Sediment recycling in the South Pyrenean Foreland Basin: impact of grain size and source rock distribution on compositional signatures

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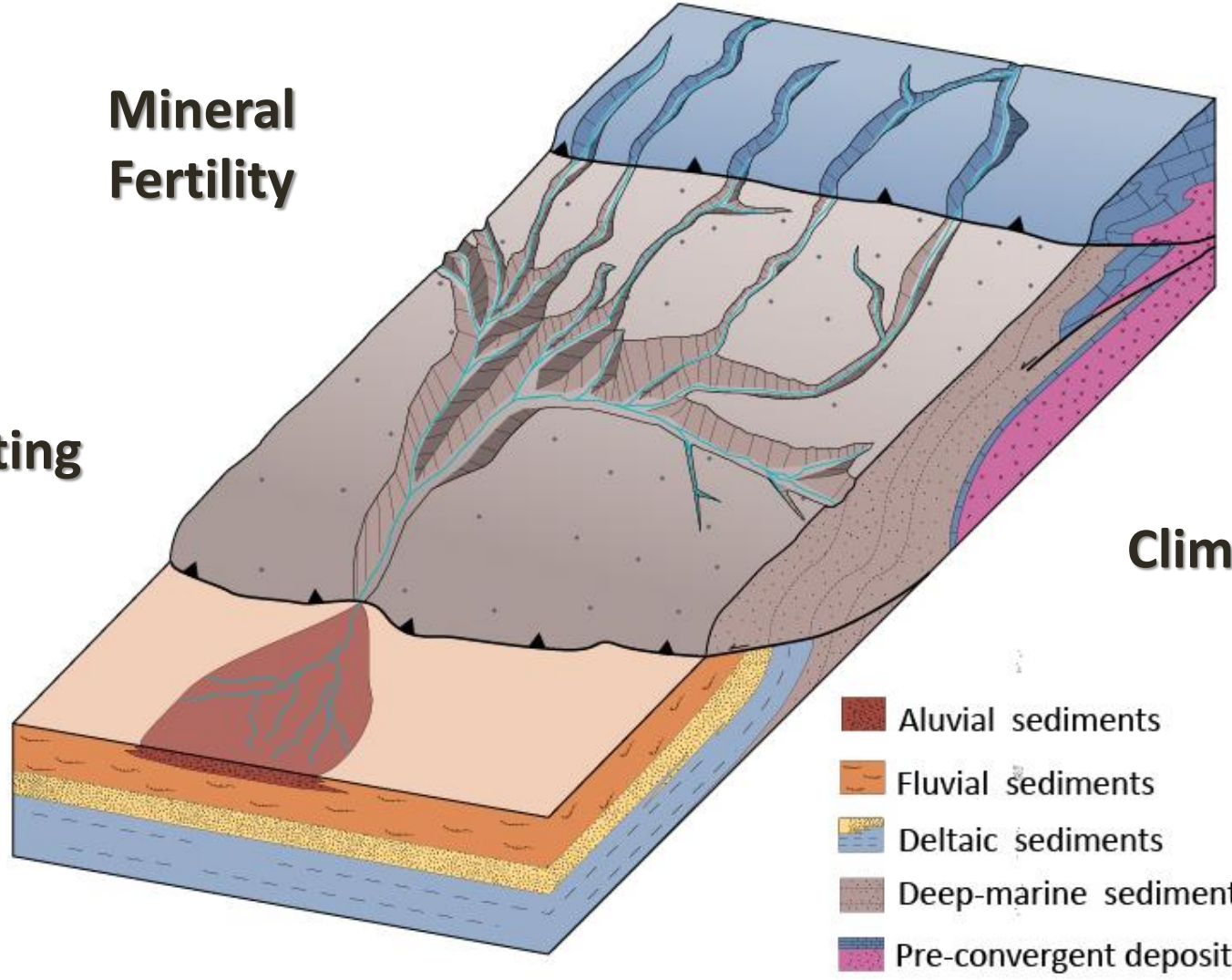
Sediment recycling in provenance studies



Mineral Fertility

Denudation rate

Rock erodability

Weathering

Grain sorting

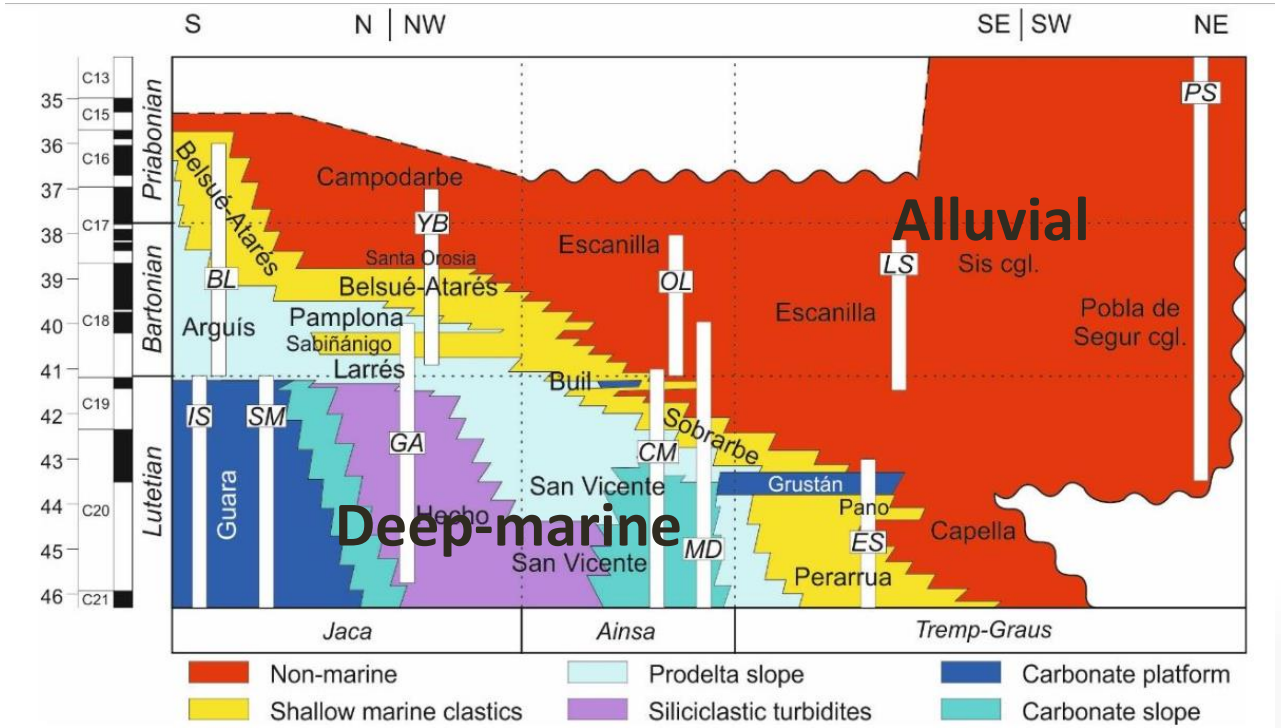
Climate

Transport

Diagenetic overprint

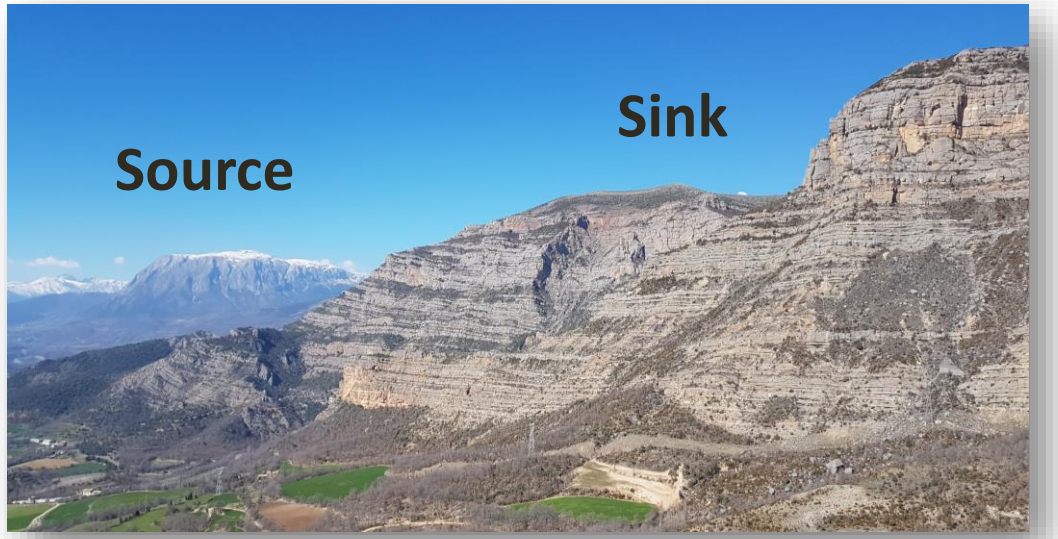
Do daughters sands mirror their parent rock lithologies?

The South Pyrenean Basin meets the requirements to shed some light to this question:



Vinyoles et al 2021

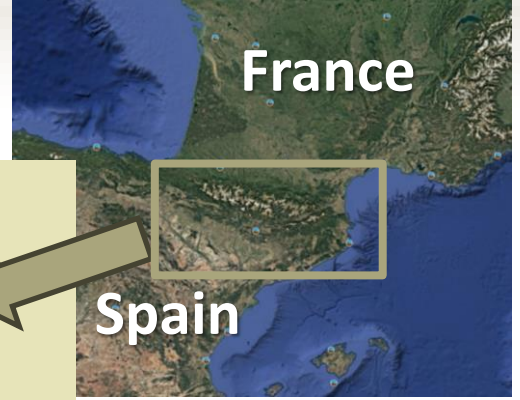
- ✓ Well-known chronostratigraphic framework
- ✓ Good continuity of sedimentary units
- ✓ Deep knowledge of the source area evolution

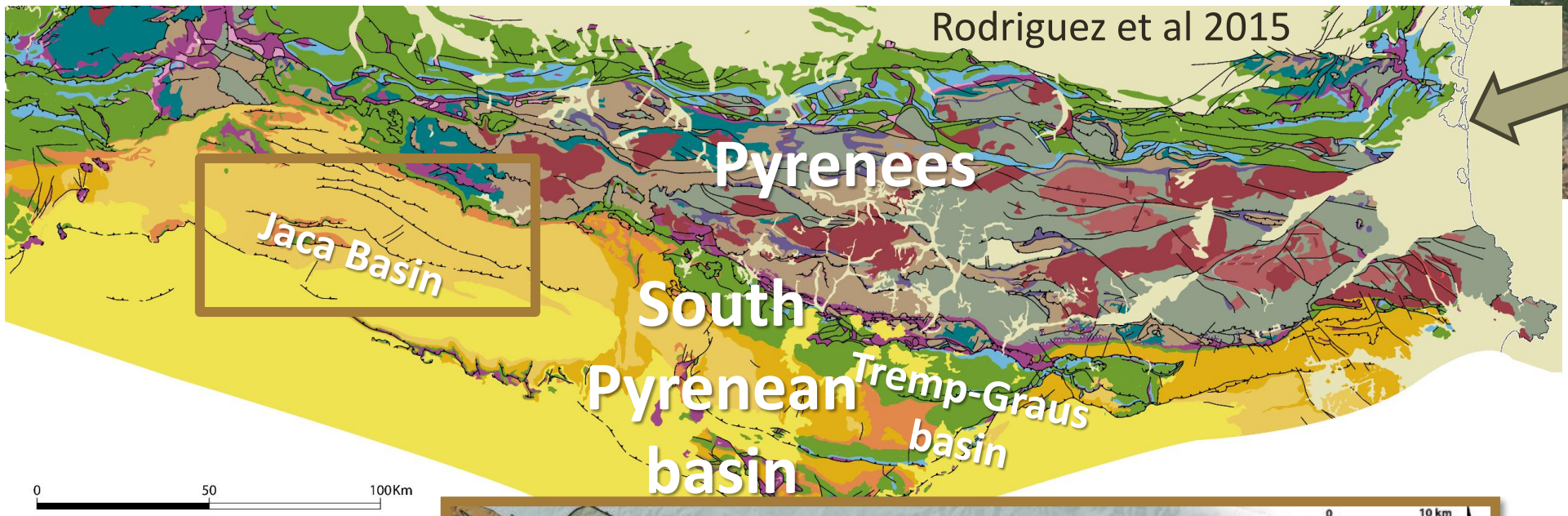


Last but not least:

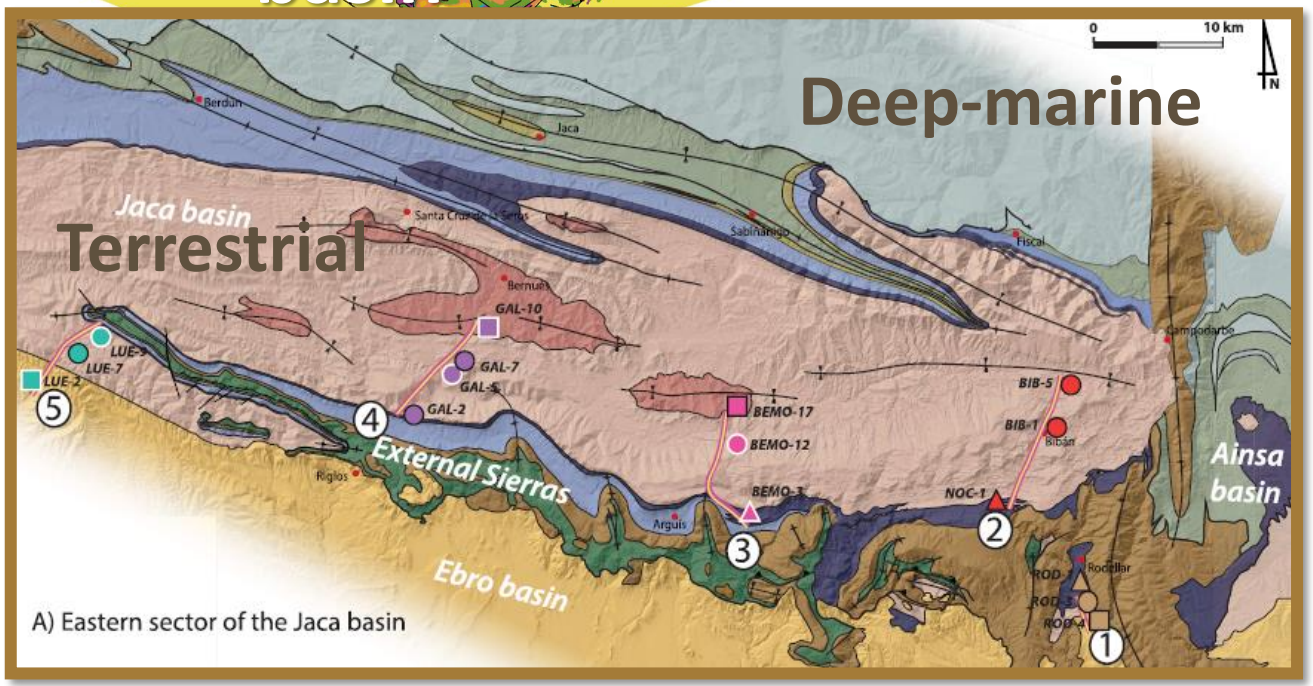
- ✓ Accurate characterisation of both the basinal deposits and the source rocks

The South Pyrenean Basin: Jaca sub-basin



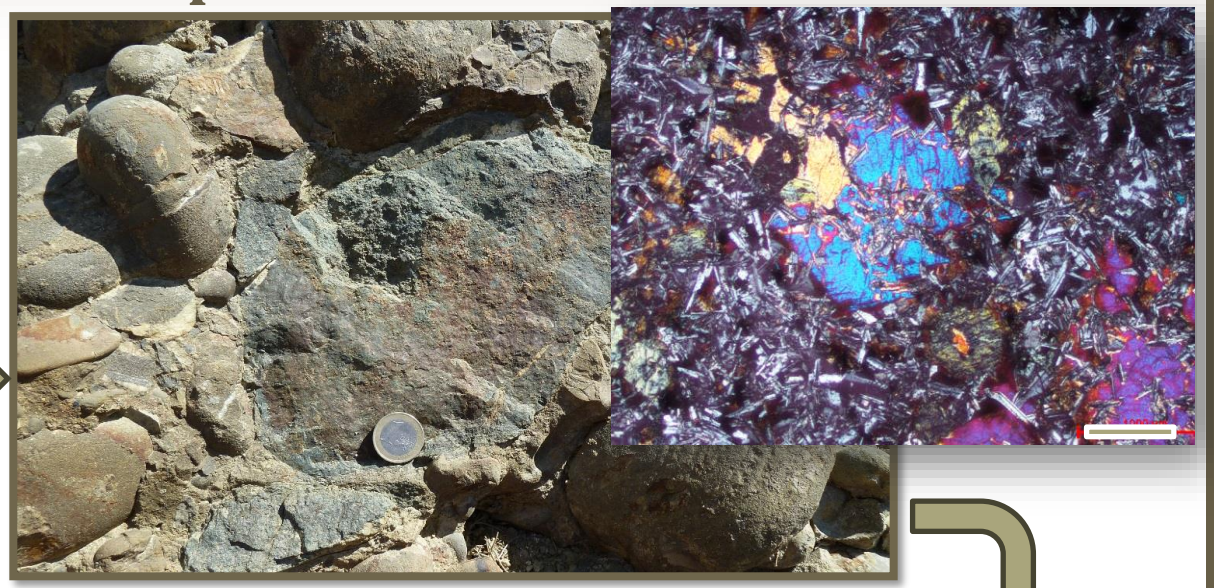


Jaca basin

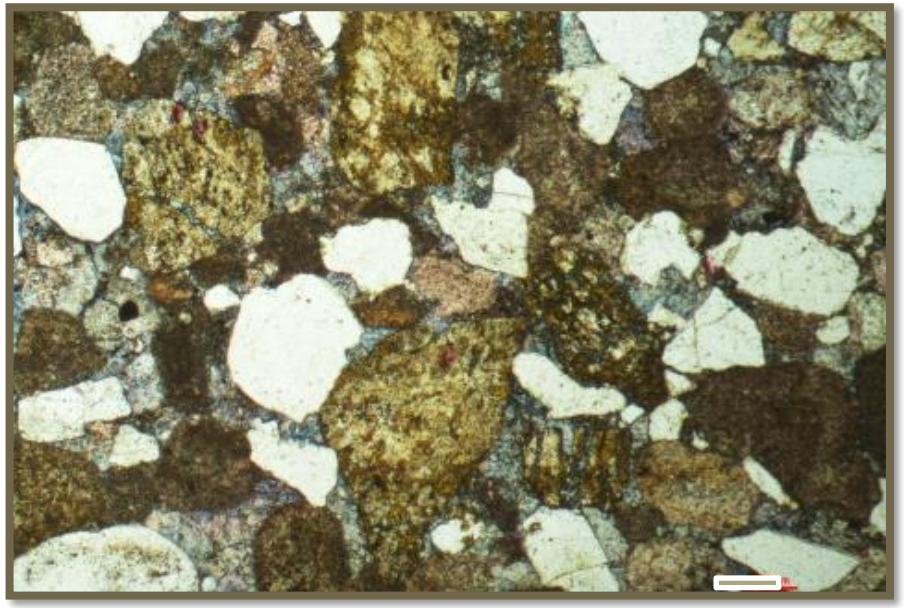


1. Pebble quantification

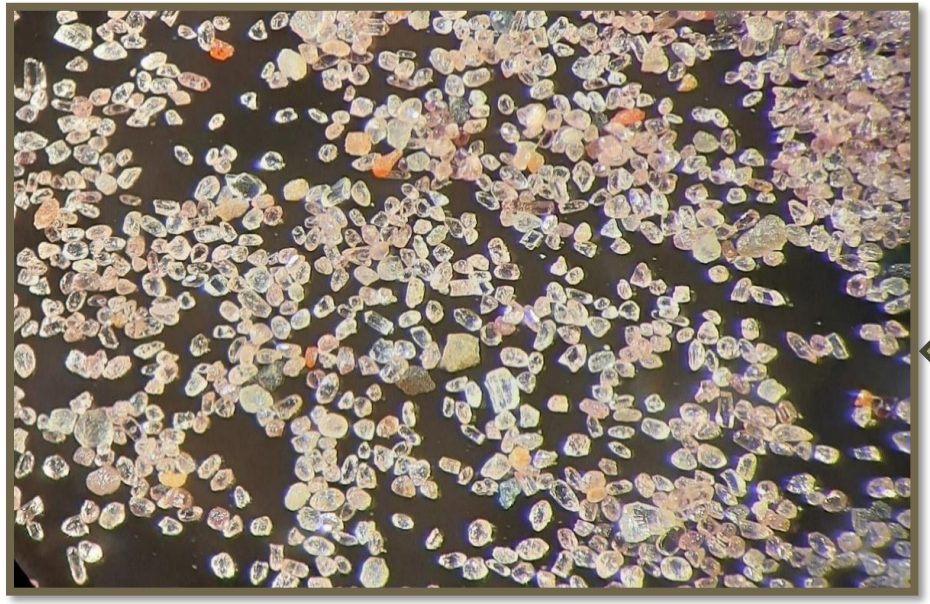
2. Compositional characterisation



3. Petrographic analysis

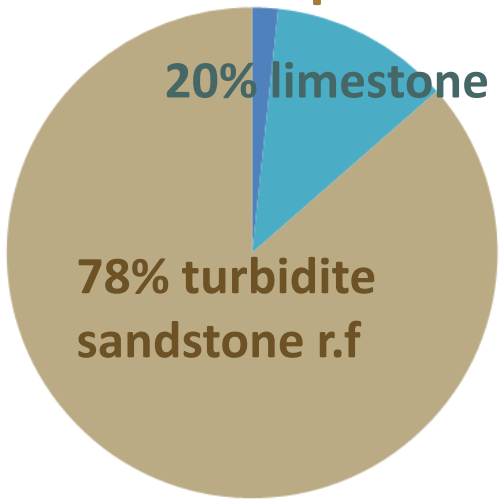


4. Detrital zircon geochronology

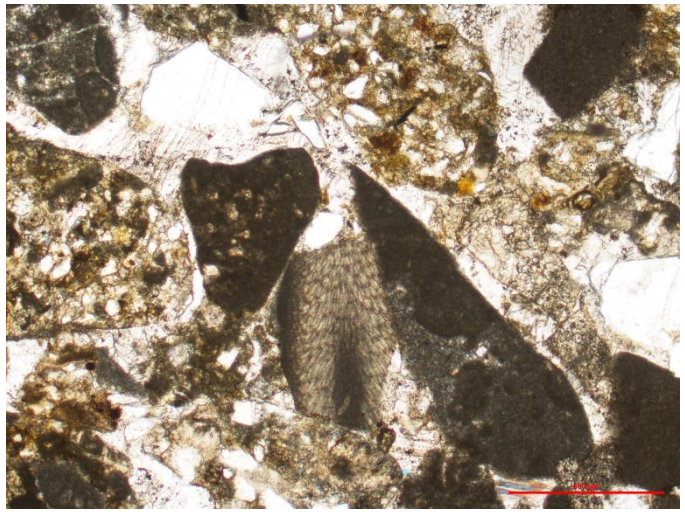


Results for the Jaca basin (Oligocene-Miocene)

Pebble composition

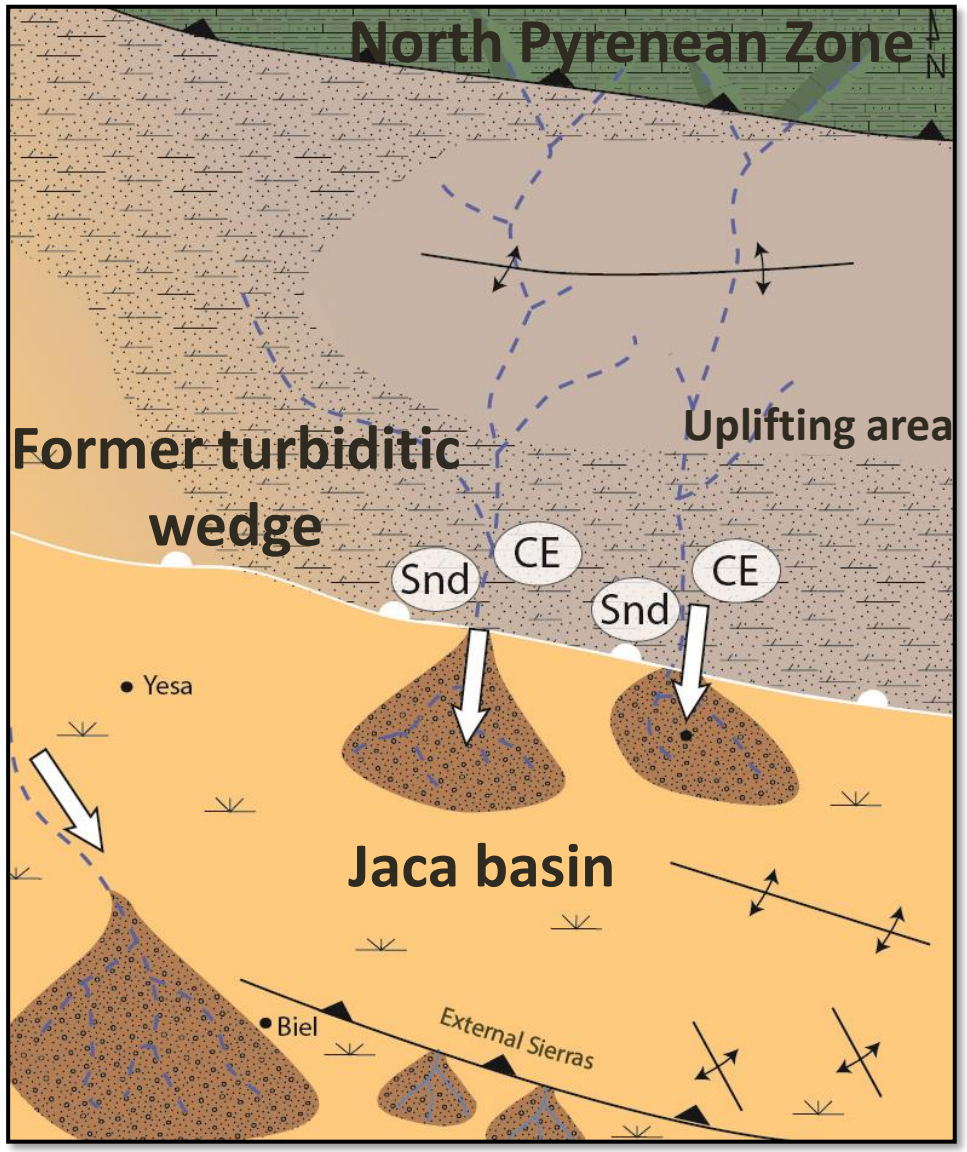


Sandstone petrography



Carbonate r.f., sandstone r.f.

Paleogeography and source area composition



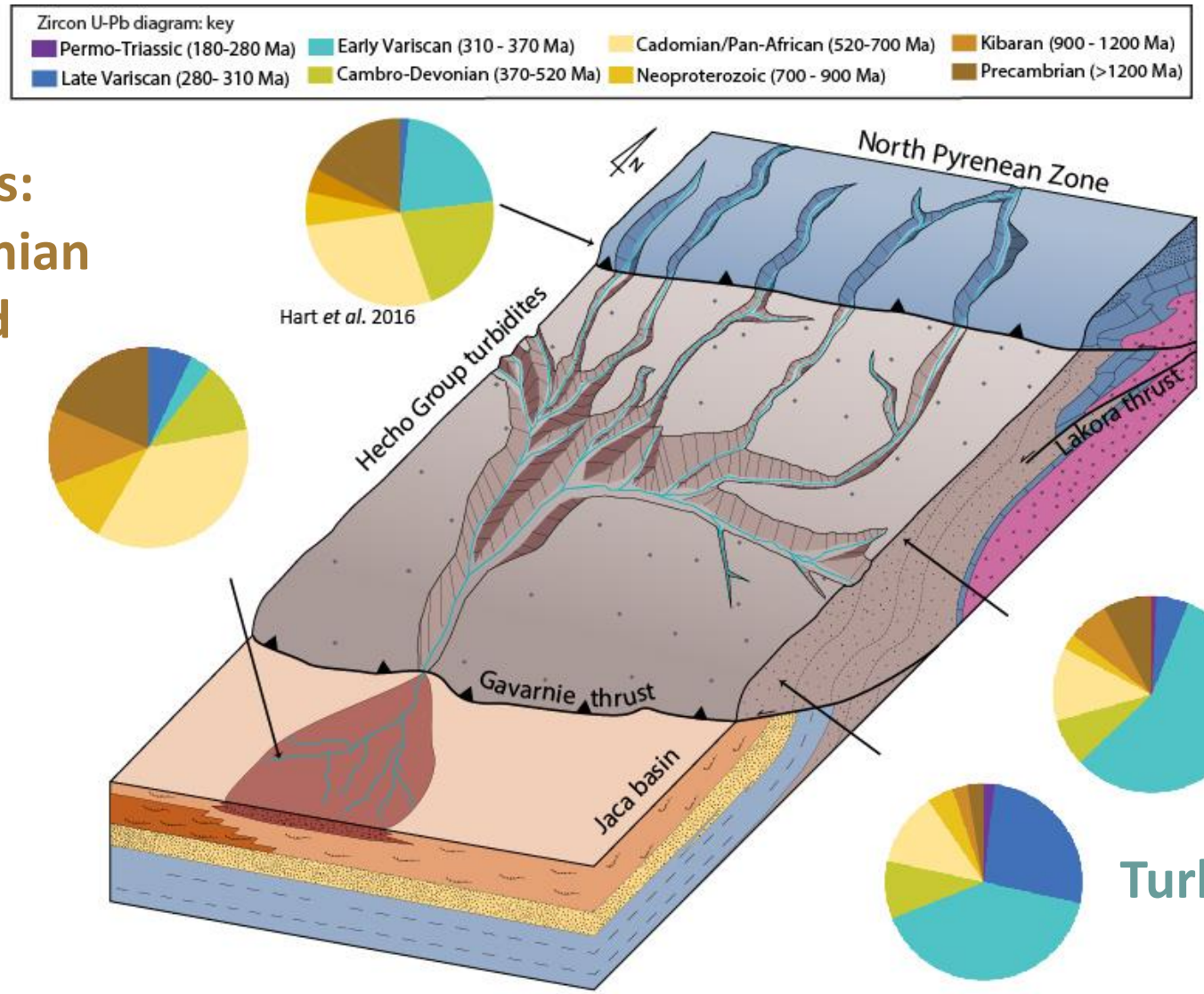
Results for the full-terrestrial basin (Oligocene-Miocene)

Detrital zircon U-Pb

Alluvial fans: cambro-devonian dominated

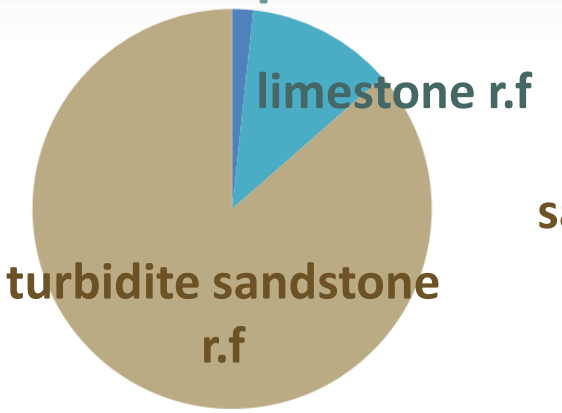
DZ Turbidites signal ≠ DZ Alluvial fan signal

Why?



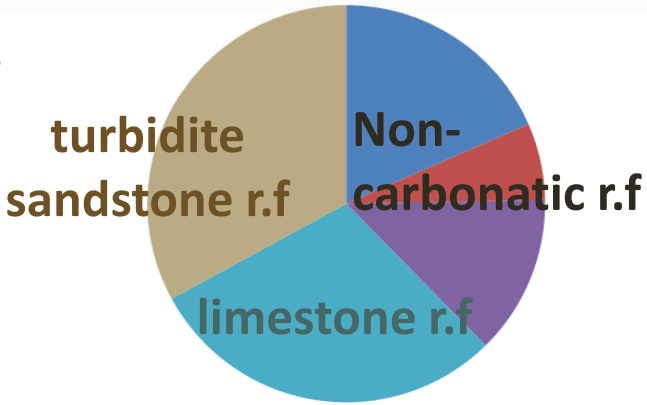
Turbidites: variscan dominated

Pebble composition



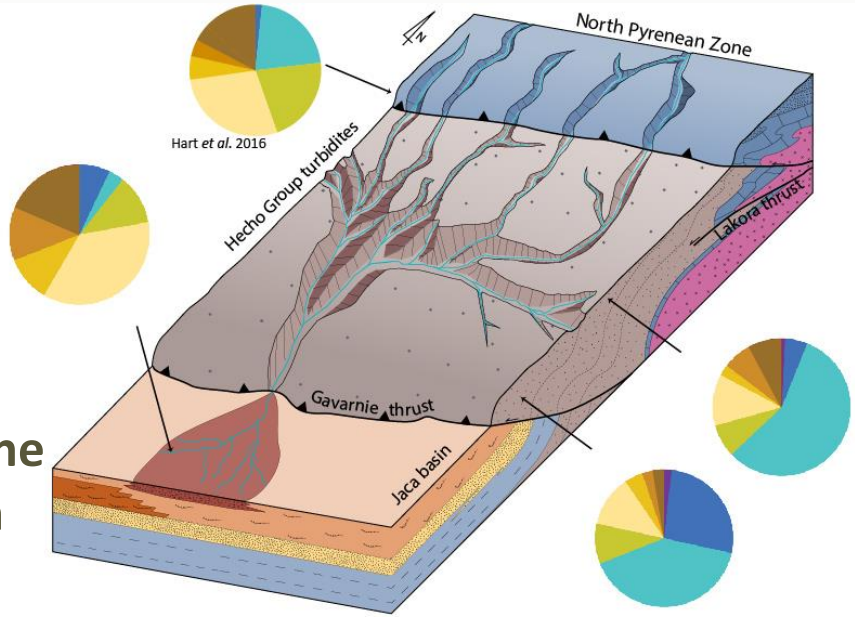
↑ of the turbidite clasts in the coarser fractions

Sandstone Petrography (matrix)



DZ geochronology and sandstone petrography detect the North Pyrenean Zone signal

Detrital zircon U-Pb

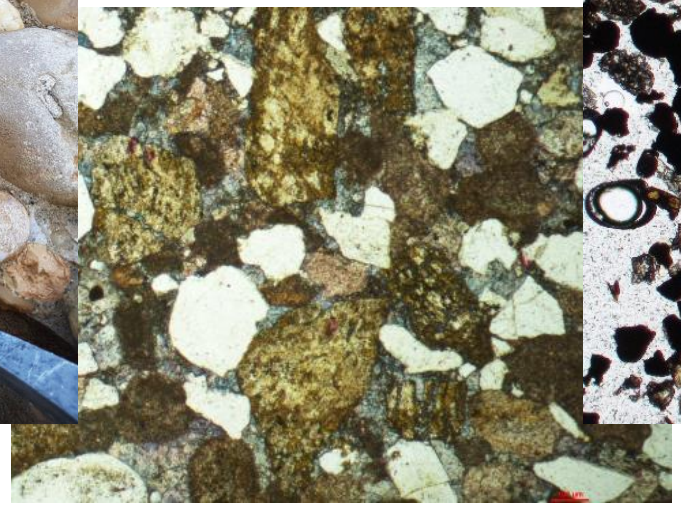


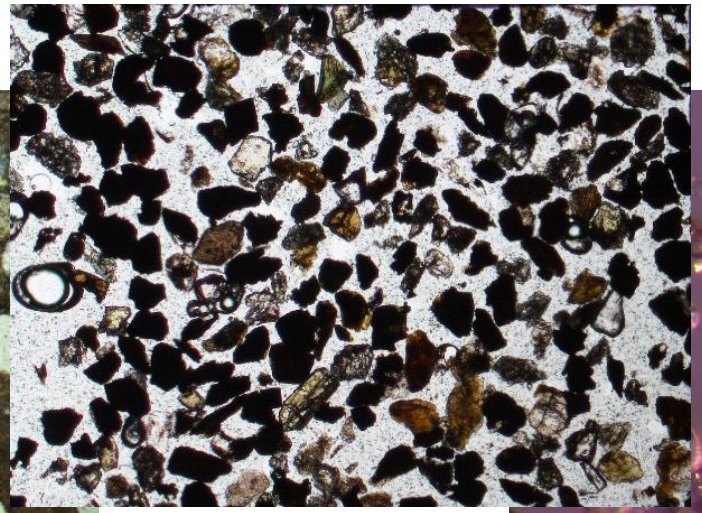
Possible controls:

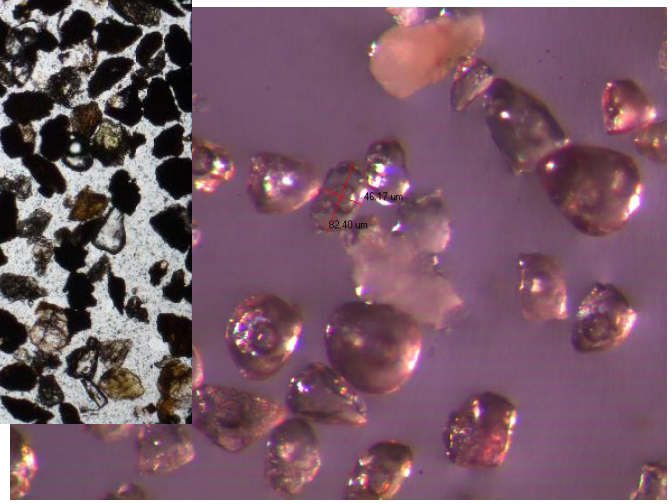
- ✓ Cementation and transport distance
- ✓ Rapid uplift and temperate climate
- ✓ Position in the drainage area

Which tool is better representing the source area?

- The provenance analysis → source area = previous turbiditic basin+cover and basement rocks.
- Detrital zircon populations do not reflect the source area rock distribution.
- Intrinsic factors control the provenance signal propagation in alluvial environments.
- The multi-method approach is crucial when it comes to deciphering signals of ambiguous provenance. Need to learn from modern settings.







Pebble characterisation + ***Sandstone petrography*** + ***Heavy minerals*** + ***Geochronology***


Thanks for your attention
¿Questions?