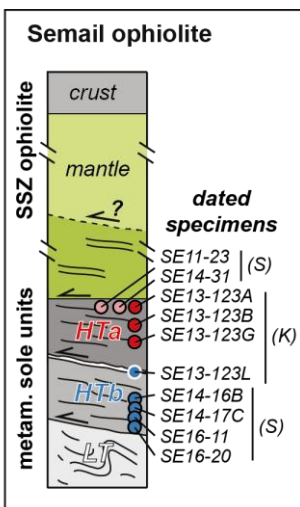
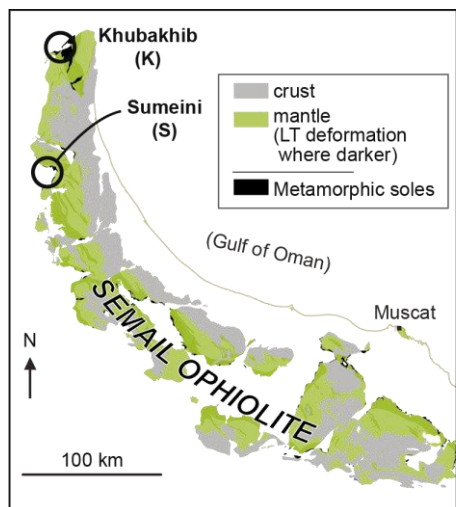


# Slow subduction initiation drives fast mantle upwelling and lithosphere formation

Mathieu Soret, G. Bonnet, P. Agard, K. Larson, J. Cottle, B. Dubacq, A. Kylander-Clark, M. Button, and N. Rividi



## Timescale of oceanic subductions?

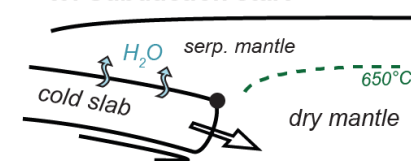
Our petrochronological study shows:

- 1) Subduction initiated at a slow rate ( $< 1 \text{ cm/yr}$ ). It stagnated at warm conditions ( $15\text{--}20^\circ\text{C/km}$ ) from  $< 100$  to  $96 \text{ Ma}$  before evolving into a faster ( $\geq 2\text{--}5 \text{ cm/yr}$ ) and colder ( $\sim 7^\circ\text{C/km}$ ) regime.
- 2) Subduction unlocking triggered the onset of slab retreat, large-scale corner flow and fast ocean spreading in the overriding plate ( $96\text{--}95 \text{ Ma}$ ).

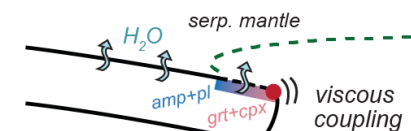
## Refined model of subduction initiation

### Slab tip close-up views

t0: Subduction start

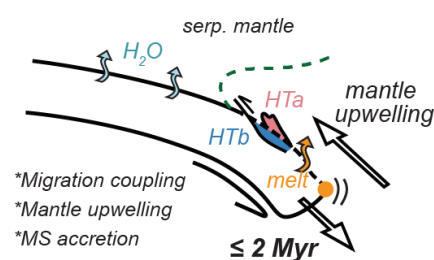


t1: "Stagnation"

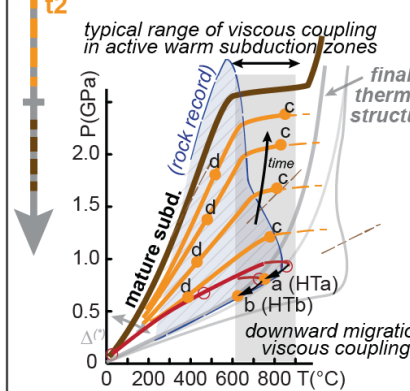
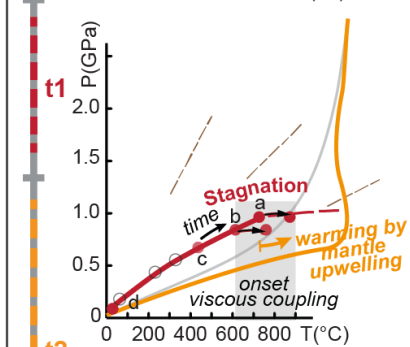
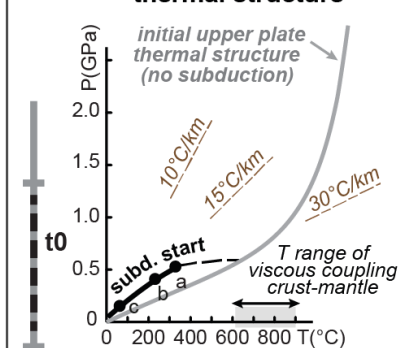


\*Dehydration  
\*Densification

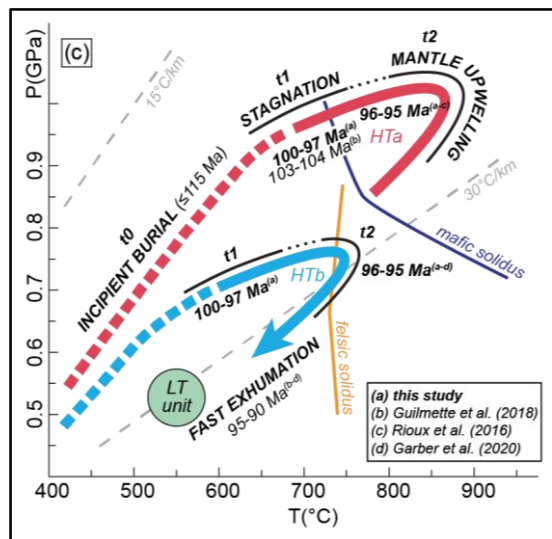
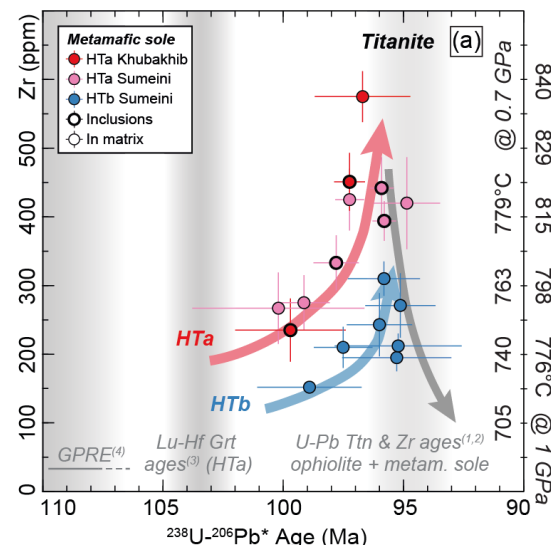
t2: "Unlocking"



### Evolution of the subduction thermal structure



## Refined P-T-t evolution of the Oman metamorphic sole



### U-Th/Pb dating:

- Monazite
- Titanite

### Pseudosections:

- Both sole units
- Prograde P-T