



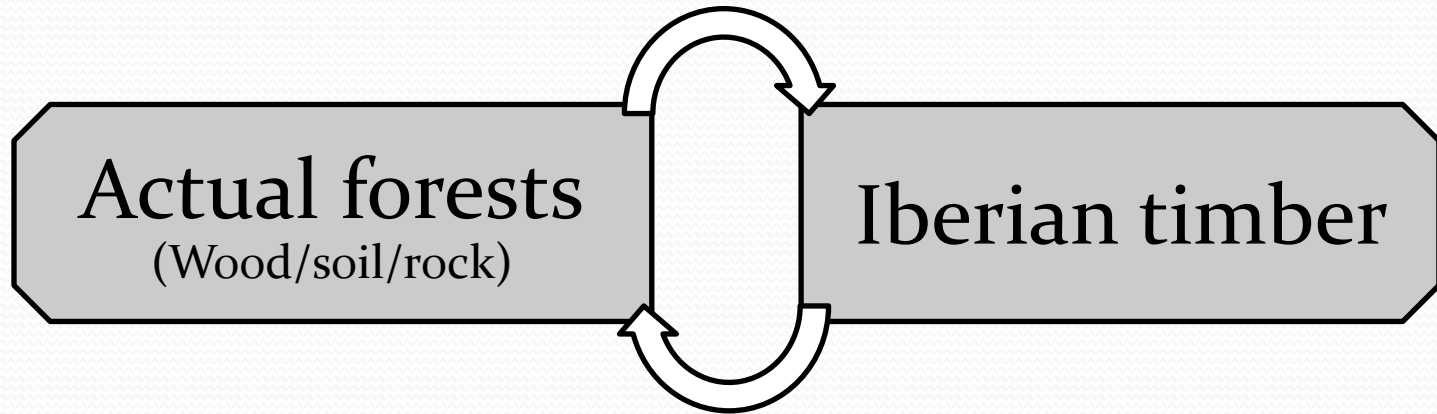
Fadi HAJJ

ESR 12: Geochemical fingerprinting of potential source areas of wood from shipwrecks



Objective of the PhD: Trace the provenance of wood from shipwrecks using geochemical tracers

Compare geochemical signatures



Geochemical tracers

- Strontium isotopes
- Trace elements (ex: Ba)
- Major elements

Geographical indicators of provenance?

Strontium isotopes

- stable isotopes used:



$^{87}\text{Sr}/^{86}\text{Sr}$ variable with

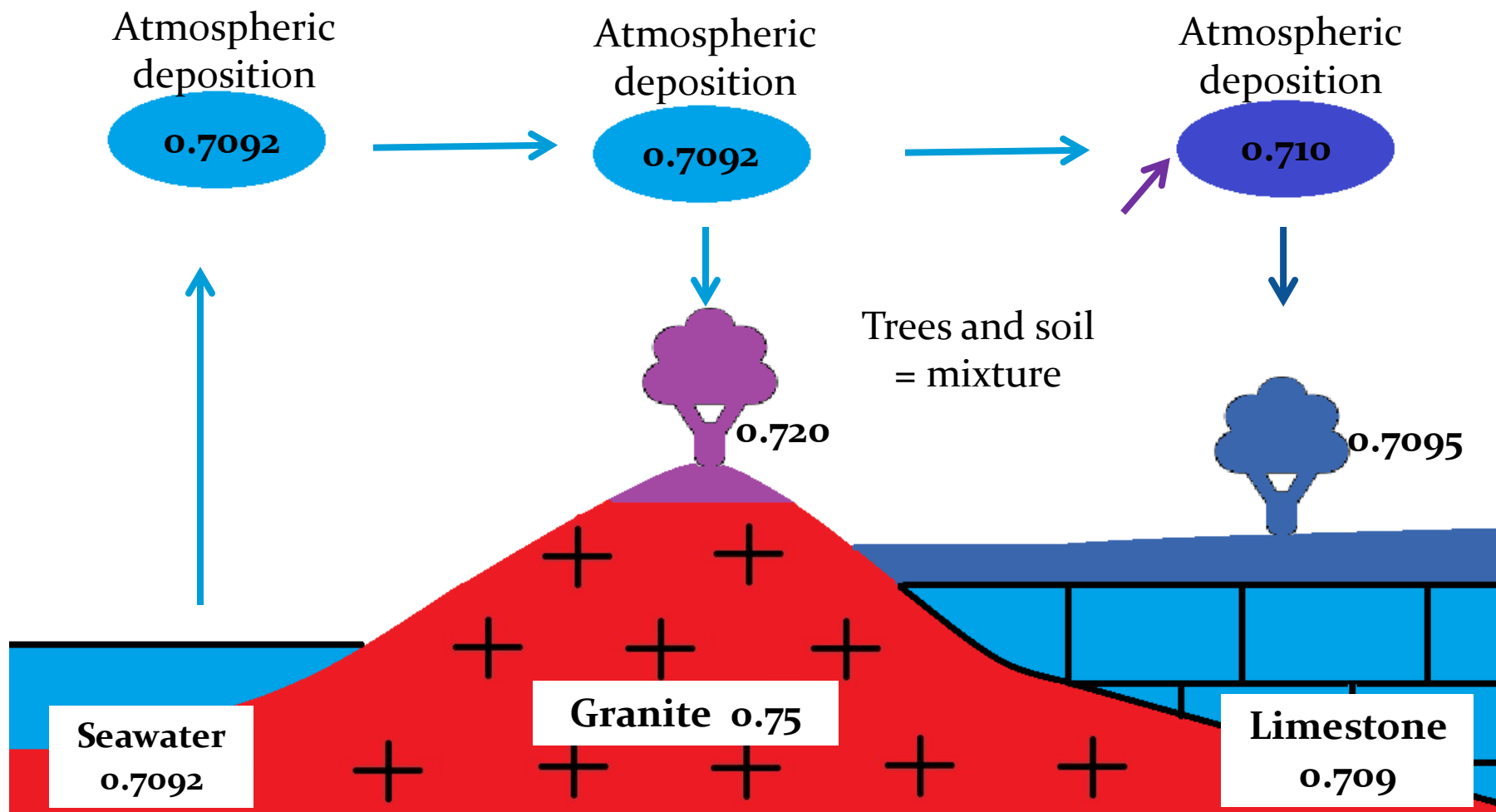
- the age of rocks
- the type of rocks
- their content in minerals rich in Rb

- Good tracer of provenance:

- No measurable fractionation

- Two general sources in the non anthropogenic sites

Schematic isotopic variation between rocks and trees

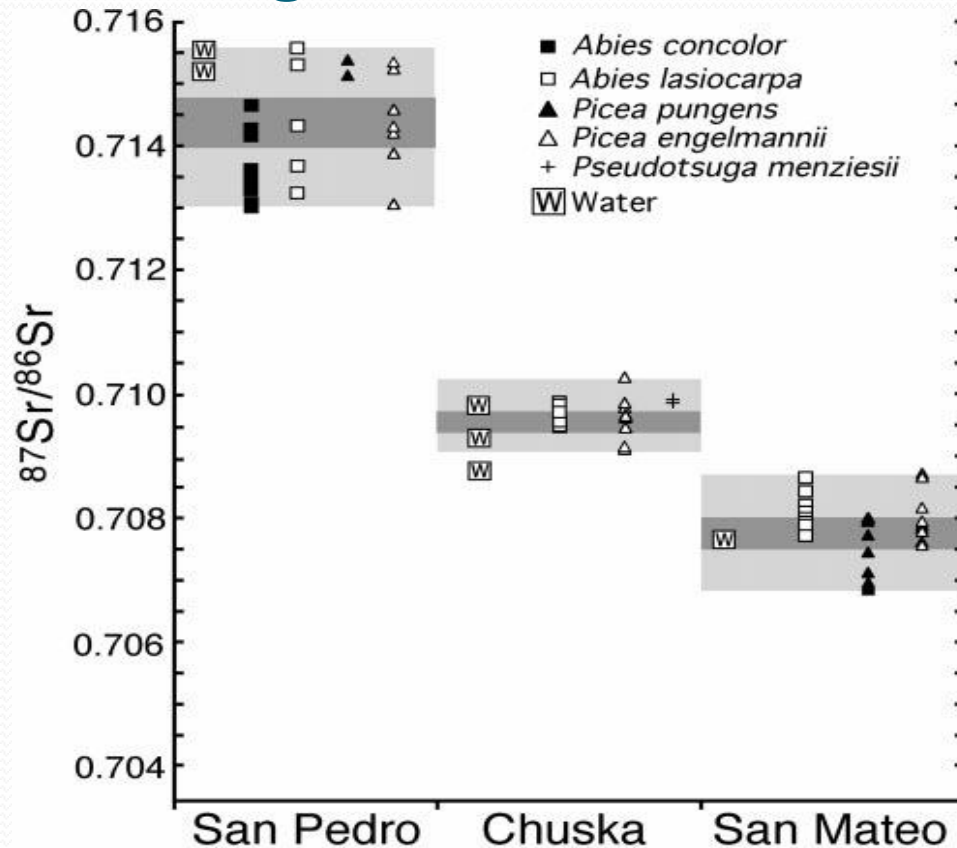


Different $^{87}\text{Sr}/^{86}\text{Sr}$ in trees on different rocks

Conditions for using the tracer

- Wood geochemical signature should be:
 - Statistically homogeneous on the same site
 - Statistically different between different sites

Example of similar approach in archaeological wood from buildings



English et al., 2001

$^{87}\text{Sr}/^{86}\text{Sr}$ also used to trace provenance in other archaeological studies (bones materials, ancient wood from cedar ships)

First questions ?

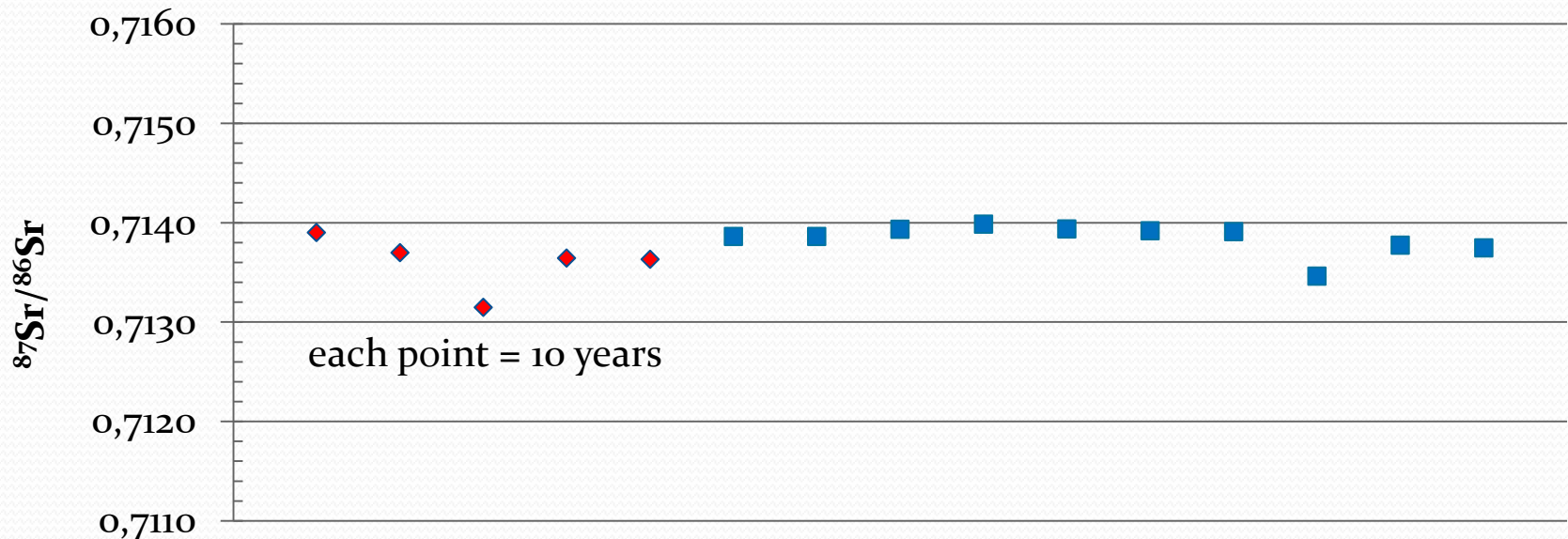
- Do we have different types of rocks in the different Spanish potential wood sources?



First questions ?

- Is the isotopic signature of the wood from actual forests representative of the ancient forests?

First results: analyze of wood from Segovia cathedral

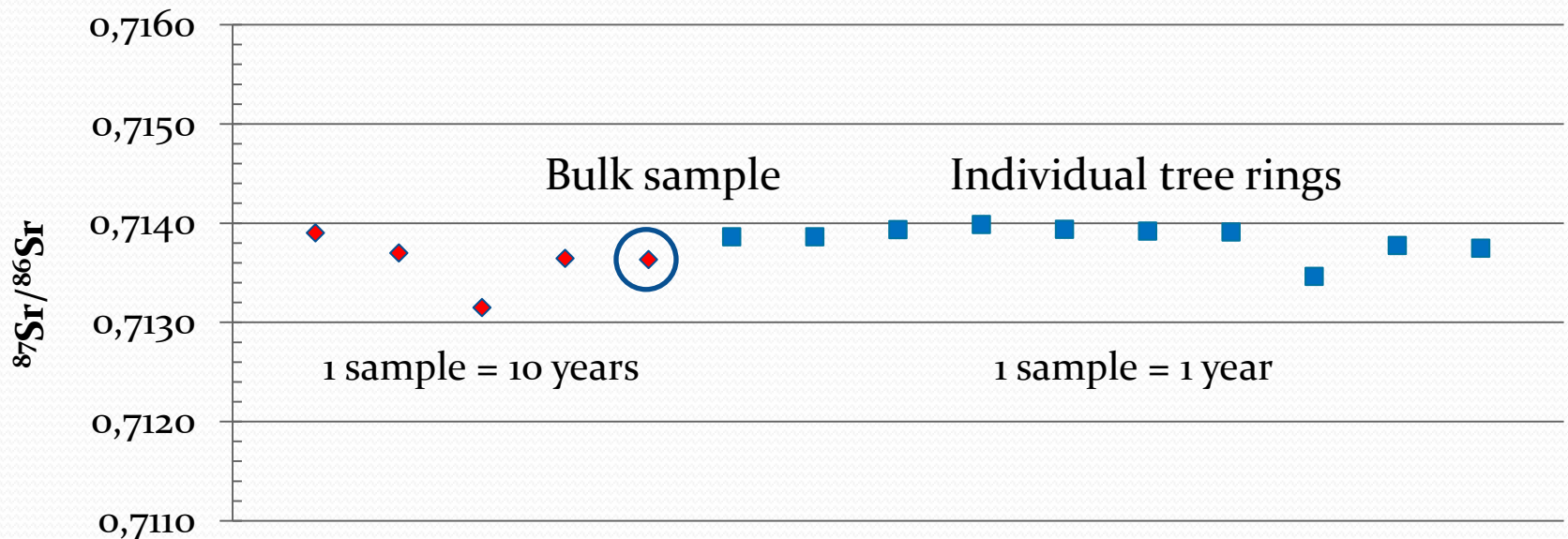


No clear variation on a 50 years period

→ We plan analysis on longer periods to check the stability

- Is the isotopic signature of one tree ring equivalent to a group of tree ring?

First results: analyze of wood from Segovia cathedral

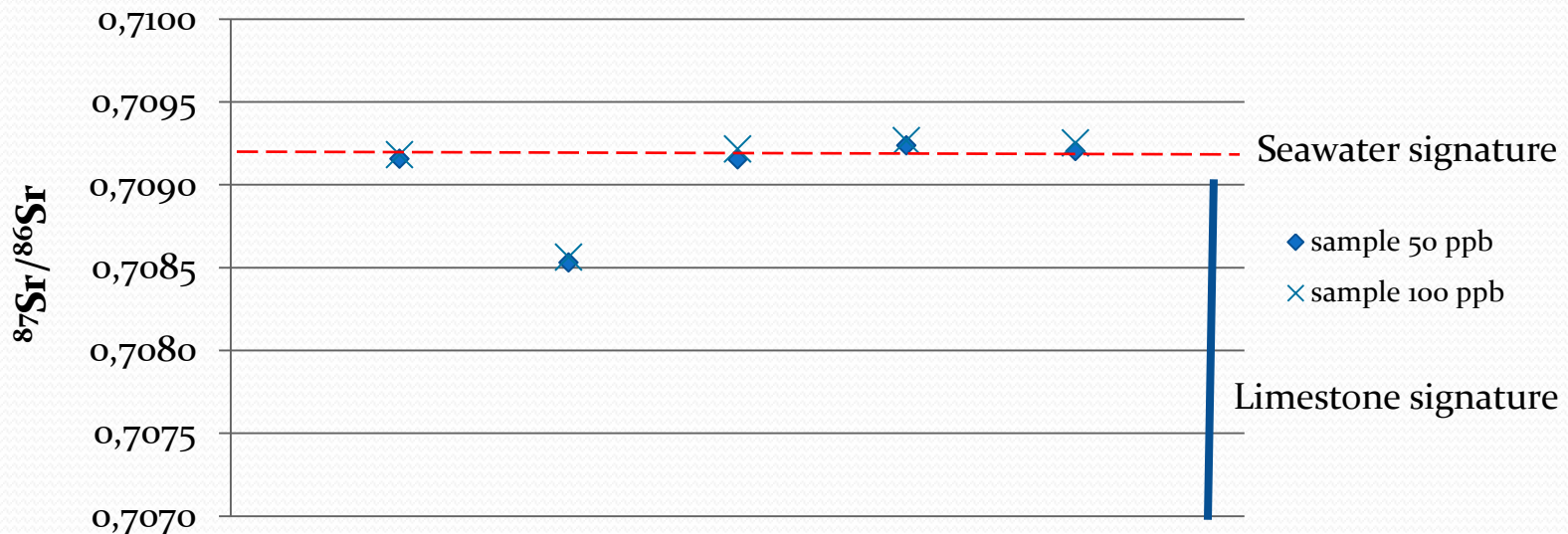


**No clear variation between bulk and individual tree rings
→ We plan analysis of tree ring groups**

First questions ?

- Is the concentration and signature of the wood from shipwrecks that resided 3 centuries in the oceans conserved?

First results: analyze of wood from shipwrecks of unknown origin



Does it mean marine strontium incorporation? Or trees grown on limestone?

Next steps

- Wood from shipwreck
 - Big pieces of wood to compare signature from surface to the center (non affected?)
- Experimental test of wood signature evolution in seawater with time
- New analysis of wood from shipwrecks (with known origin) without Sr from marine origin

PLEASE ... WE NEED SAMPLES!

- Wood from actual forests
 - Analysis of wood sampled in November 2014
 - First site signature characterization
- Complete data with trace and major elements concentration in samples
- Sampling of more potential sites

PLEASE ... WE NEED INFORMATIONS
ABOUT POTENTIAL SITES!



Thanks for your attention!