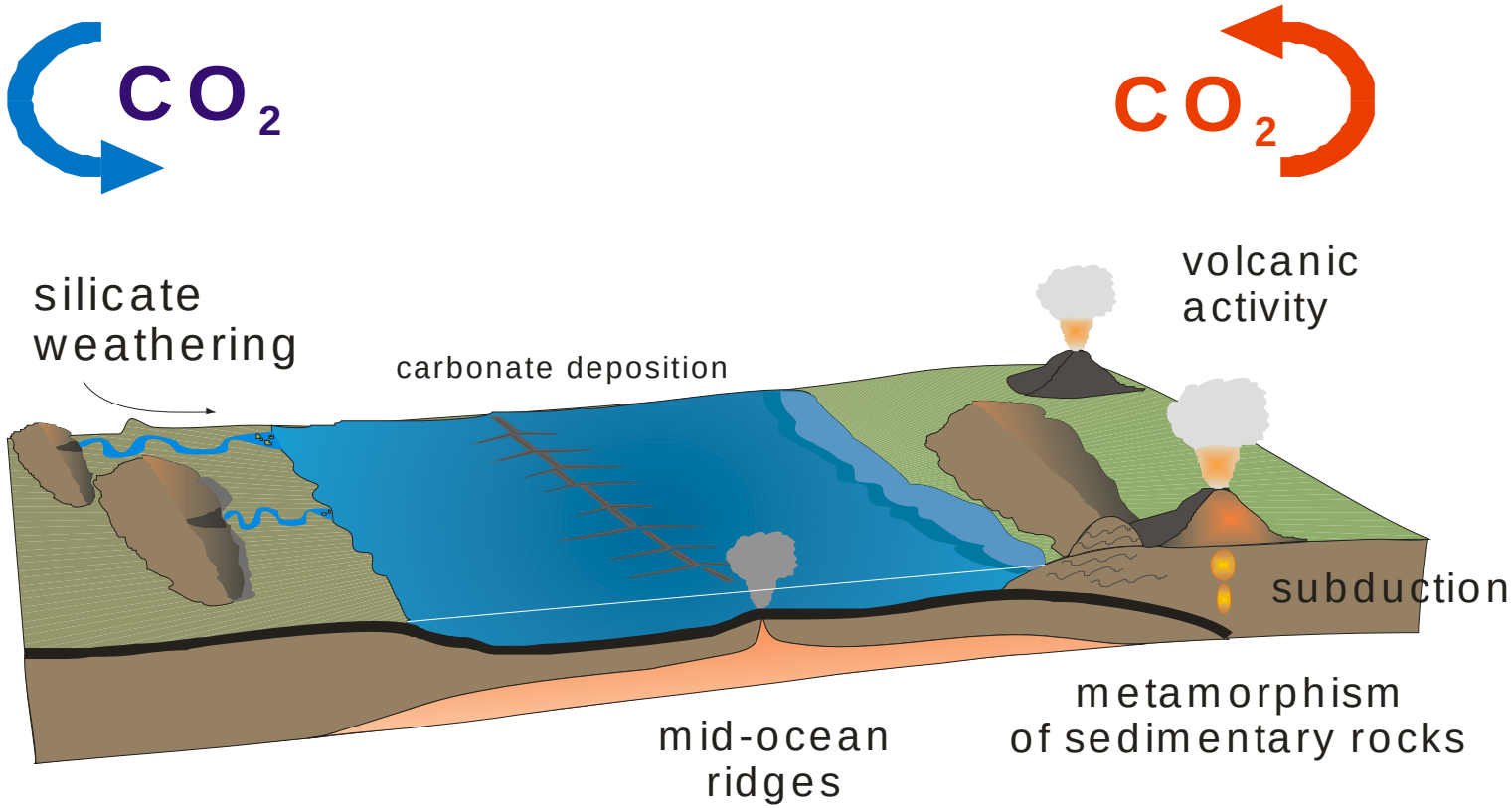
ANR ECO-MIST [2011-2015]

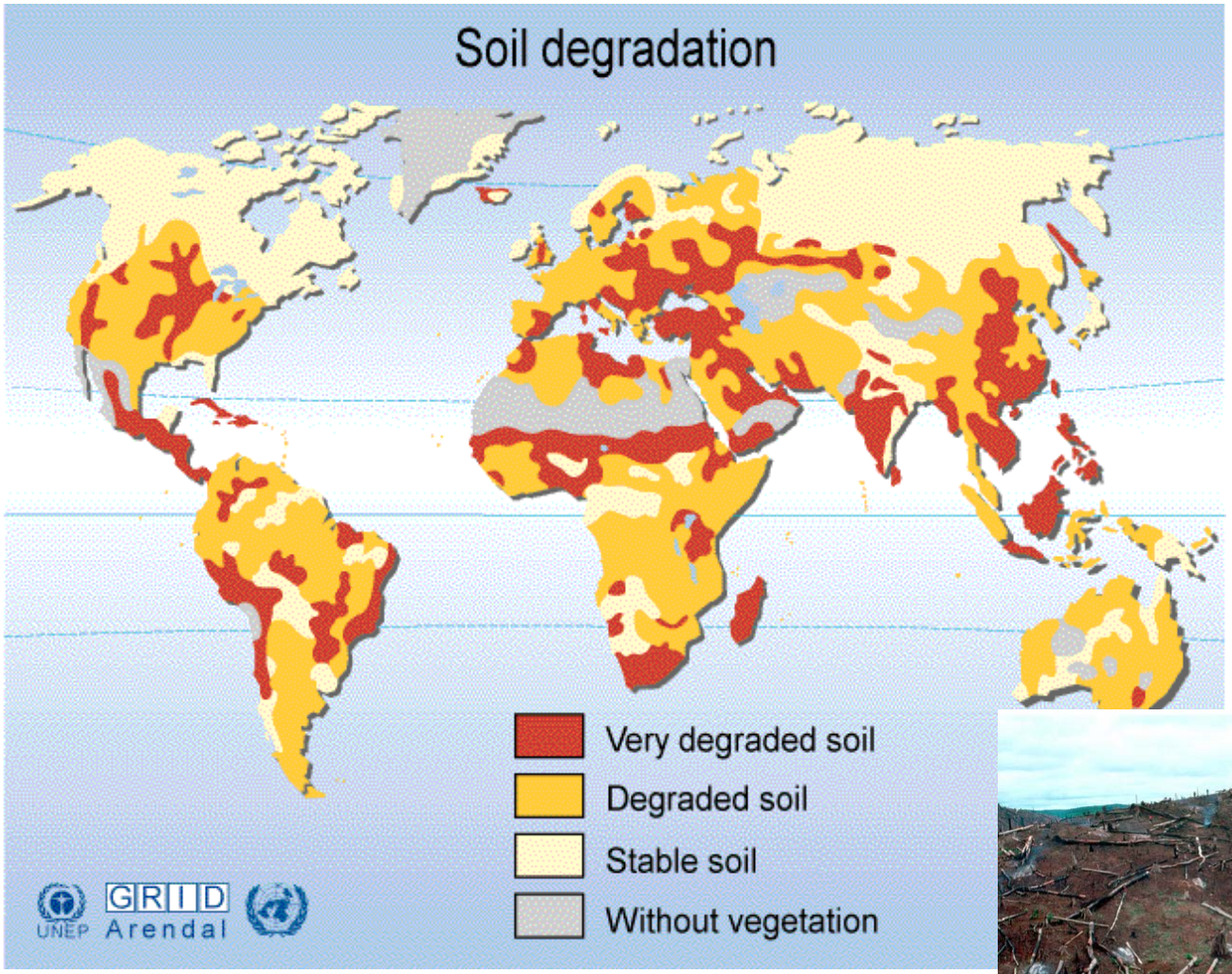
Erosion of the COntinents
investigated using
novel Molecular and ISotopic Tracers

- The composition of soils is controlled by local climate, vegetation, topography and geology…

Major sink of atmospheric CO_2 over geological times

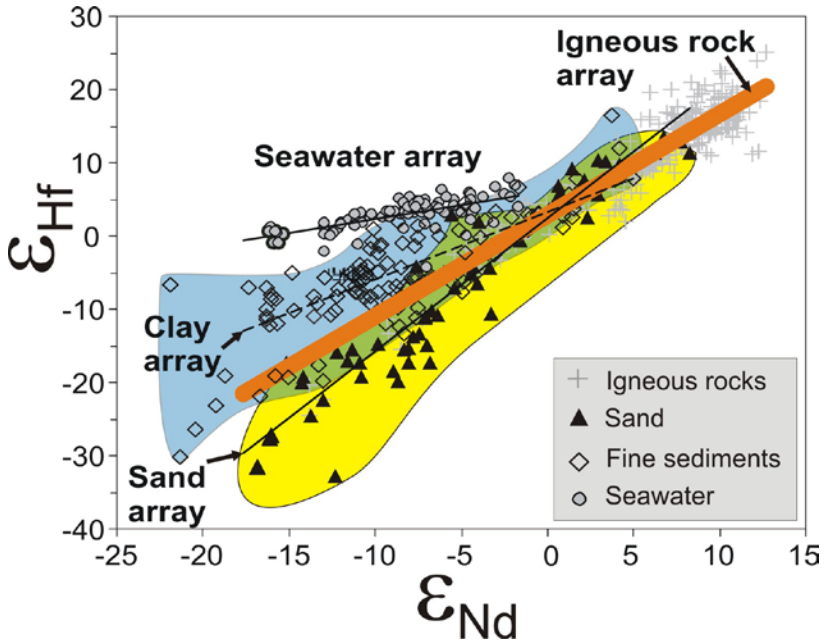


Human land-use increases erosion



Novel isotopic and molecular tracers

- **Hf and Nd isotopes in fine-grained sediments.** A proxy for silicate weathering intensity



- **BIT-index**. past river discharges (relative amounts of riverine vs marine organic matter)

- **GDGTs**. past annual mean air T°C and soil pH

Objectives ANR ECO-MIST

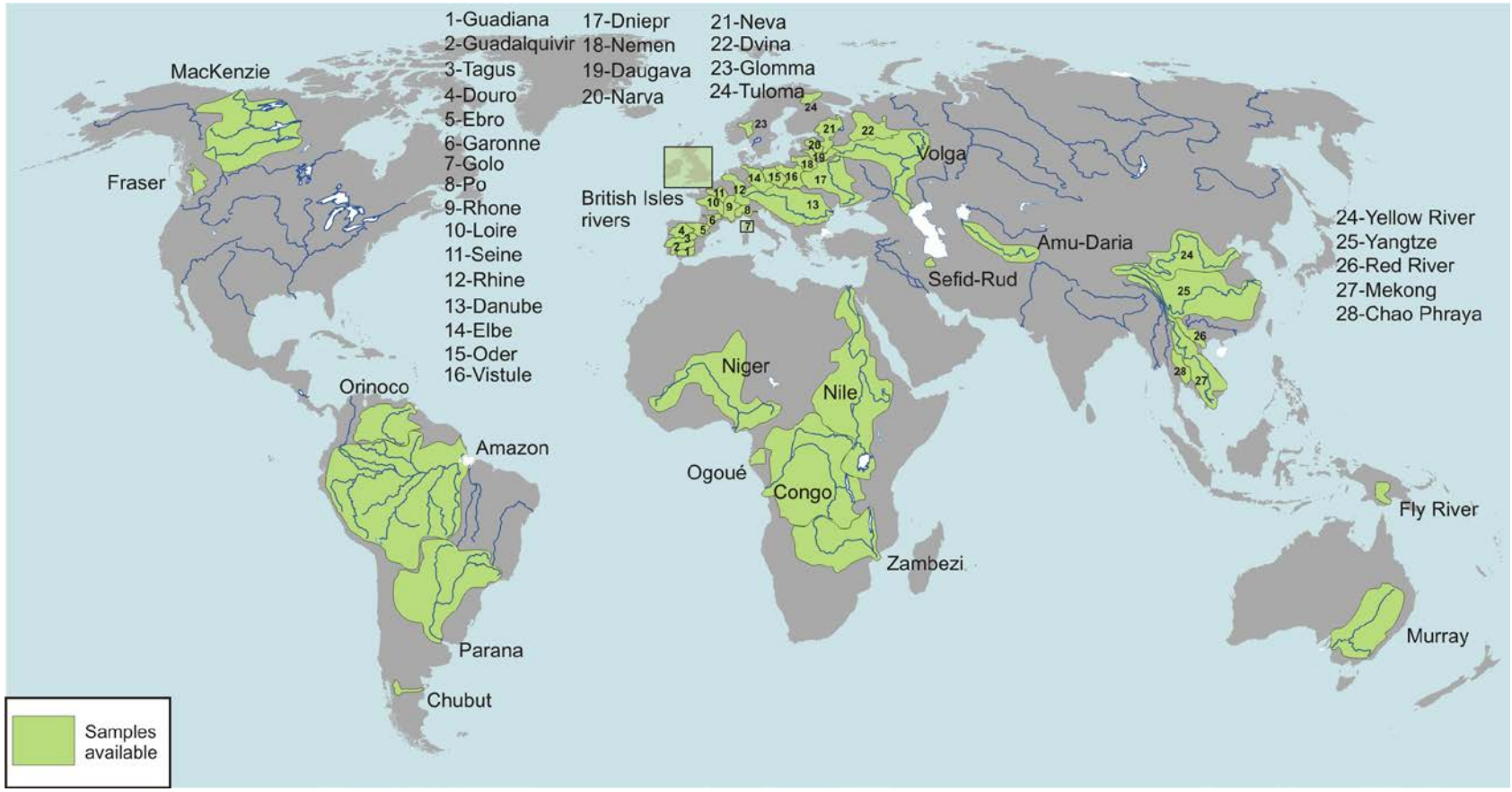
- **Part 1**: **Proxy calibration**

To determine the factors controlling the distribution of Hf-Nd isotopes and biomarkers in sediments

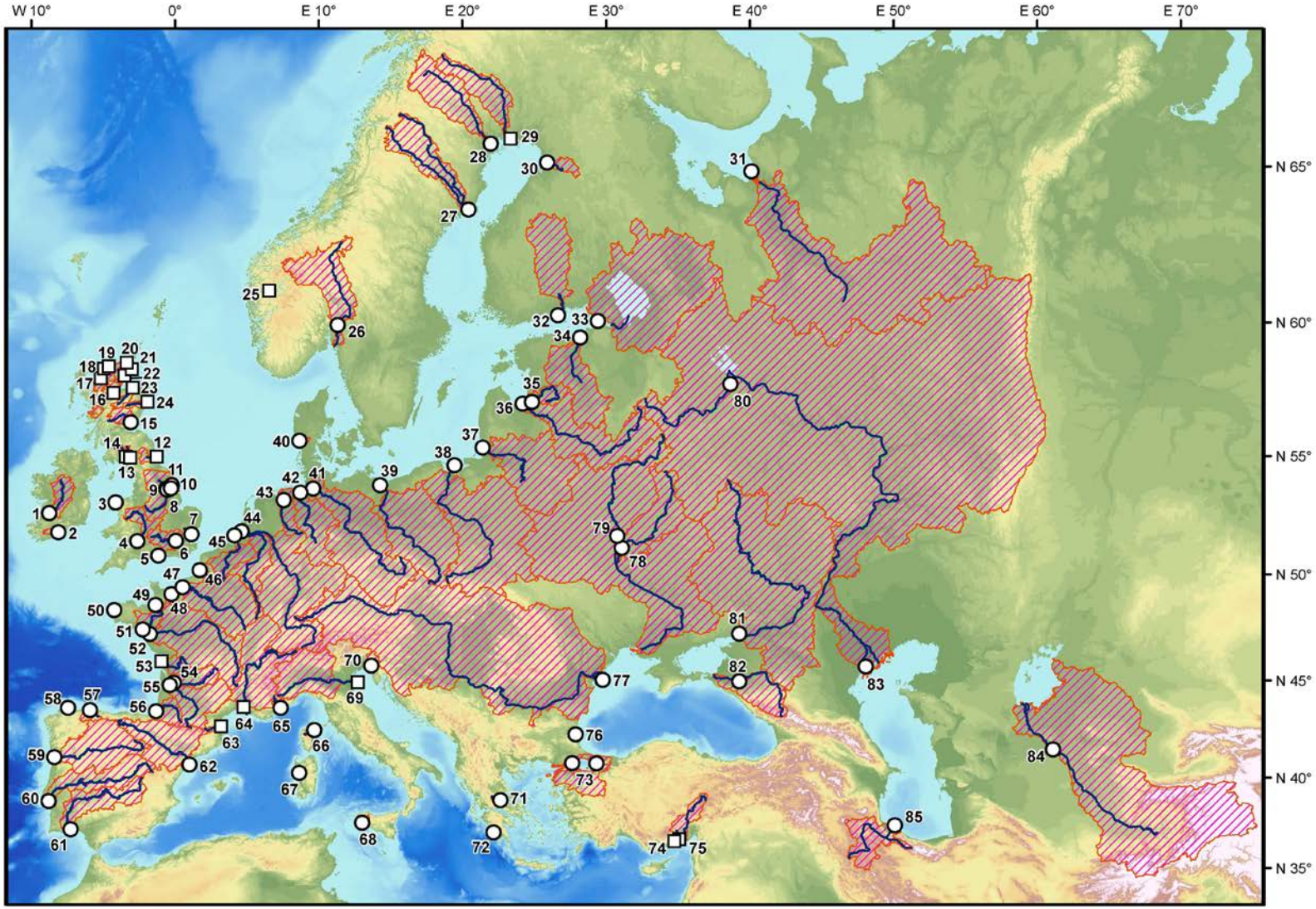
- **Part 2**: **Applications**

To assess the impact of Late Quaternary climate change on continental weathering

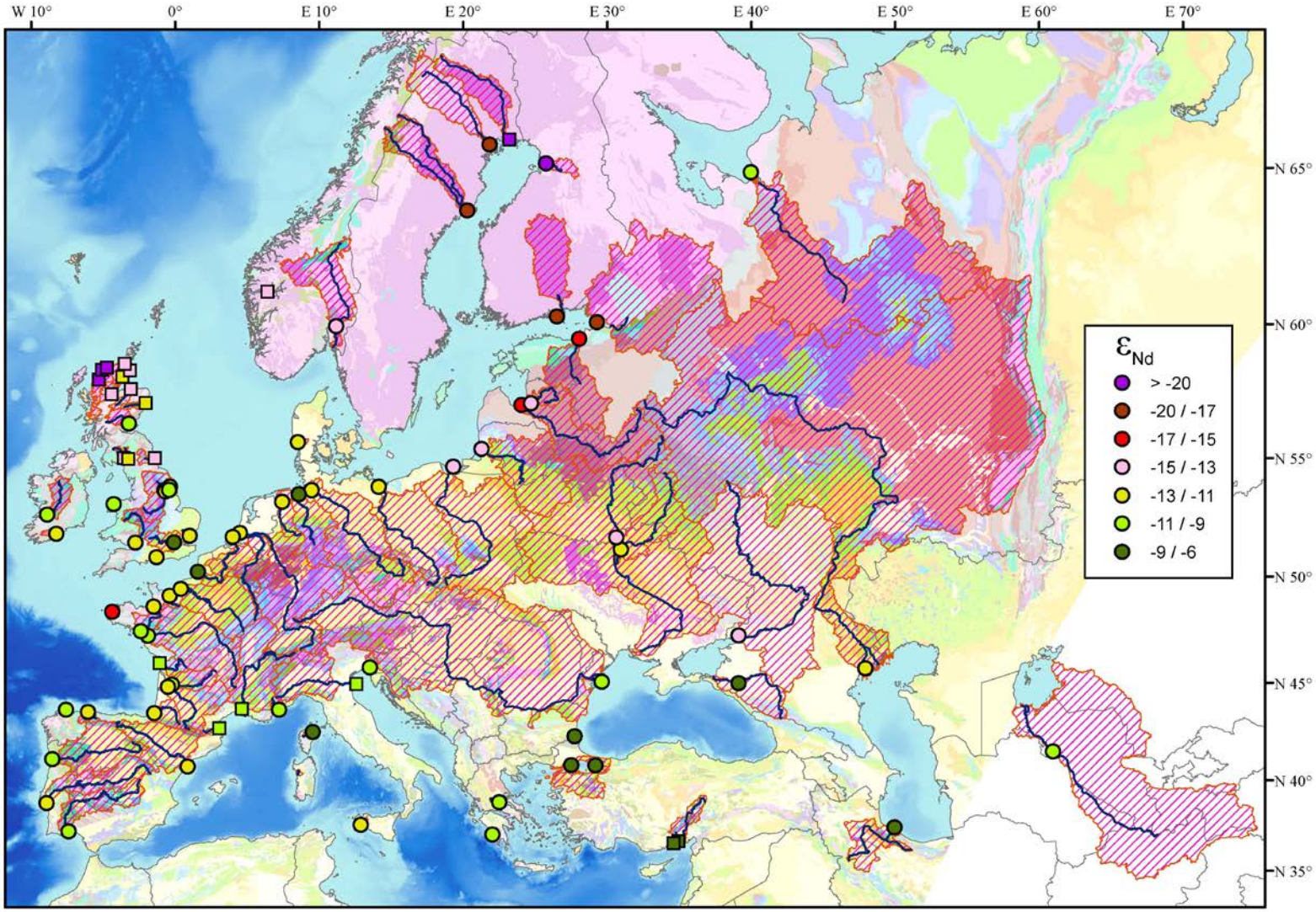
Task 1: World survey of Hf-Nd isotopes and biomarkers in river-borne sediments



Analyses of modern sediments will help in assessing the potential of the studied tracers as weathering proxies.



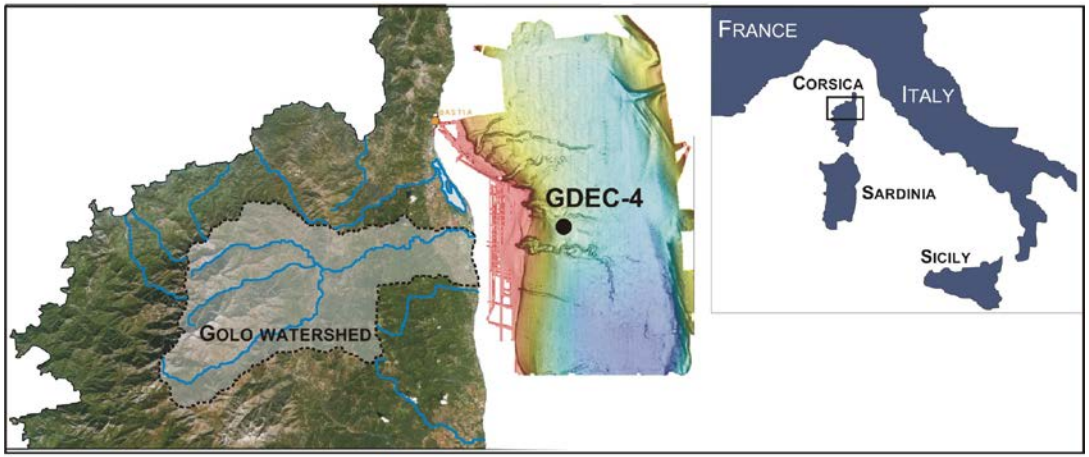
Geodesic system : WGS84 ; projection : Mercator 55°N

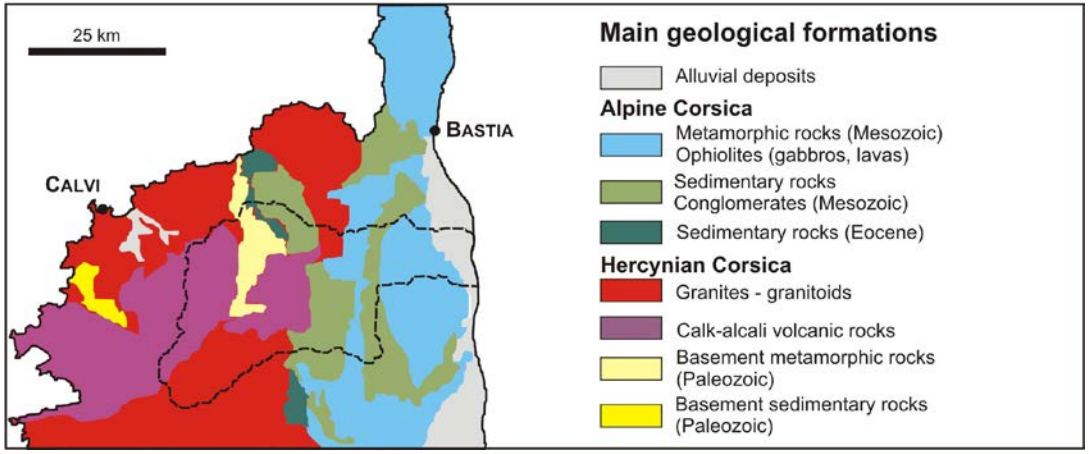


A global distribution map of Nd isotopes in European river basins: Application to Quaternary sciences (Toucanne et al., submitted)

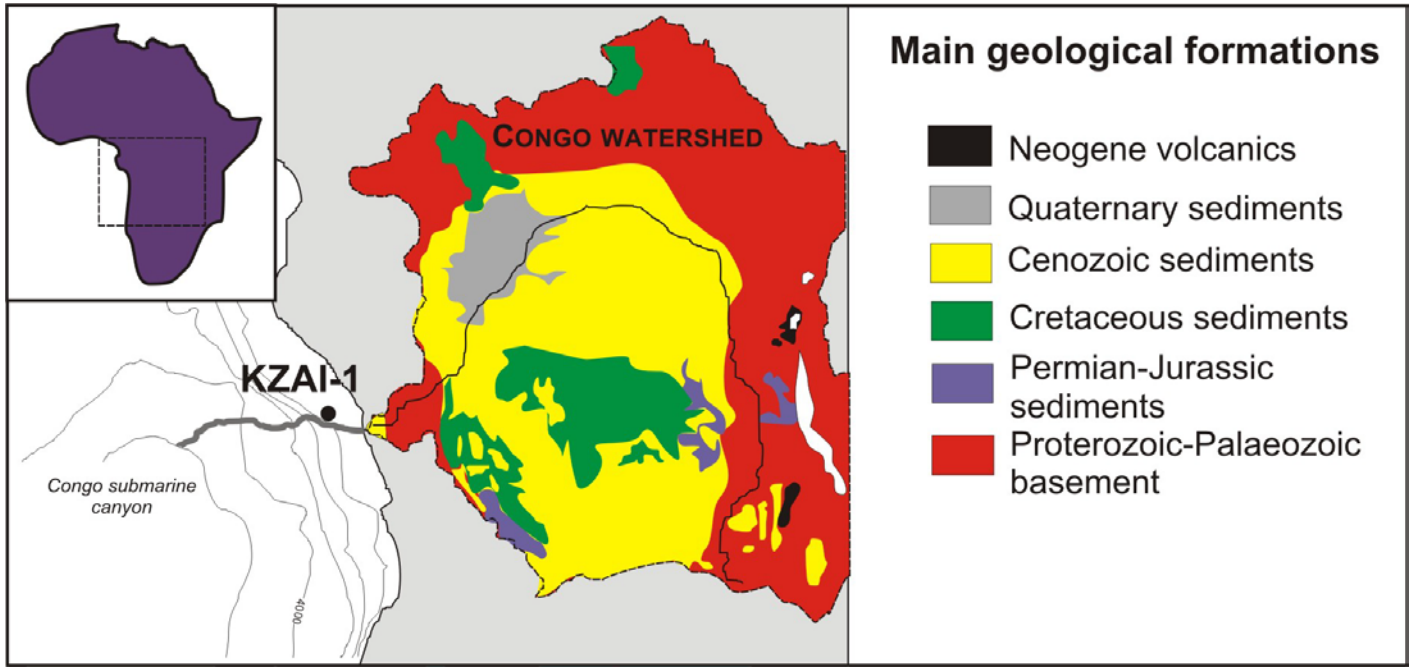
Task 3: Application – Case study of a 125m-long drill core from the Corsican margin

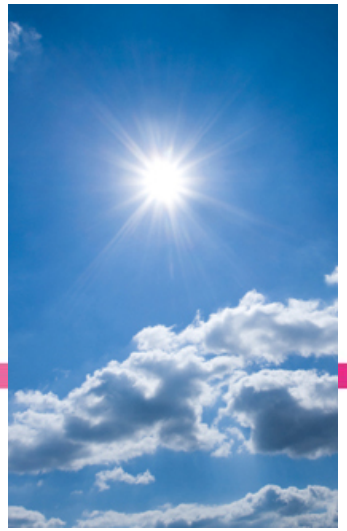
Thèse: N. Freslon (encadrants: G. Jouet, G. Bayon, G. Ménot)

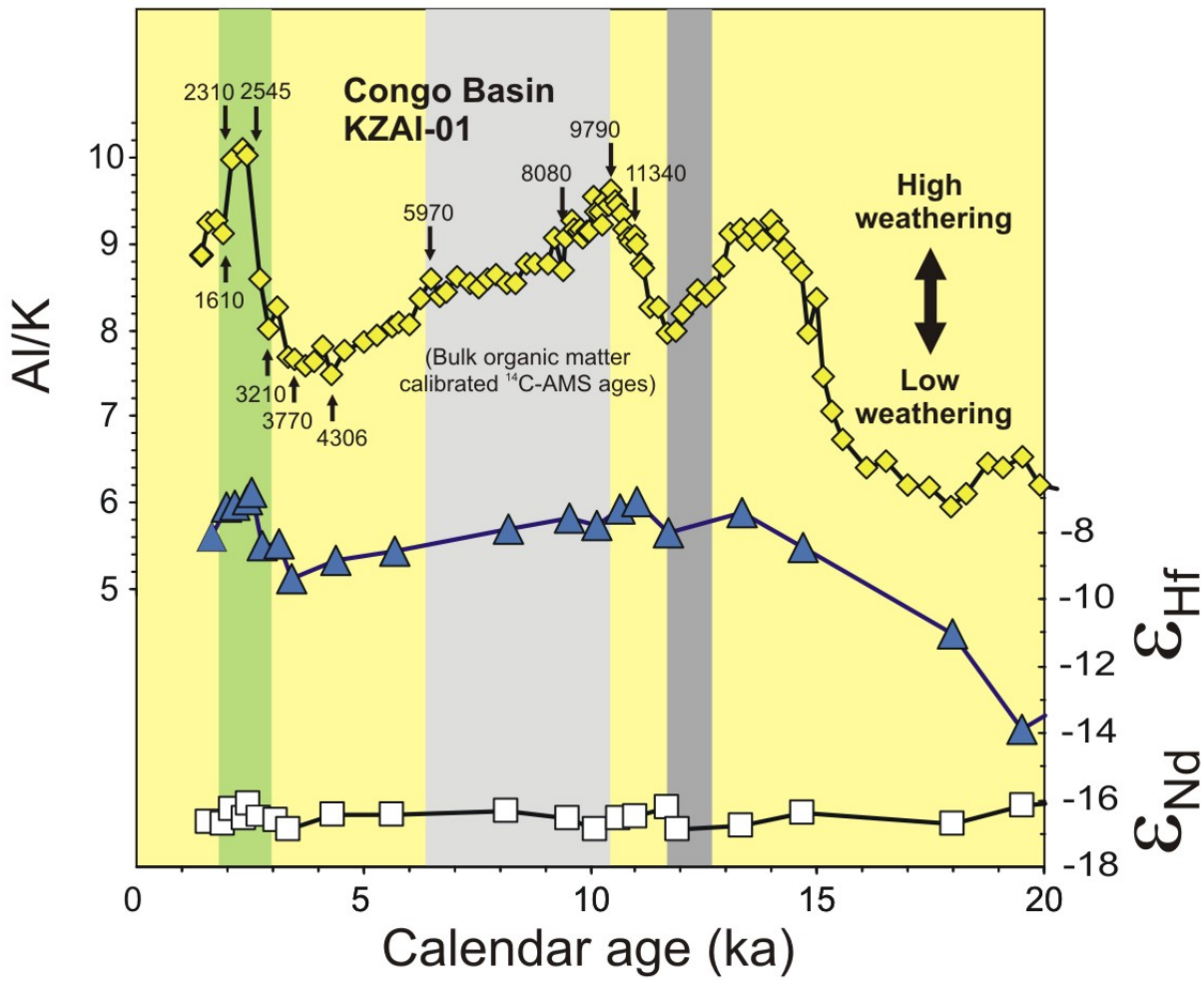




Task 4: Application – Controls on chemical weathering in Central Africa – Late Quaternary

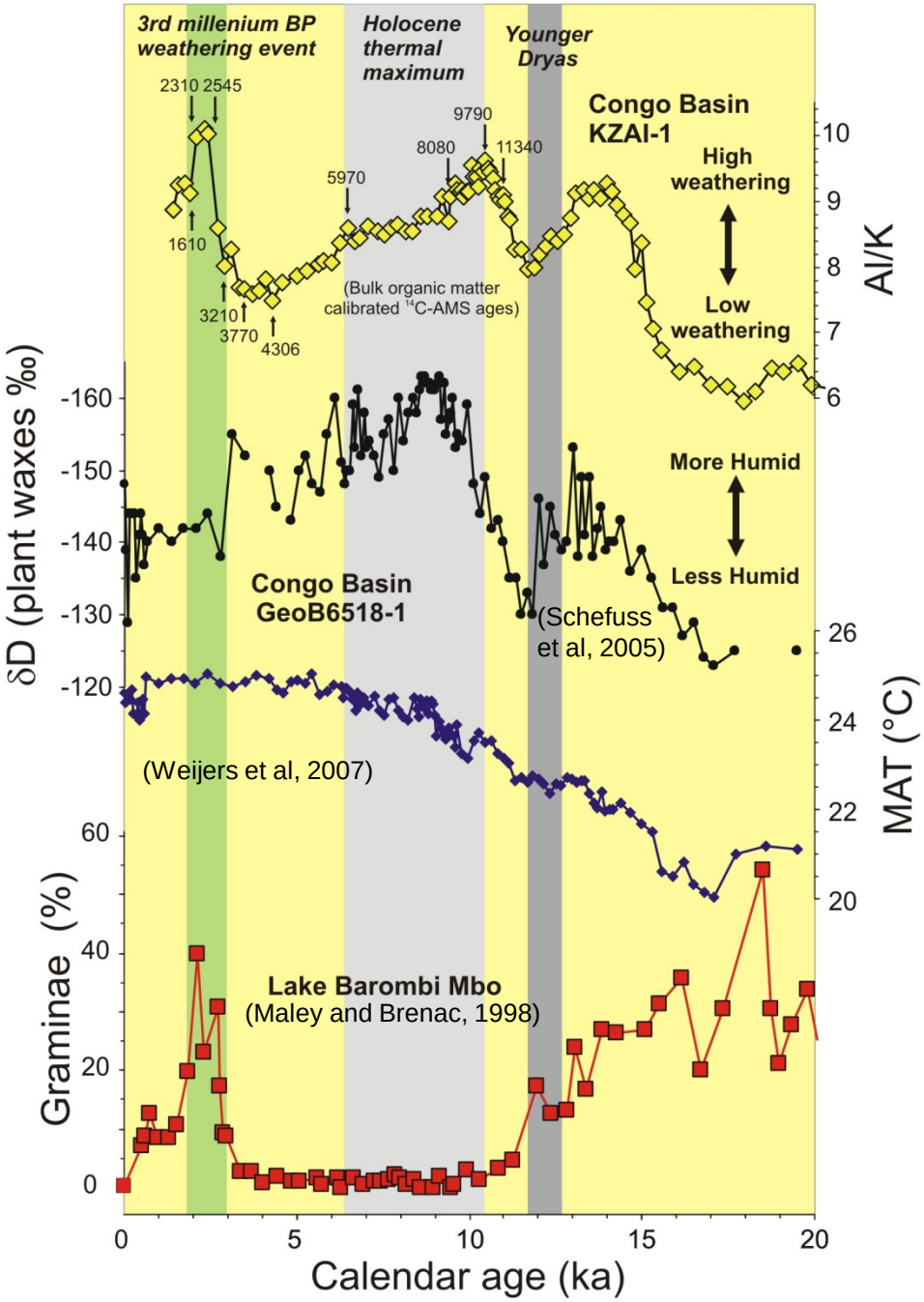






- **Nd isotopes**: unchanged sediment provenance
- **Hf isotopes and Al/K ratios:**

tracers of chemical weathering intensity



- **From 20 to 3 kyr ago:** Coupling between climate and weathering

- **After 3 kyr:** Climate and chemical weathering are decoupled

- Intensification of soil erosion/weathering related to **onset of agriculture**

(Bayon et al., 2012)