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Tracing the transport and flux of iron with four radium isotopes

Half-life: ^{224}Ra – 3.6 days
 ^{223}Ra – 11.3 days
 ^{228}Ra – 5.8 years
 ^{226}Ra – 1600 years

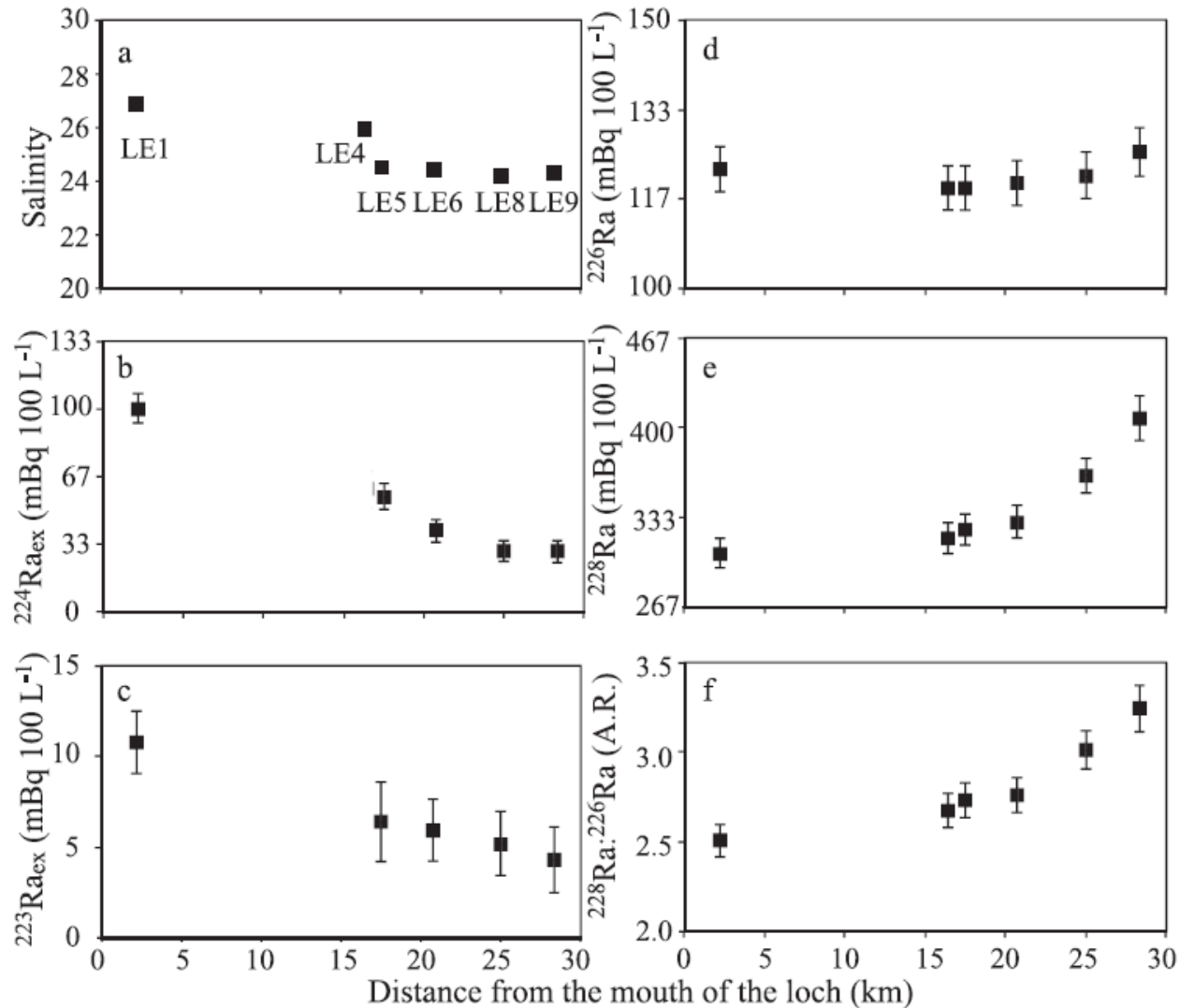
Why radium?

- Natural source in sediments, radioactive, four different half-lives
- Extensive use as a mixing tracer (isopycnal and diapycnal, depending on setting and time scales)
- Used to trace submarine groundwater discharge, “subterranean estuary”
- Determination of iron fluxes (and other dissolved species) from sediments
- Water column inventory allows calculation of flux (averaged over mean life)

→ Best explained with a recent example

Horizontal mixing as reflected in 4 radium isotopes

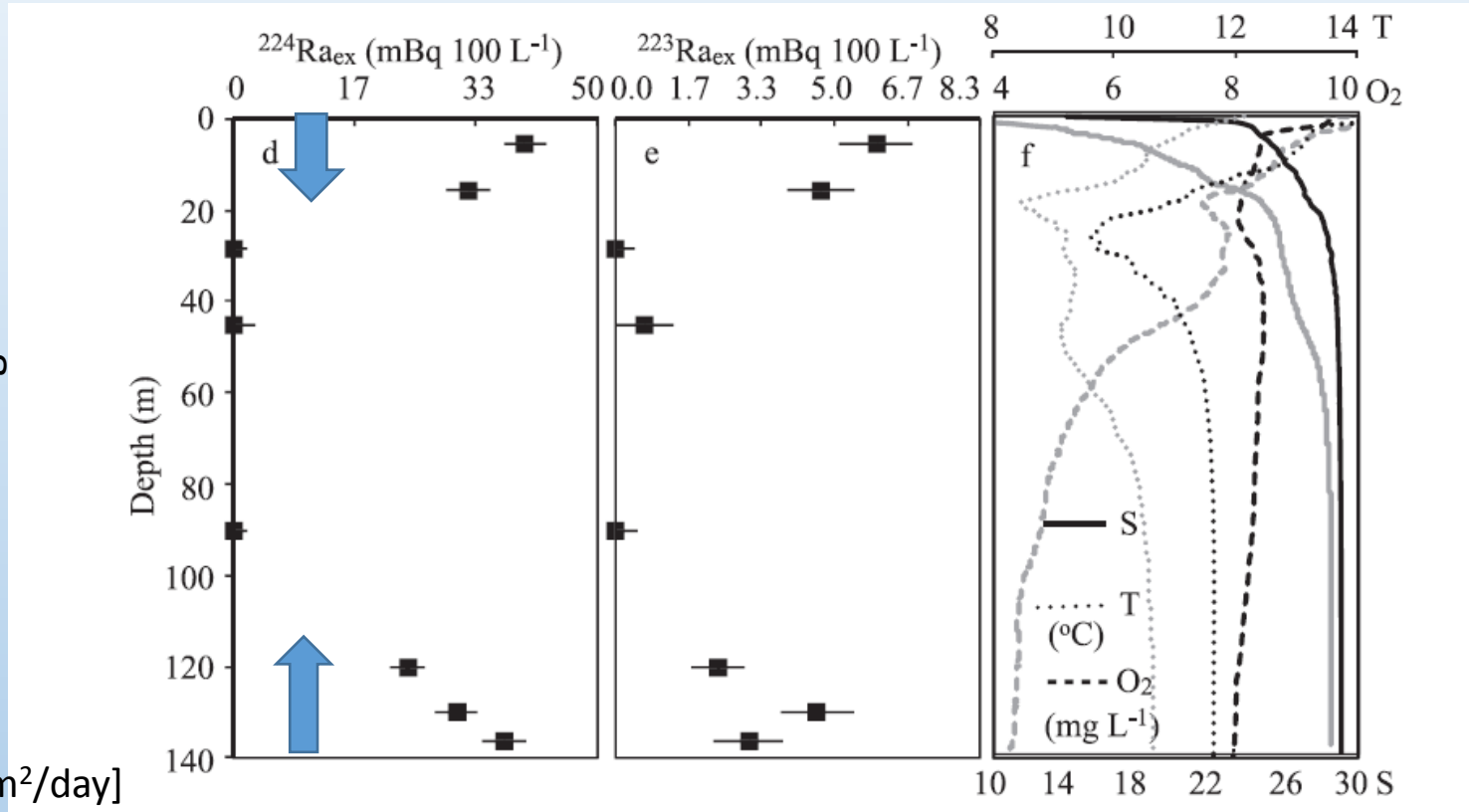
Fjord mixing based on radium isotopes



Vertical processes as reflected in short-lived radium

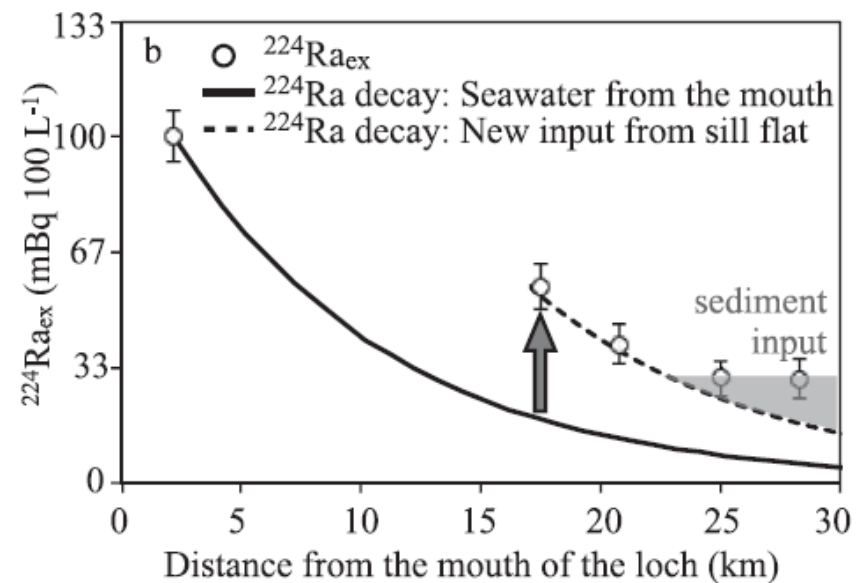
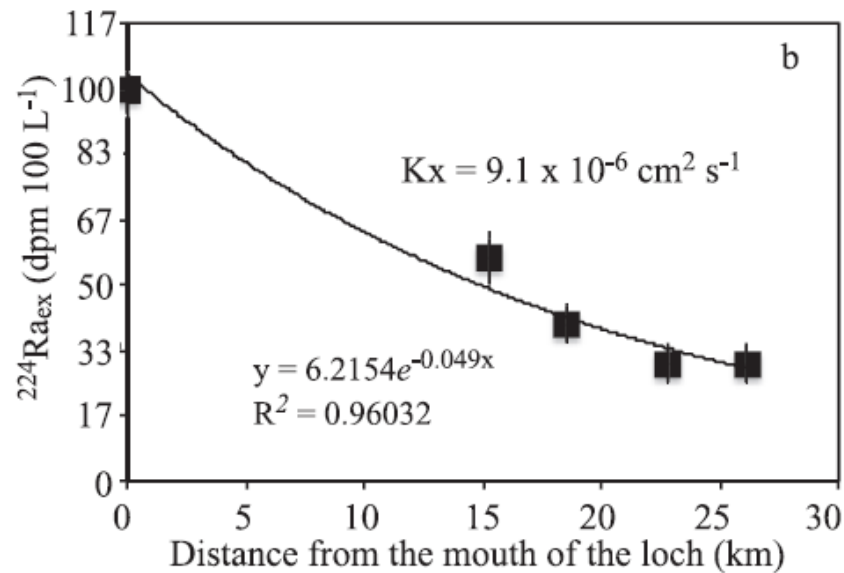
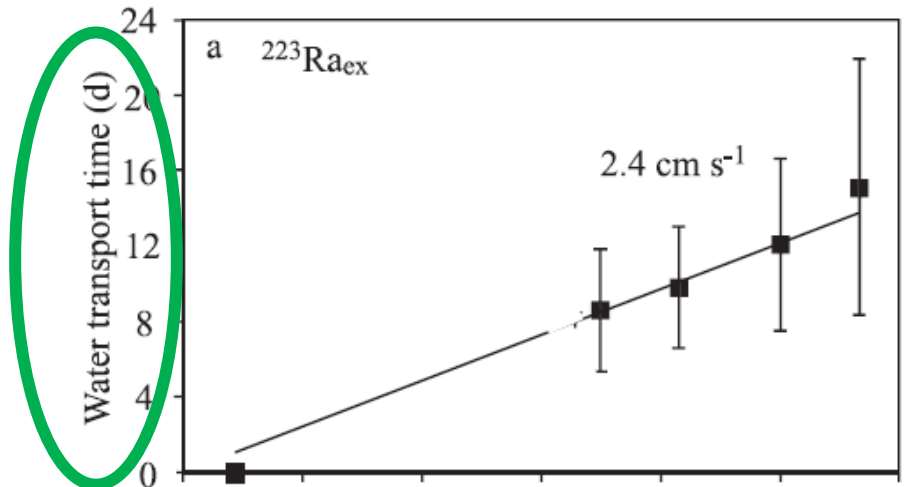
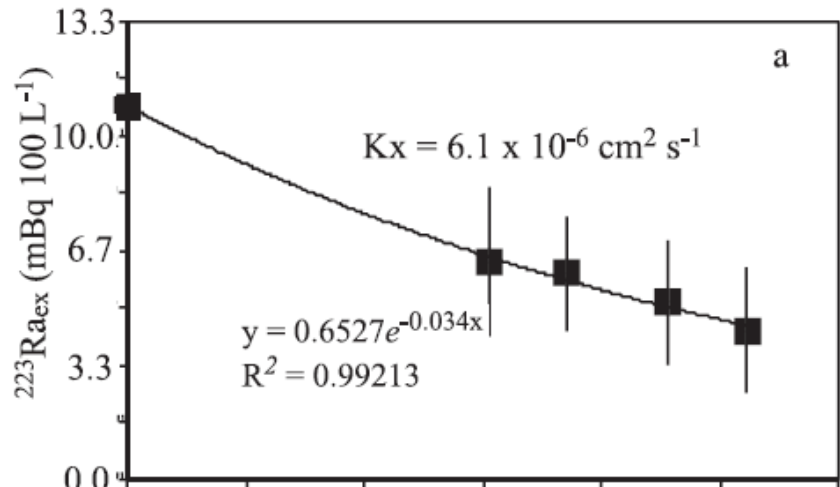
Complete Ra decay:
clear statement
about age!

Flux
[atoms/m²/day]



Hsieh et al. 2013

Horizontal rate constraints from short-lived radium



Cruise participation for radium analysis

2 pelagic cruises (July, November)

Following the offshore transport of iron, possibly integrated benthic flux from shelf

Large volume sampling (about 80 l per sample) from standard CTD

Part of the analysis on board

Hoping to expand to sampling on the shelf, for **integrated fluxes of dissolved species & link to benthic work**