

# Variability of the shortening rate in Central Andes controlled by subduction dynamics and interaction between slab and overriding plate

Talk



Abstract/Display

This presentation participates in OSPP



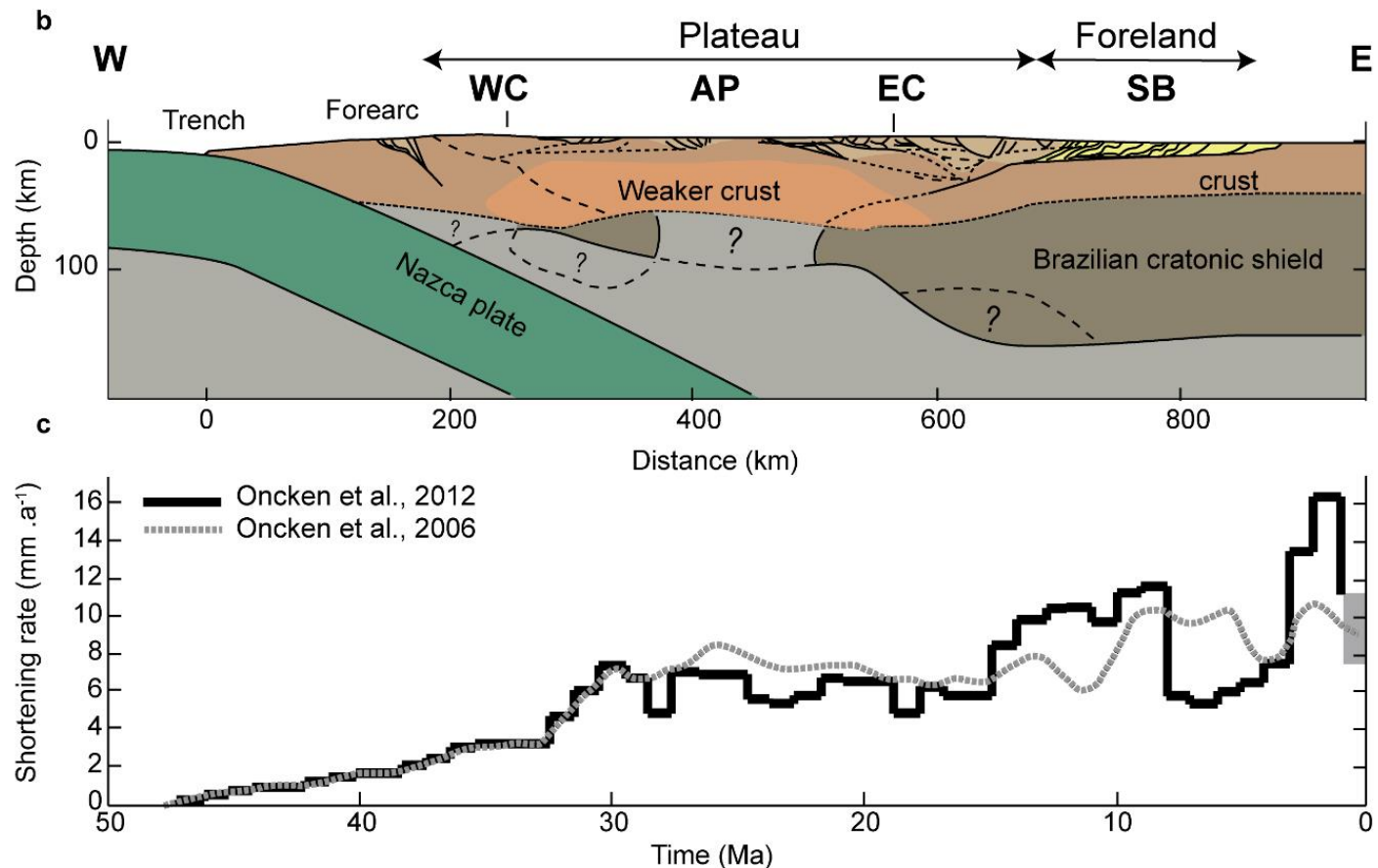
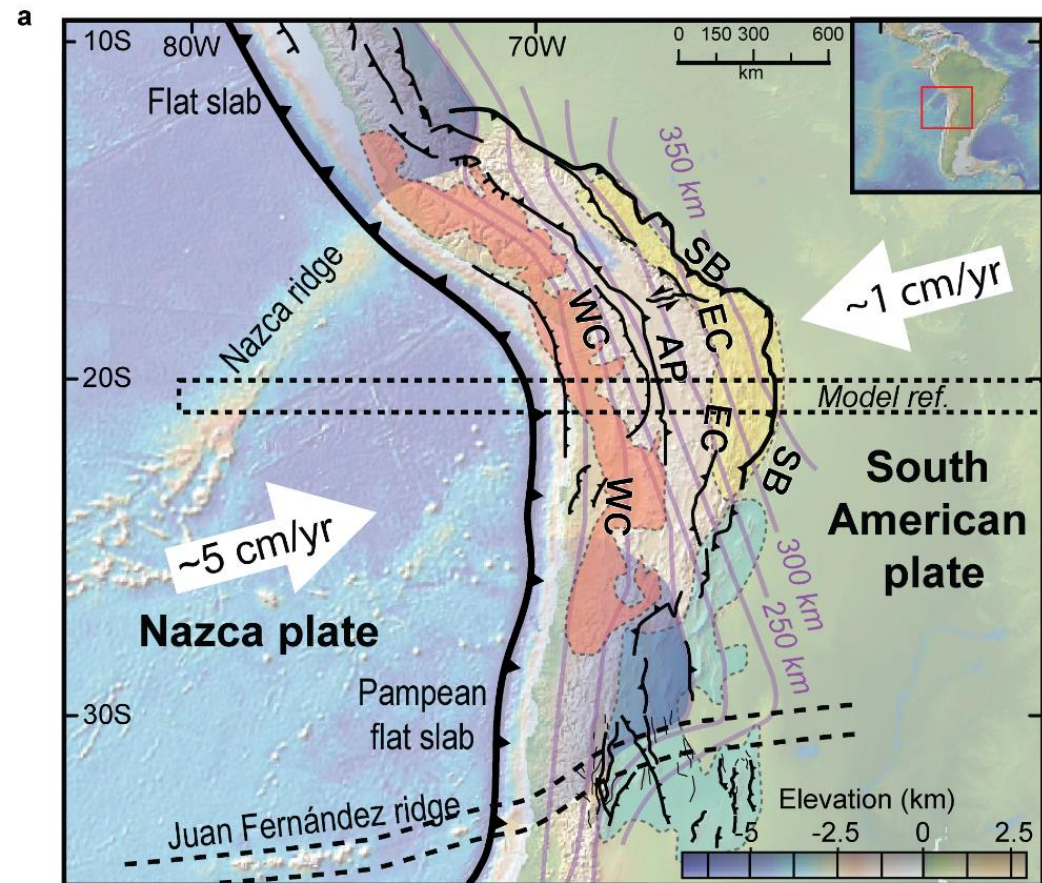
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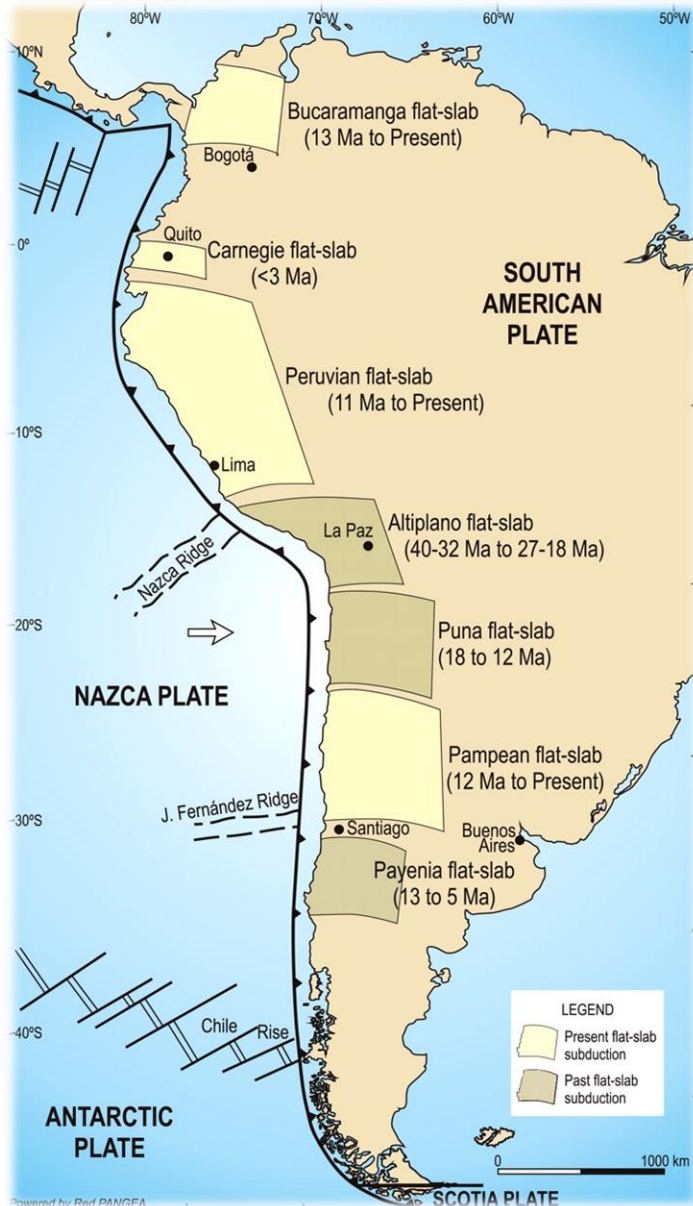
**Michaël Pons<sup>1,2</sup>, Stephan Sobolev<sup>1,2</sup>, Sibiao Liu<sup>1,2</sup>, Derek Neuharth<sup>1</sup>**  
**23<sup>th</sup> May 2021, GD 5.2 Subduction**

# Tectonic setting

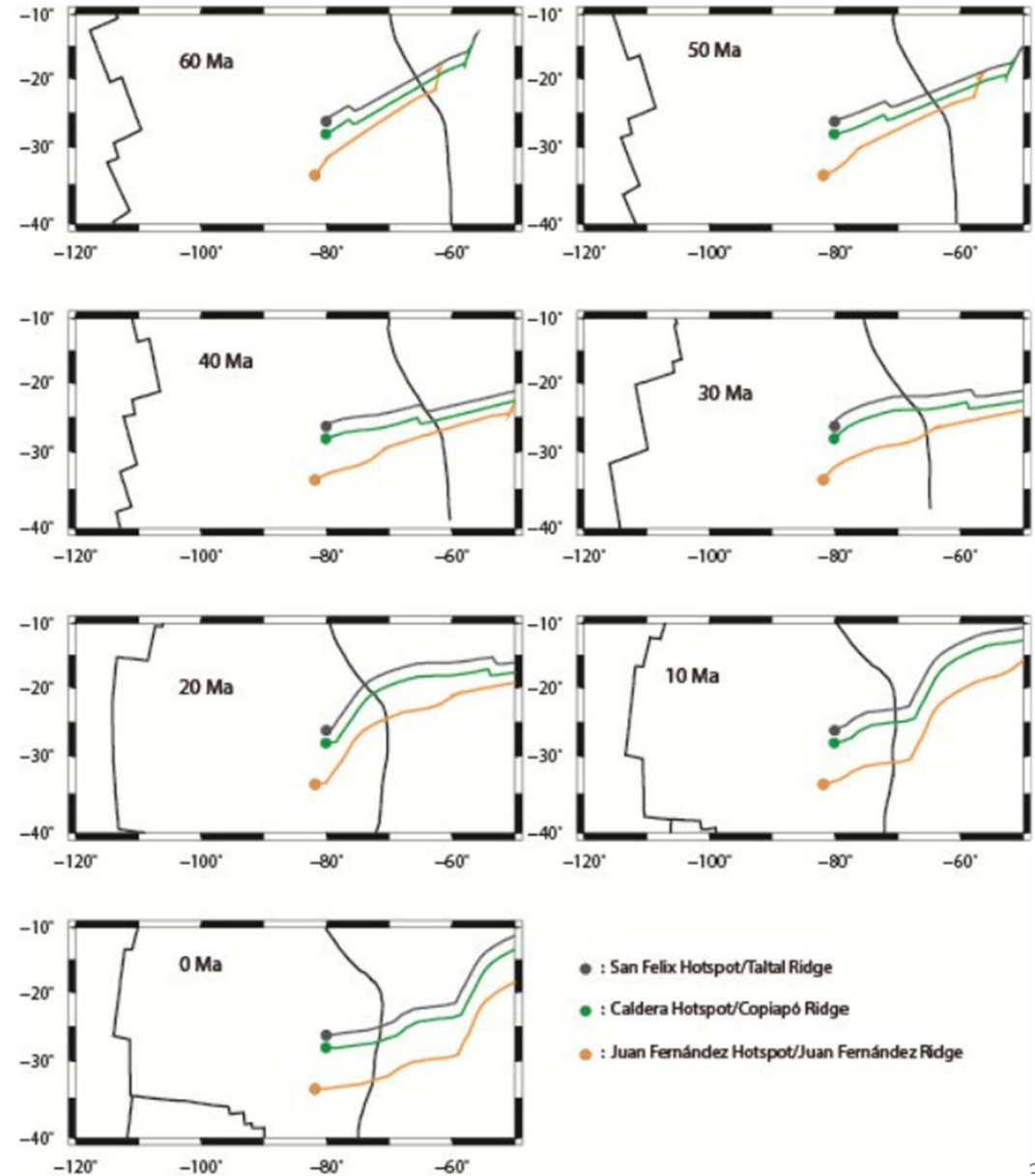


What mechanism controls the temporal variation of the shortening rate in Central Andes ?

# Timing of the Flat slab at Altiplano latitude

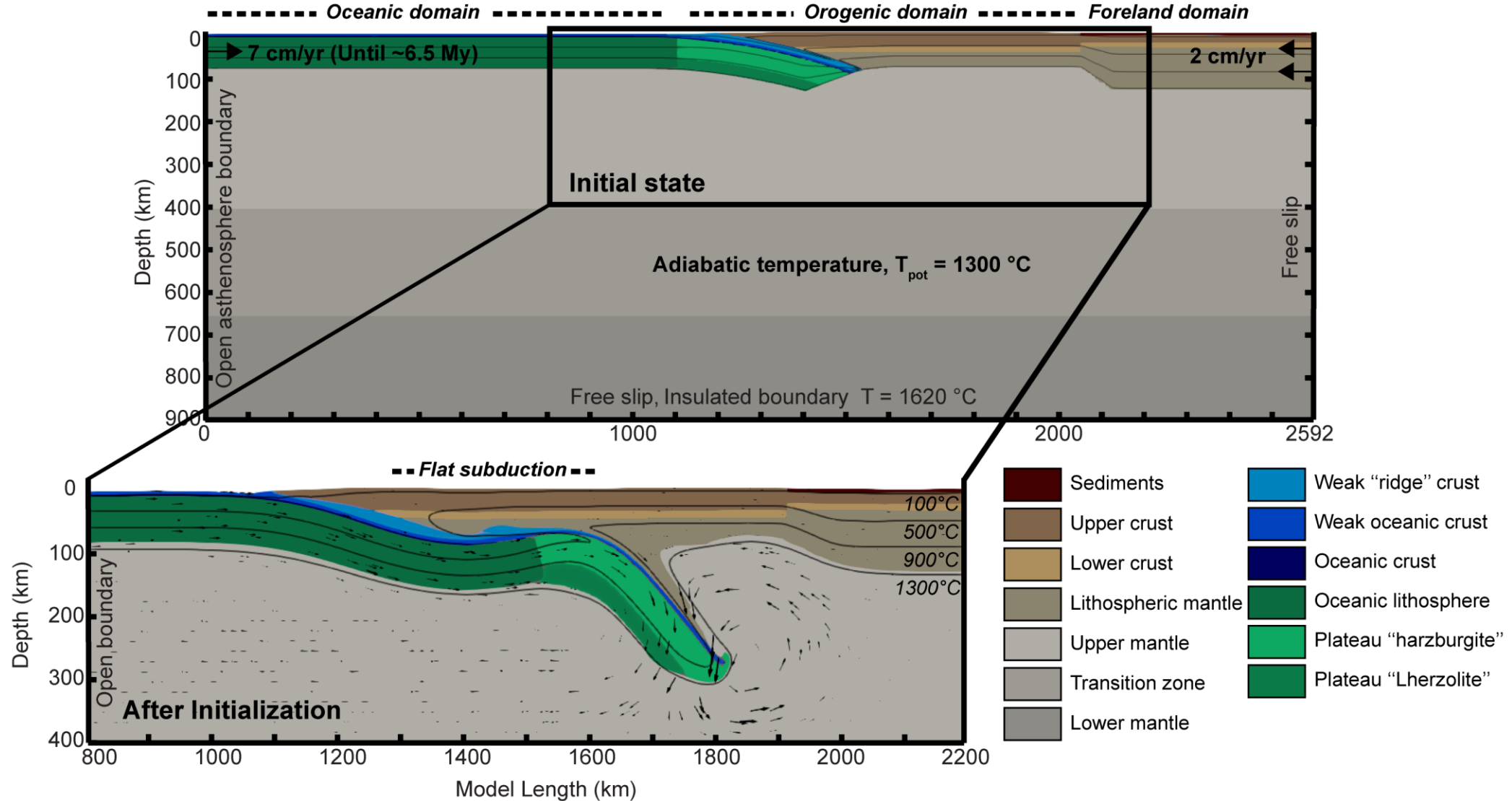


Ramos and Folguera, 2009

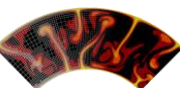


Bello-Gonzalez et al., 2018 <sup>3</sup> 2

# Model set up



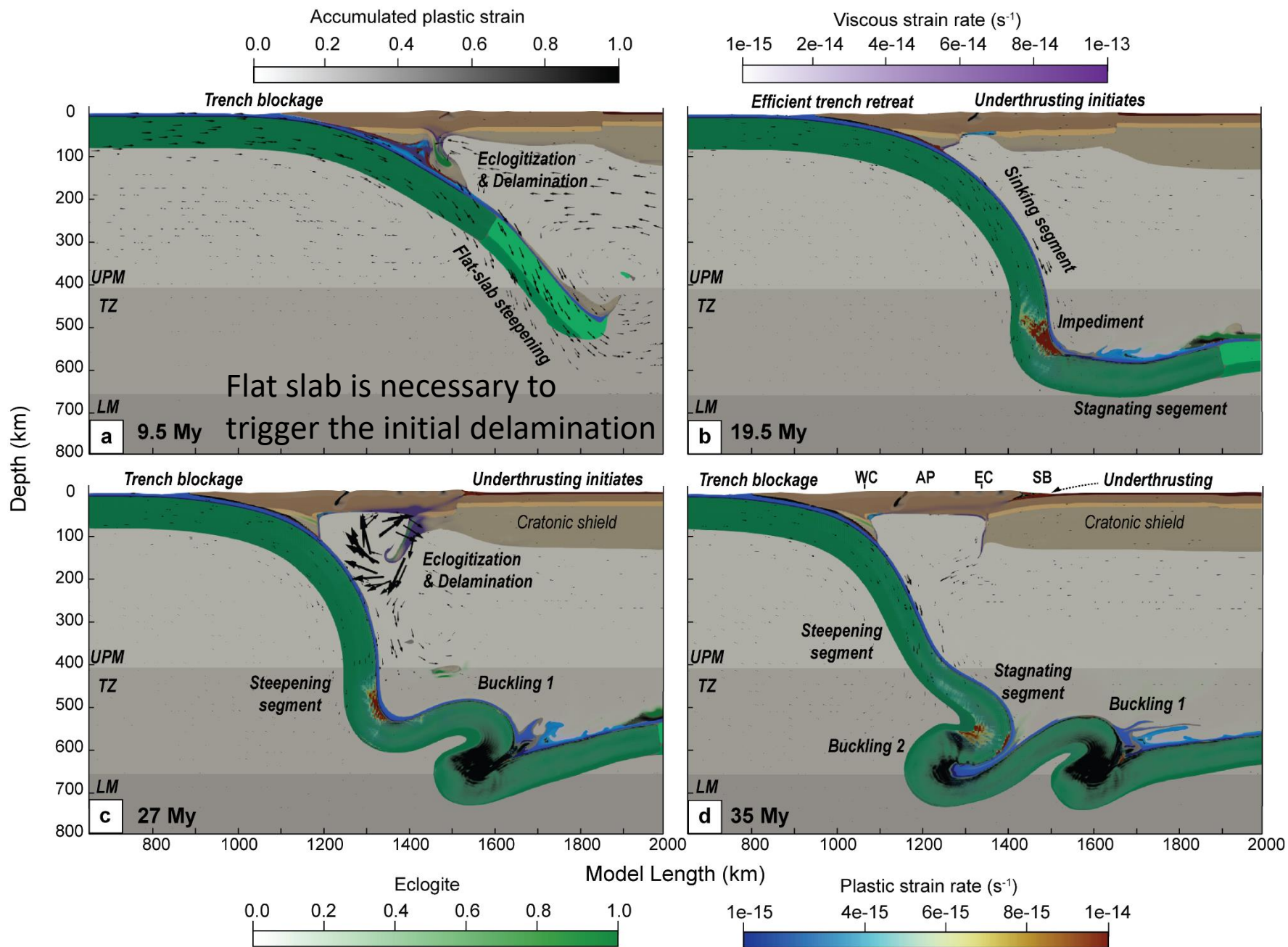
Visco-plastic (dislocation, diffusion creep, plasticity). Computations were done using the ASPECT code version 2.3.0



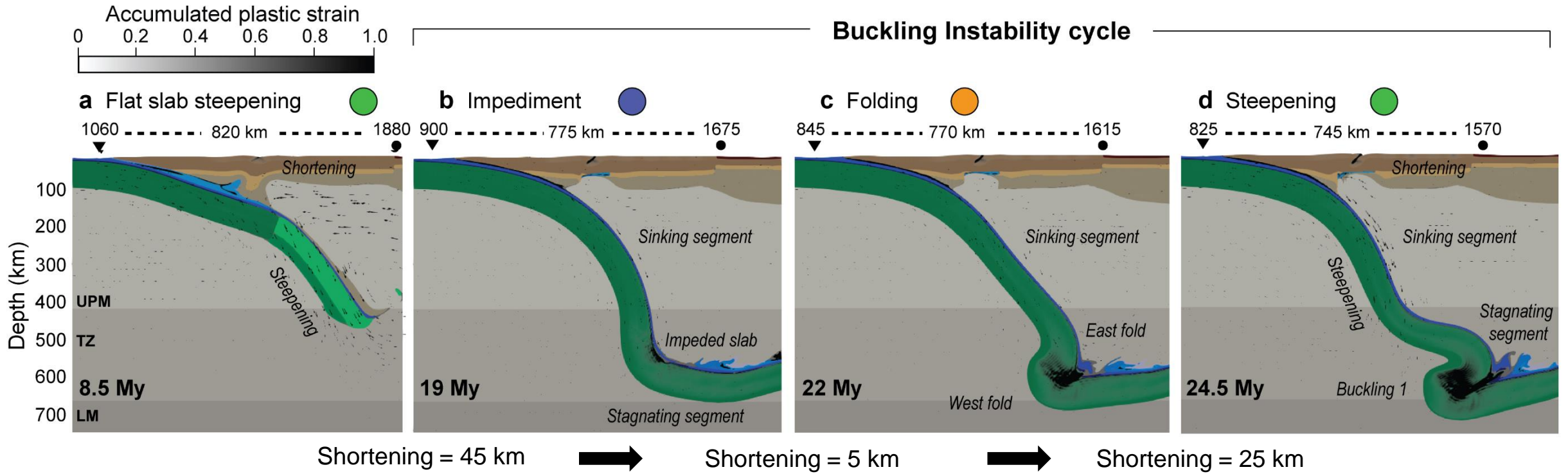


Click on it

# Model evolution

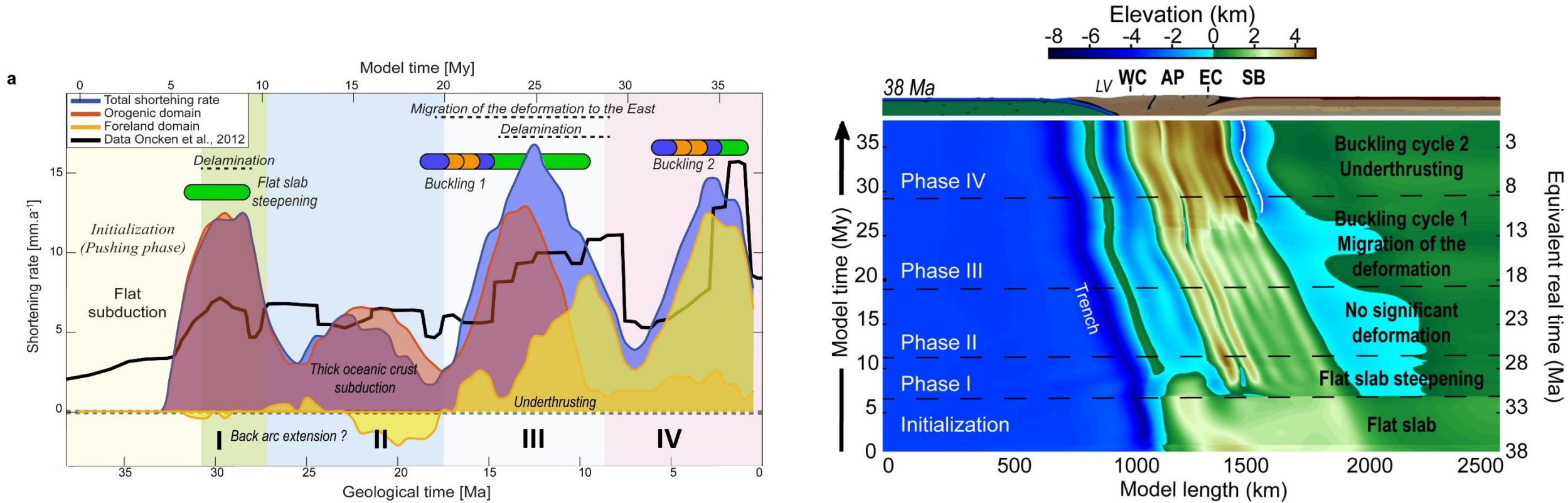


# Model interpretation



- The forced trench retreat from the overriding plate motion prevents the slab to pile up (b - c).
- Therefore the slab sinks in the upper mantle and steepens at the end of a buckling cycle hindering the trench (d).
- The difference of velocity between the trench and the overriding plate is accommodated by shortening.
- Steepening also happens just after the passage of the flat slab (a)

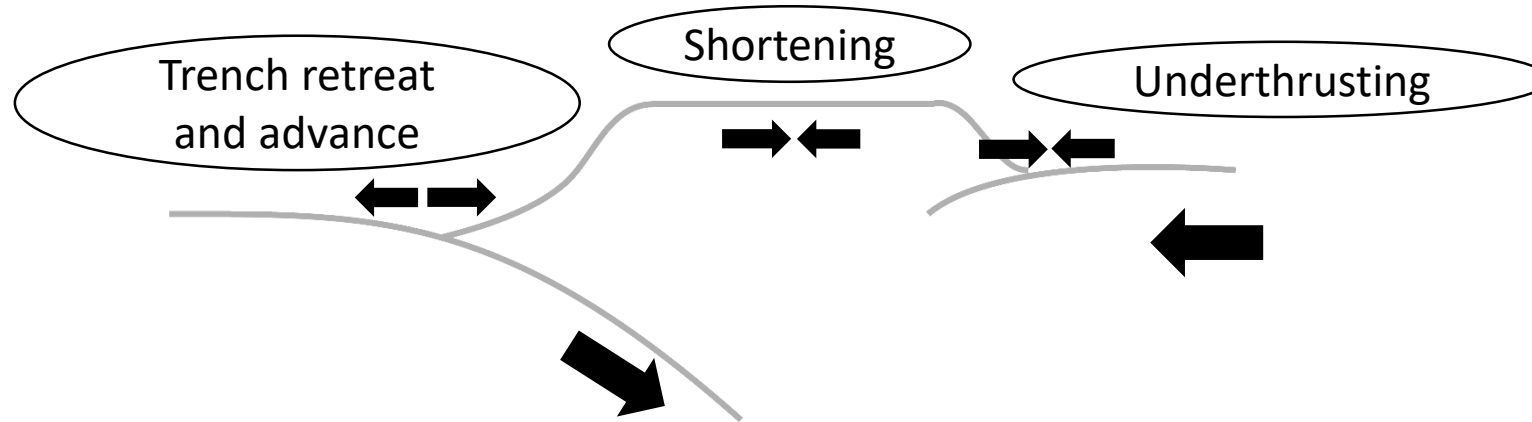
# Model results



- Shortening rate and timing of uplift are consistent with previous estimates (Oncken et al., 2006,2012 ; Garzione et al., 2017)
- Our model predicts higher shortening at 30 Ma. New study indicates higher shortening in Western Andean Flank (Habel et al. 2022).
- Melting and Lower crustal flow processes are not taken into account and can contribute to smooth Phase II before the start of the delamination.

# What mechanism controls the temporal variability of the shortening ?

## Summary of the way the forces are accommodated



### The key factors are:

- Overriding plate weakening by eclogitization and delamination.
- Foreland sediments weakening allows the underthrusting.
- Subduction interface friction coefficient of  $\sim 0.05$

### The answer is:

It is the “**Hindering of the trench** by **steepening** of the slab” that controls the variability of the shortening rate in Central Andes. This occurs when the slab sinks freely and does not encounter an obstacle due to the forced trench retreat.

*I am looking for a Post-doc position for the end of 2022.*

*I am open to new ideas and projects, please contact me at [ponsm@gfz-potsdam.de](mailto:ponsm@gfz-potsdam.de)*

thank you for your attention !



## ACKNOWLEDGEMENT

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