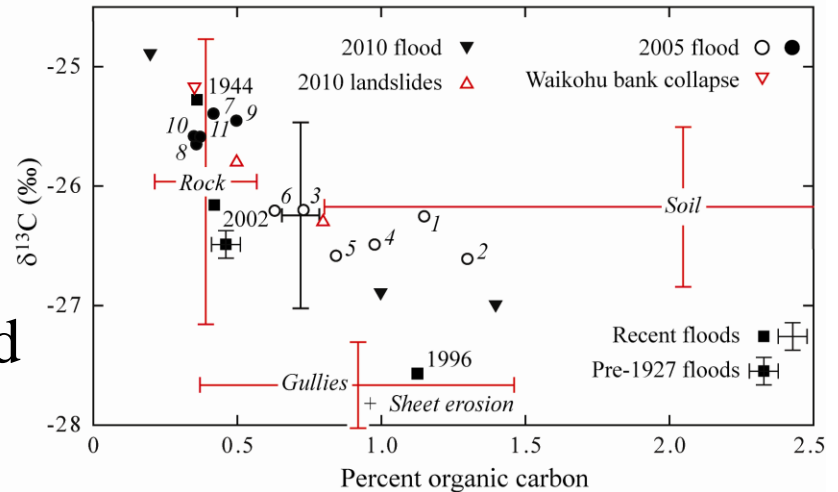
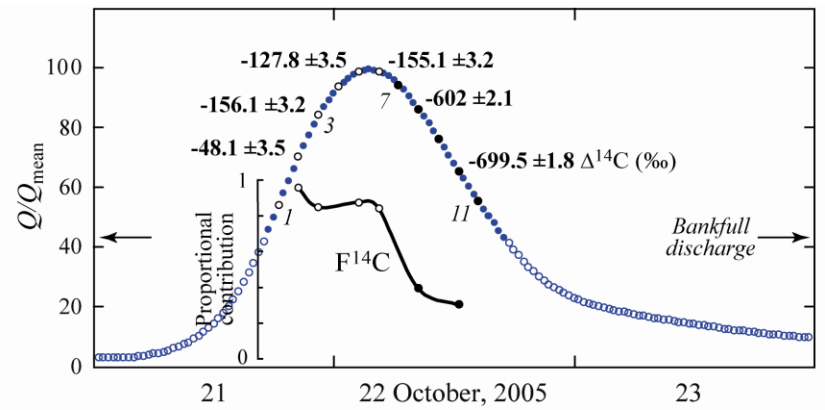
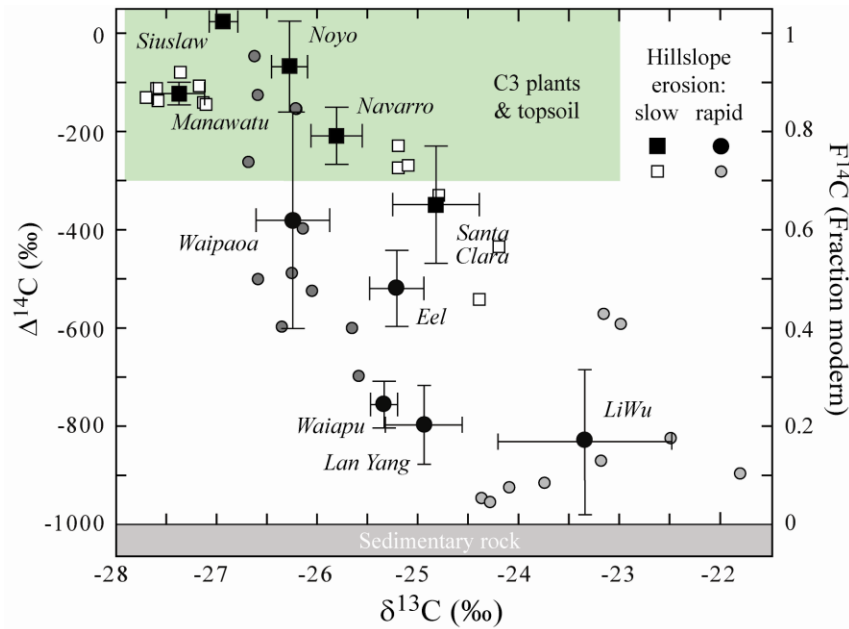


Waipaoa

Earthflow activity increases during wetter periods

Composition of particle-bound organic carbon





The composition of POC transported by steep-land rivers is determined by the relative contributions made by shallow hillslope erosion processes that mobilize soil-derived modern organic carbon and deep-seated erosion processes that release bedrock-derived ancient organic carbon, *and may vary during and between floods.*

Implications for S2S

- ❑ **Climate** (*magnitude & frequency of floods*) **matters**
supply- or transport-limited conditions?
- ❑ Measurements in **undisturbed basins**
are there any?
- ❑ **High resolution proxies for the SAM** are needed to
better decipher the signals preserved in Southern
Hemisphere sinks