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# Chemical weathering response to the PETM in a source-to-sink system: Insights from the southern Pyrenees, Spain

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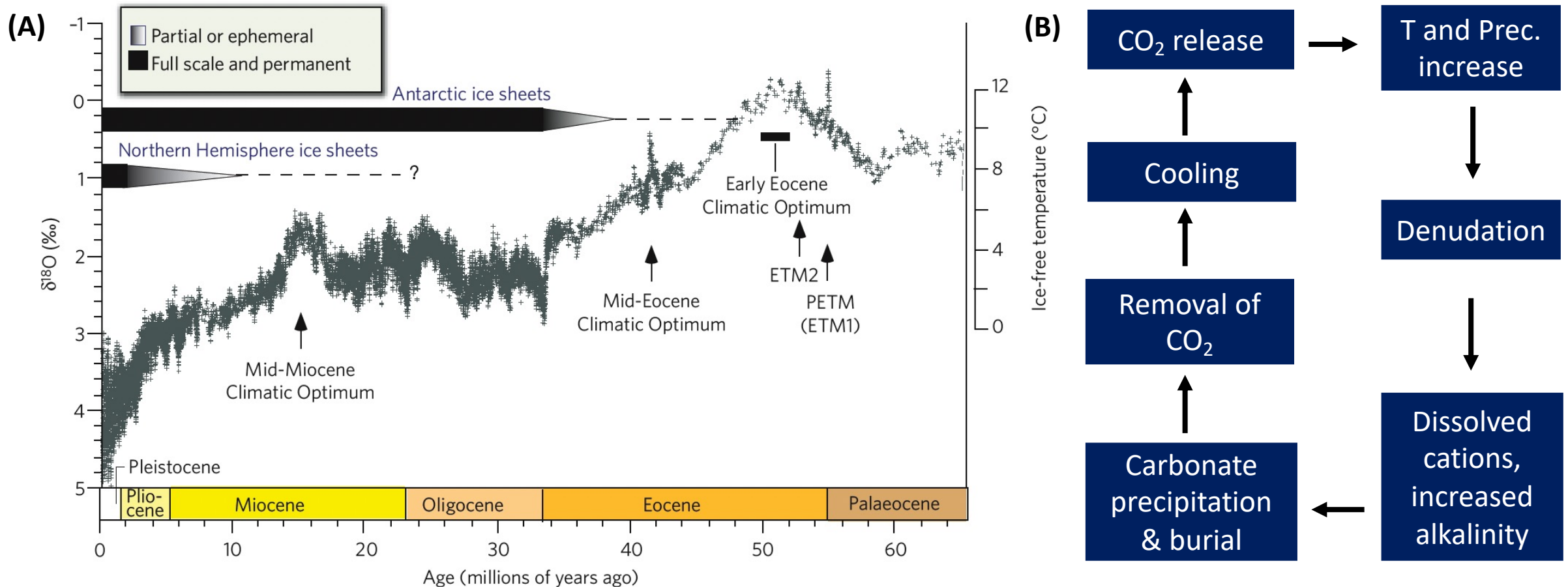
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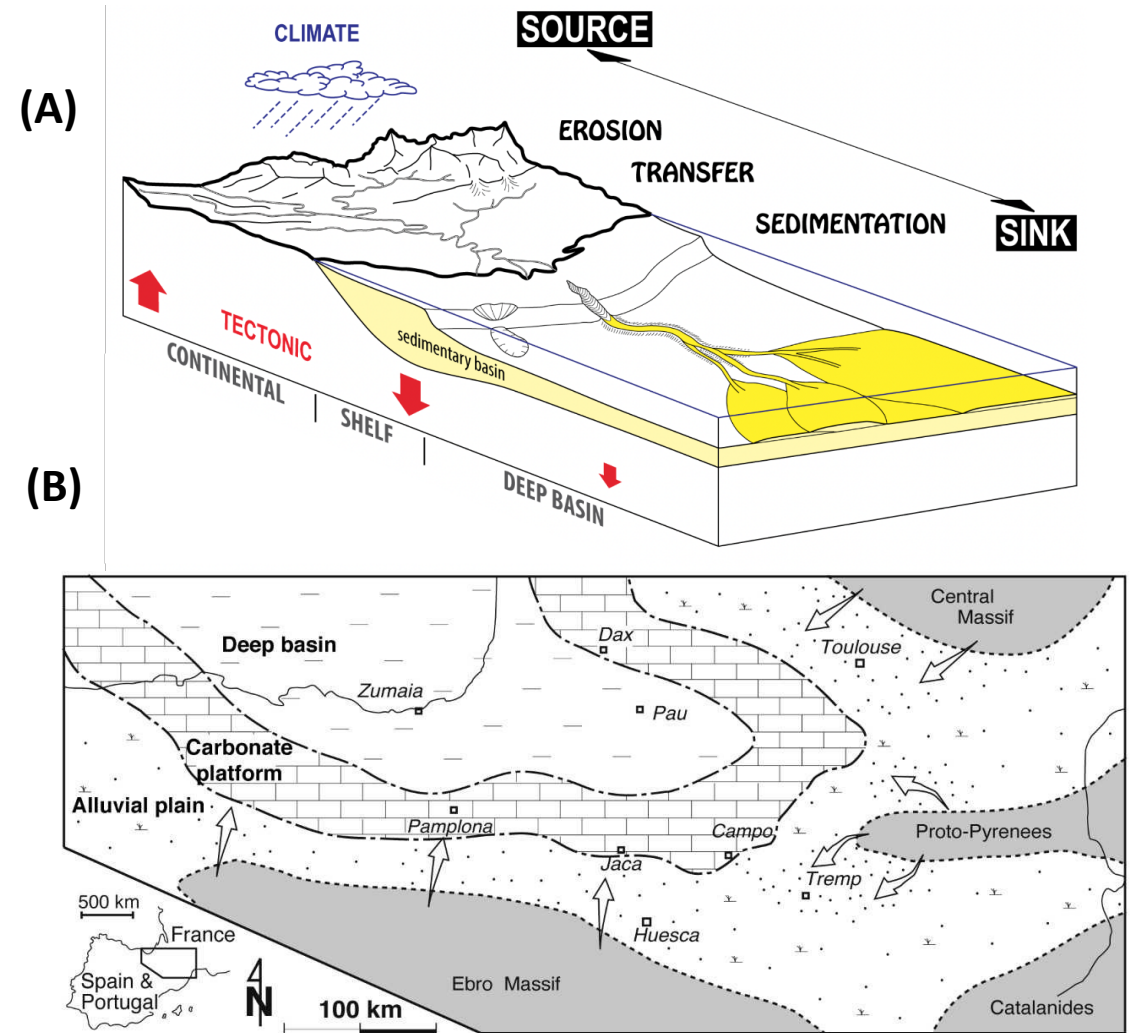
# The Paleocene-Eocene Thermal Maximum



**Figure 1.** (A) Global deep-sea oxygen isotope records based on data compiled from more than 40 DSDP and ODP sites showing the onset of the PETM (Zachos et al., 2008). (B) CO<sub>2</sub> removal during increased denudation.

# The Spanish Pyrenees

- Estimated 6-9 times more clays in the distal Tremp-Graus Basin and northern margin of Bay of Biscay (Chen et al., 2018).
- More erosion or increased weathering on the continents (Pogge von Strand-mann et al., 2021).
- **Is there a single source of sediments?**



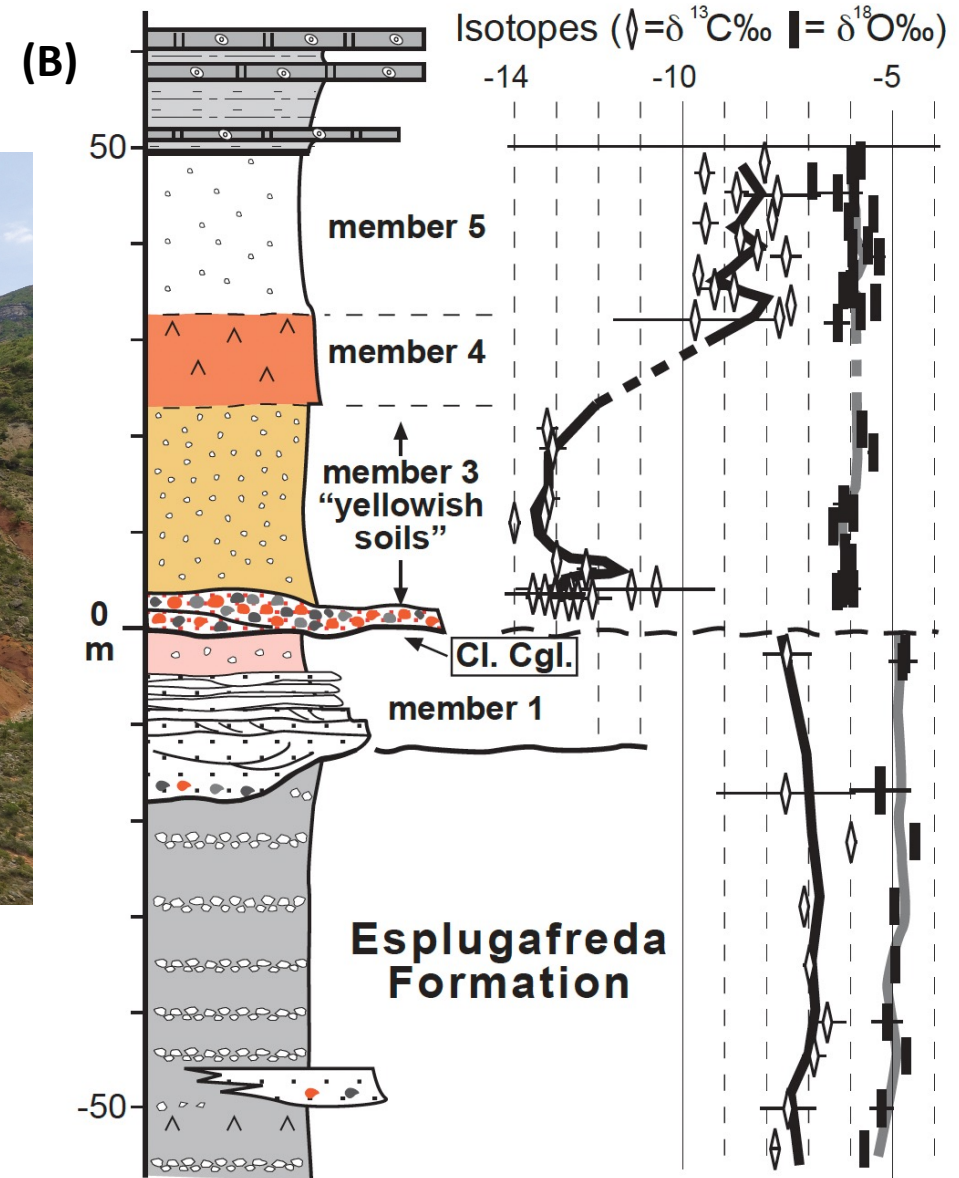
**Figure 2.** (A) General S2S system (S2S H2020 ITN, 2019). (B) Paleogeography during the PETM in the sediment routing system (Modified from Pujalte et al., 2016).

# Esplugafreda

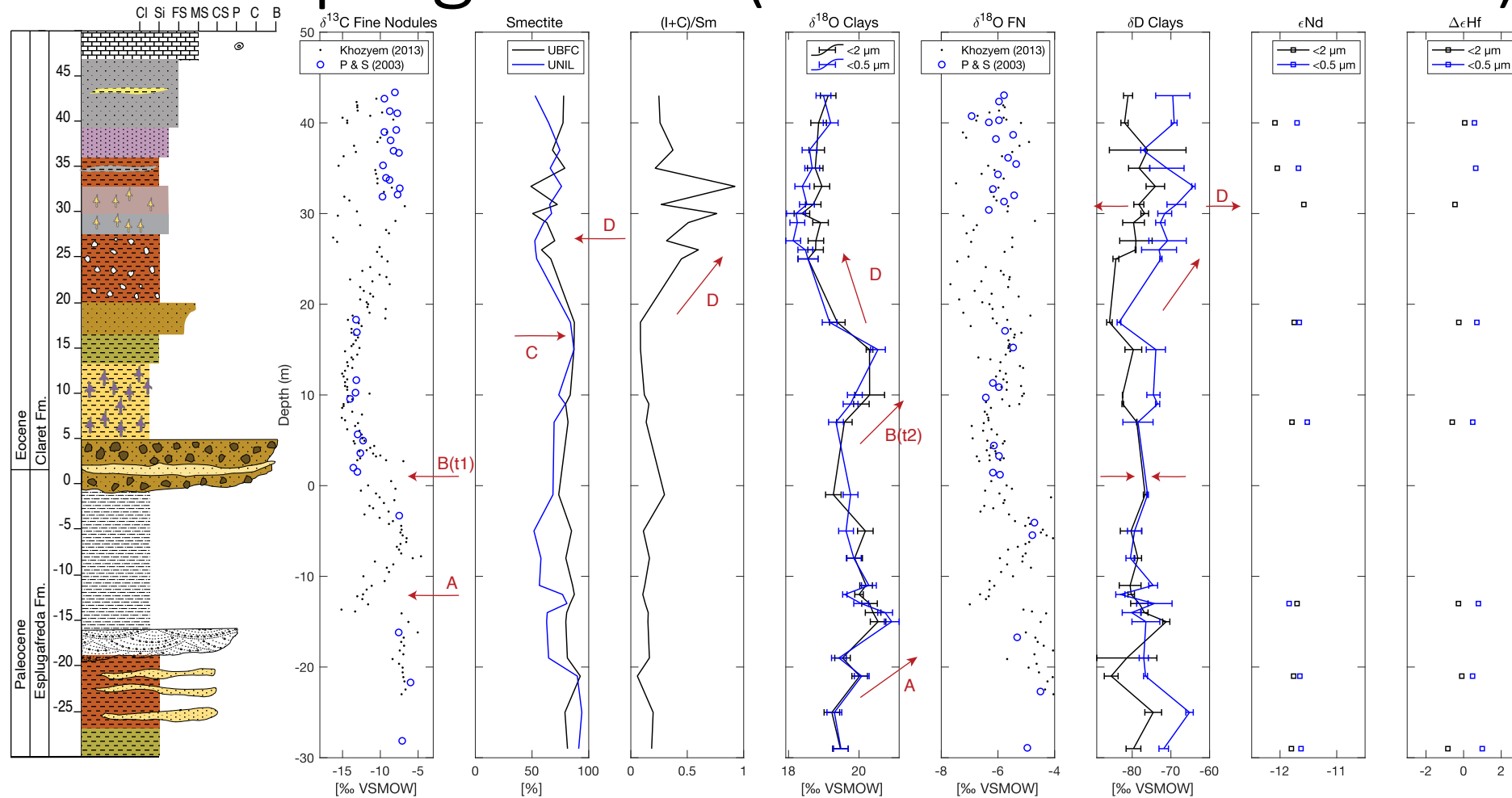
(A)



**Figure 3.** (A) Esplugafreda section. Red and yellow paleosols in the Esplugafreda Fm to Claret Fm. (A) Esplugafreda section stratigraphy (Pujalte et al., 2014). Photo: Teodoro Hunger.



# Results: Esplugafreda (continental section)



**Figure 4.** Esplugafreda stratigraphy;  $\delta^{13}\text{C}$  results from carbonate nodules, smectite content, (I+C)/S, stable isotopes in detrital clays ( $\delta^{18}\text{O}$  and  $\delta\text{D}$ ),  $\epsilon\text{Nd}$  and  $\Delta\epsilon\text{Hf}$

# What do we know so far?

- Reworking of clay minerals during the IVF, hydrolizing conditions during body of the PETM and increase in reworking during recovery.
- Negative  $\delta^{18}\text{O}$  excursion after the body and during the recovery of the PETM. No distinct trend in  $\delta\text{D}$ . **Temperature dominated climate** change, as opposed to precipitation.
- The  $\epsilon\text{Nd}$  results show little variation, both stratigraphically and within the two size fractions. Indication of **a single source for the clay minerals** in Esplugafreda.
- Continental sections of Spanish Pyrenees: **aridification under increasing temperature** and negligible precipitation changes. **Extreme events**. Denudation controlled by physical erosion.

A wide-angle photograph of a mountain landscape. In the foreground, a hiker wearing a bright yellow safety vest and dark pants is walking away from the camera on a dirt path. Several other hikers are visible further up the path. The terrain is rocky and covered with dry, brownish grass. In the background, there are large, flat-topped mountains under a bright blue sky with scattered white clouds.

# Thank you! Questions?

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