Assessing the geodynamics of strongly arcuate subduction zones in the eastern Caribbean subduction setting

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Welcome to the Caribbean...

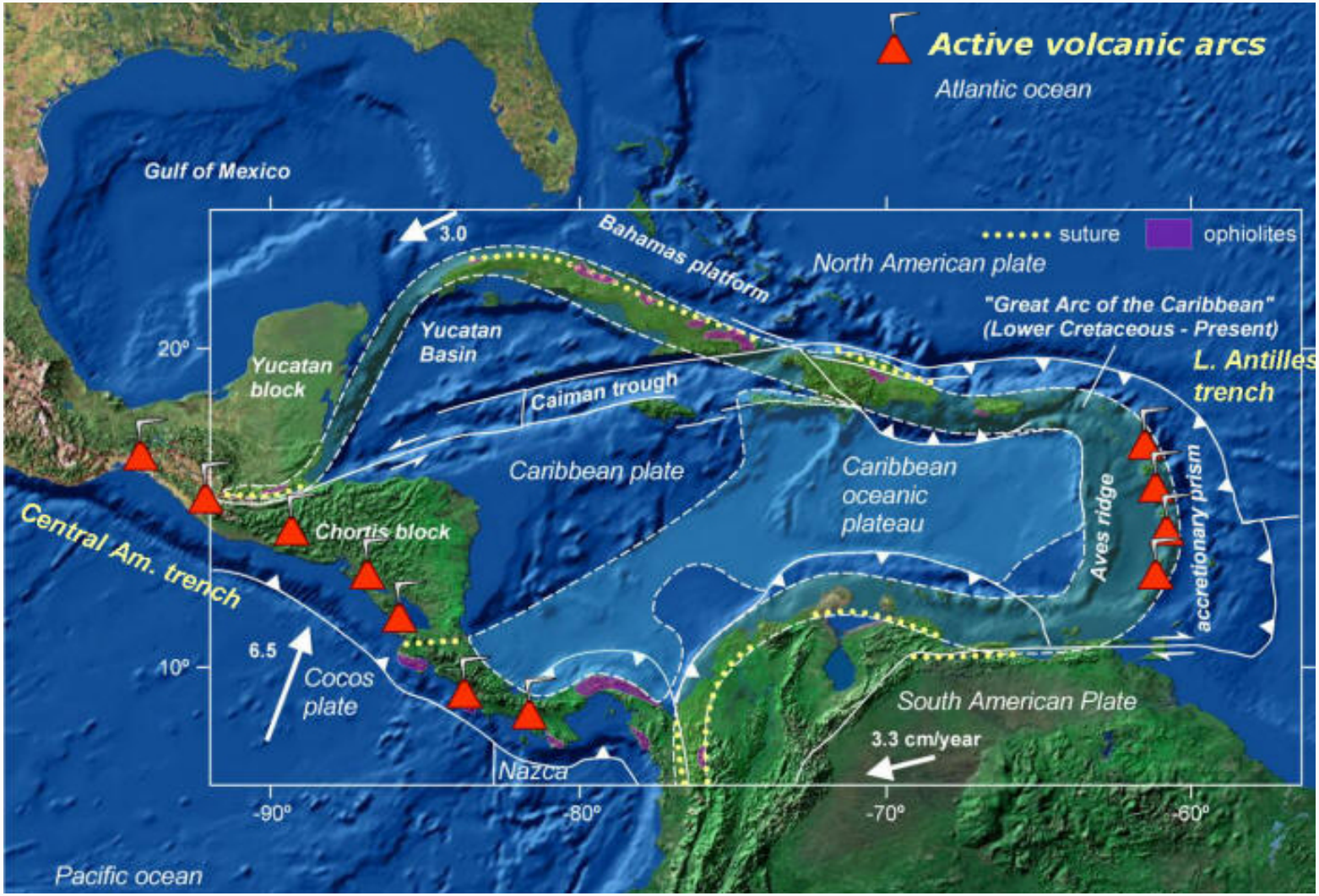

Figure 1: The Caribbean tectonic setting. (From http://www.ugr.es, compilation by García-Casco el al. (2006))

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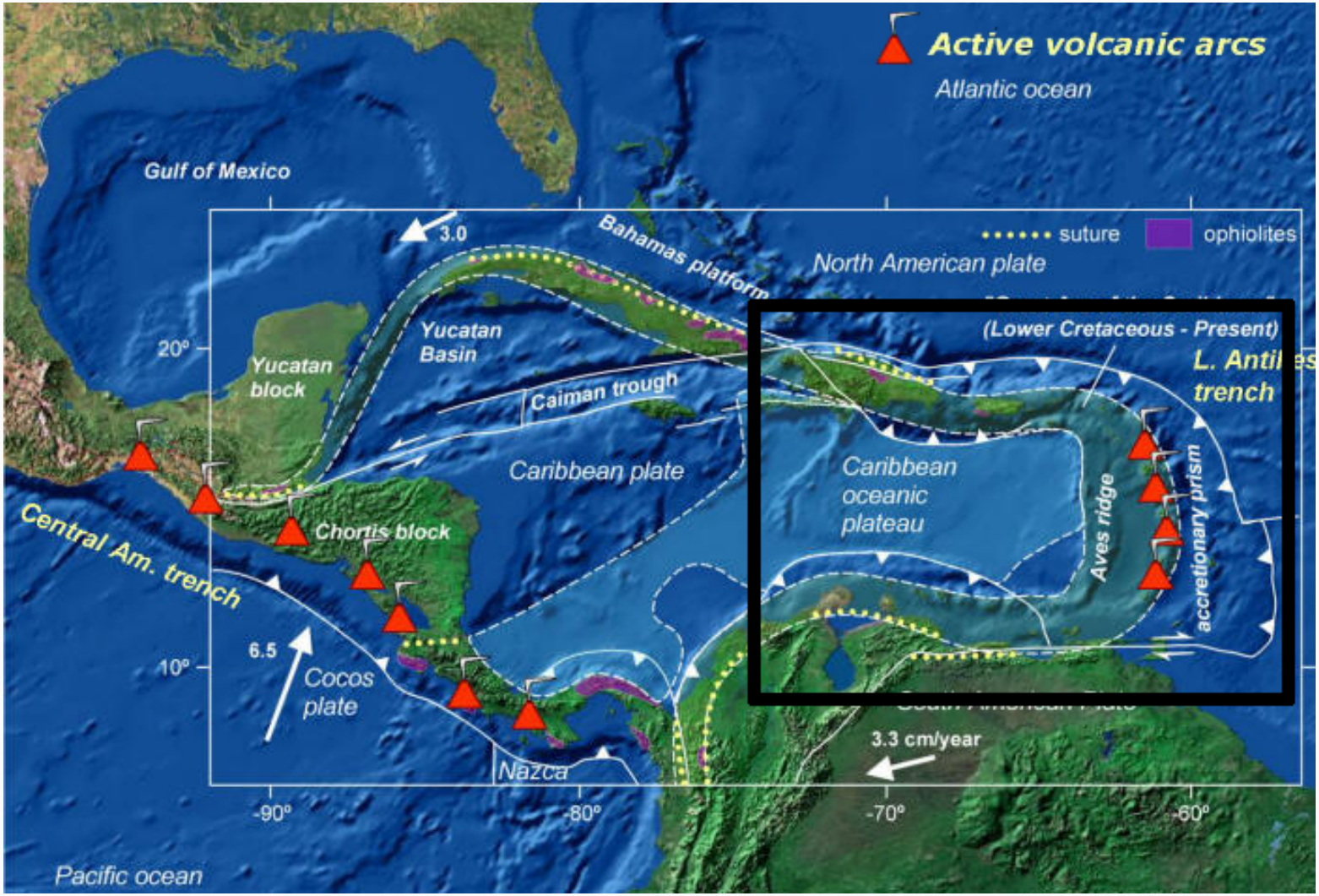

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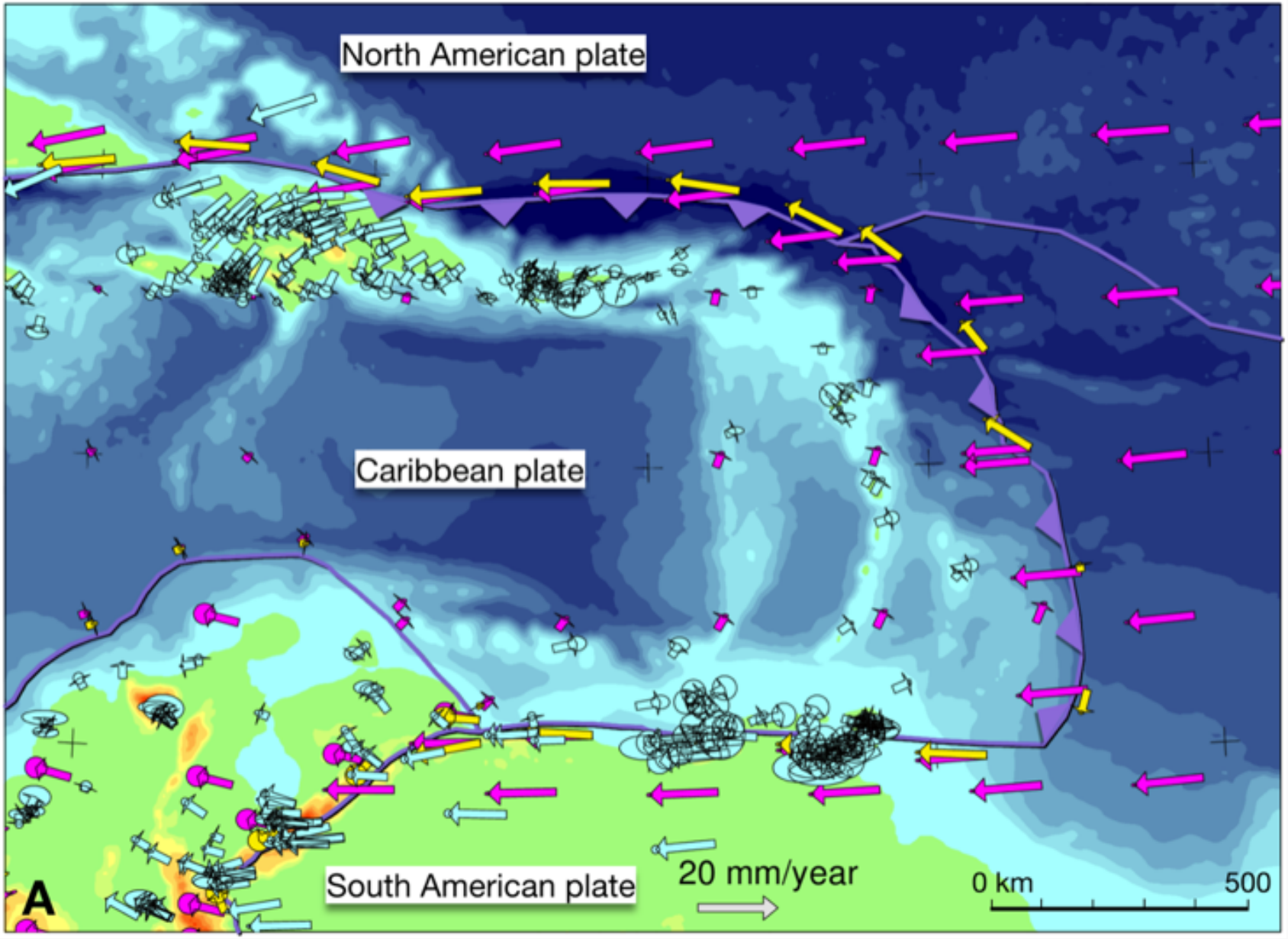
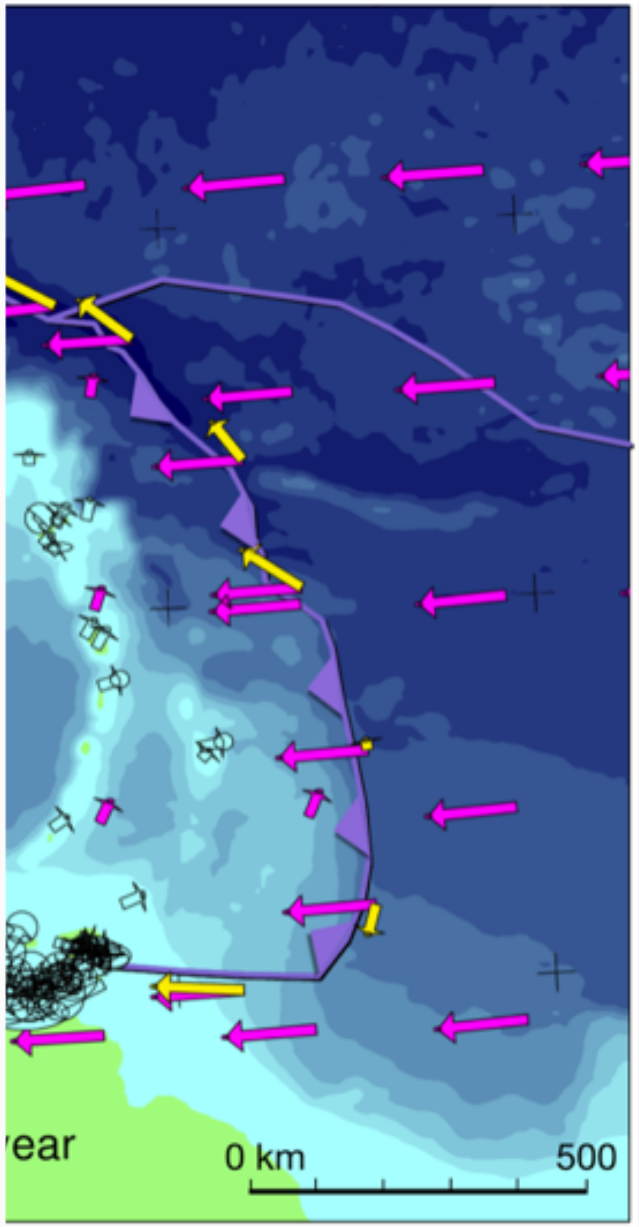
What happens when a trench is dragged?



What happens when a trench is dragged?



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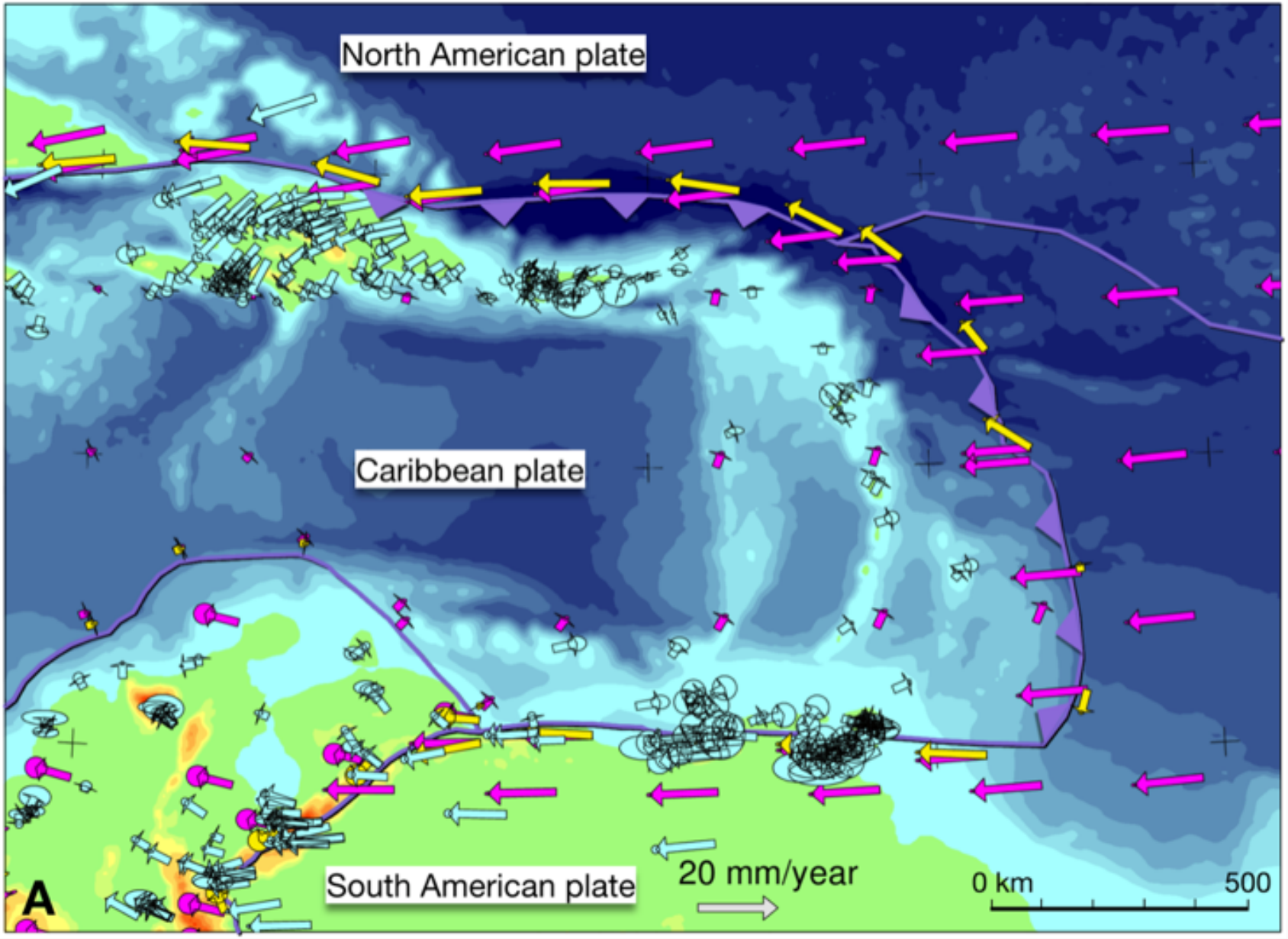


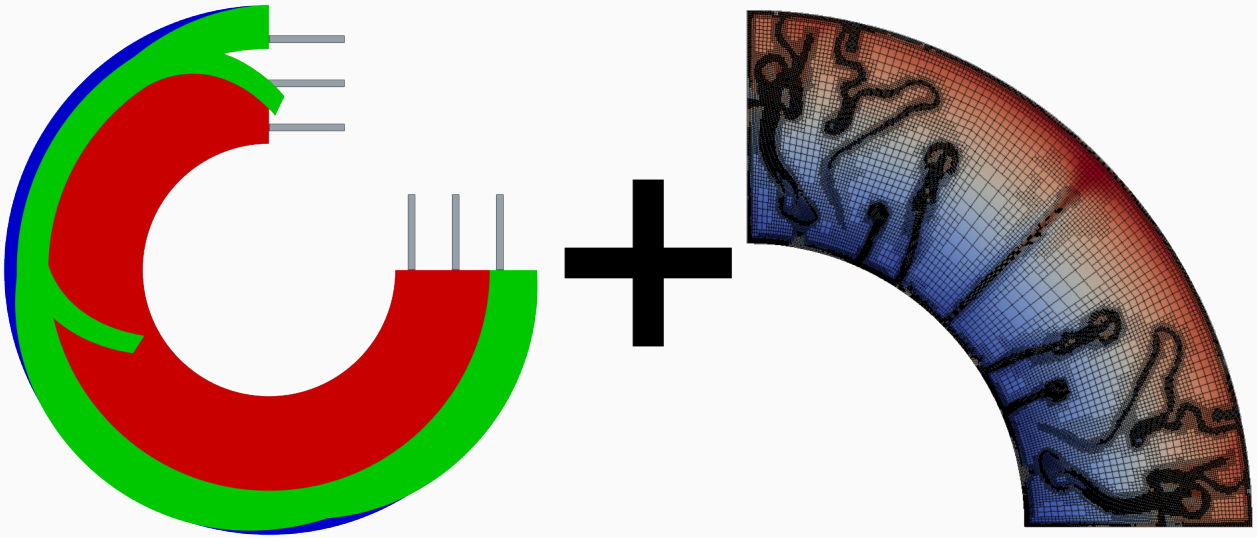
Questions to investigate

In this strongly arcuate subduction system, we investigate:

1. the feasibility of slab dragging
2. The stress field in the slab

Setting up the model

ASPECT + World Builder



World Builder:

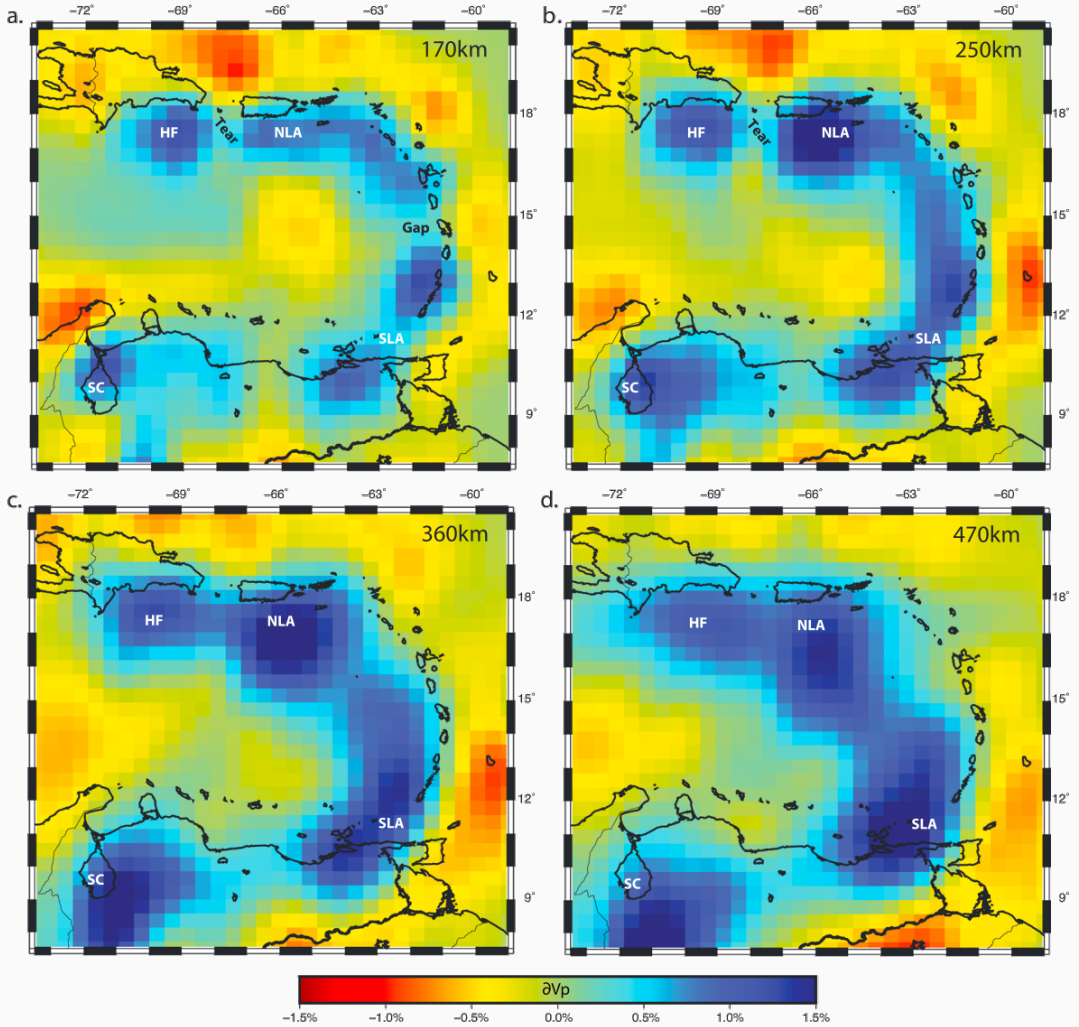
- Single text-file as input
- Using plate tectonic terminology
- Up-to-date documentation
- Open source, contributions welcome!

ASPECT:

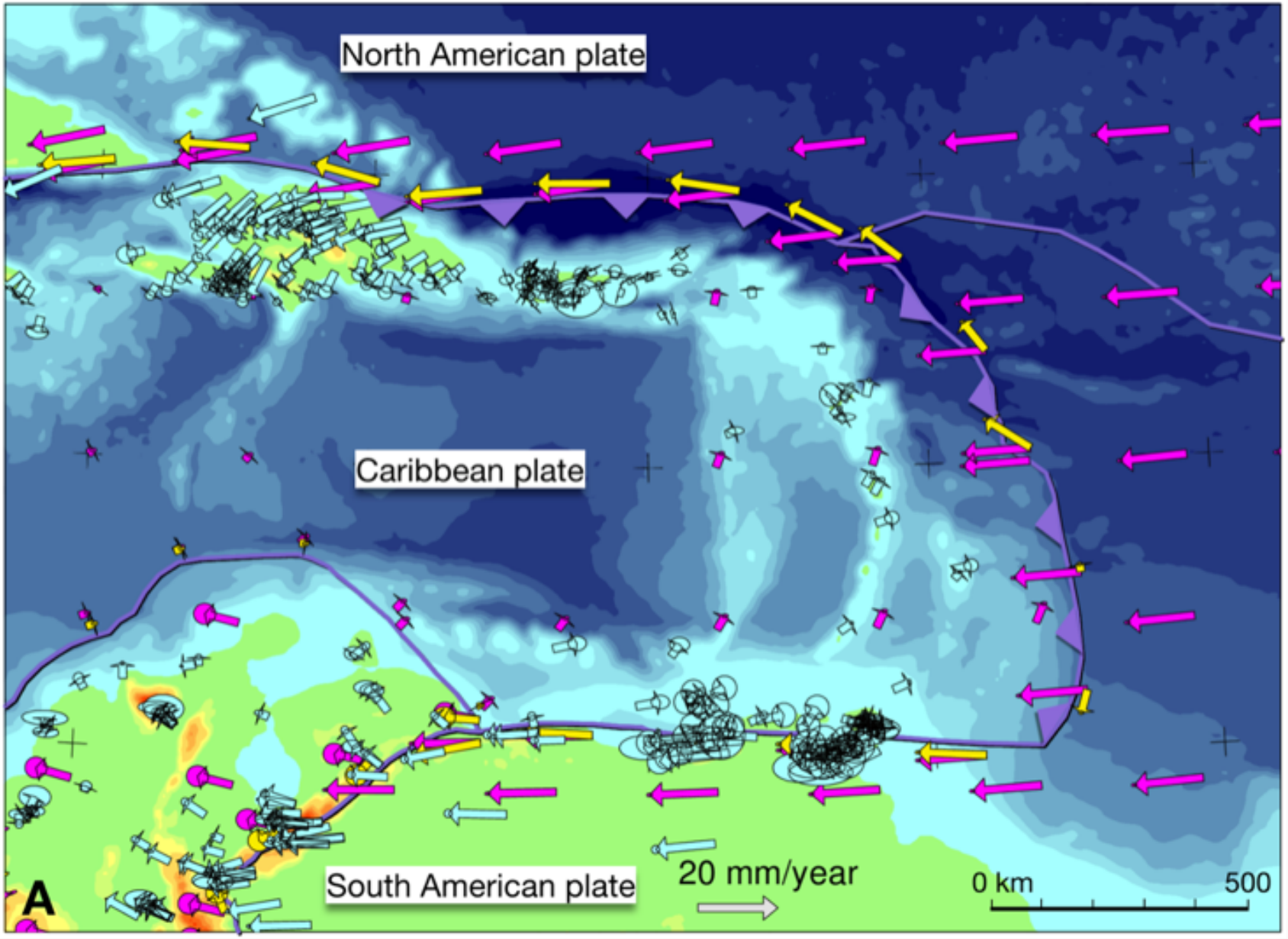
- adaptive mesh refinement
- scales up to thousand of cores
- easy to add new functionality
- open source community code!

Model design: tomographic basis

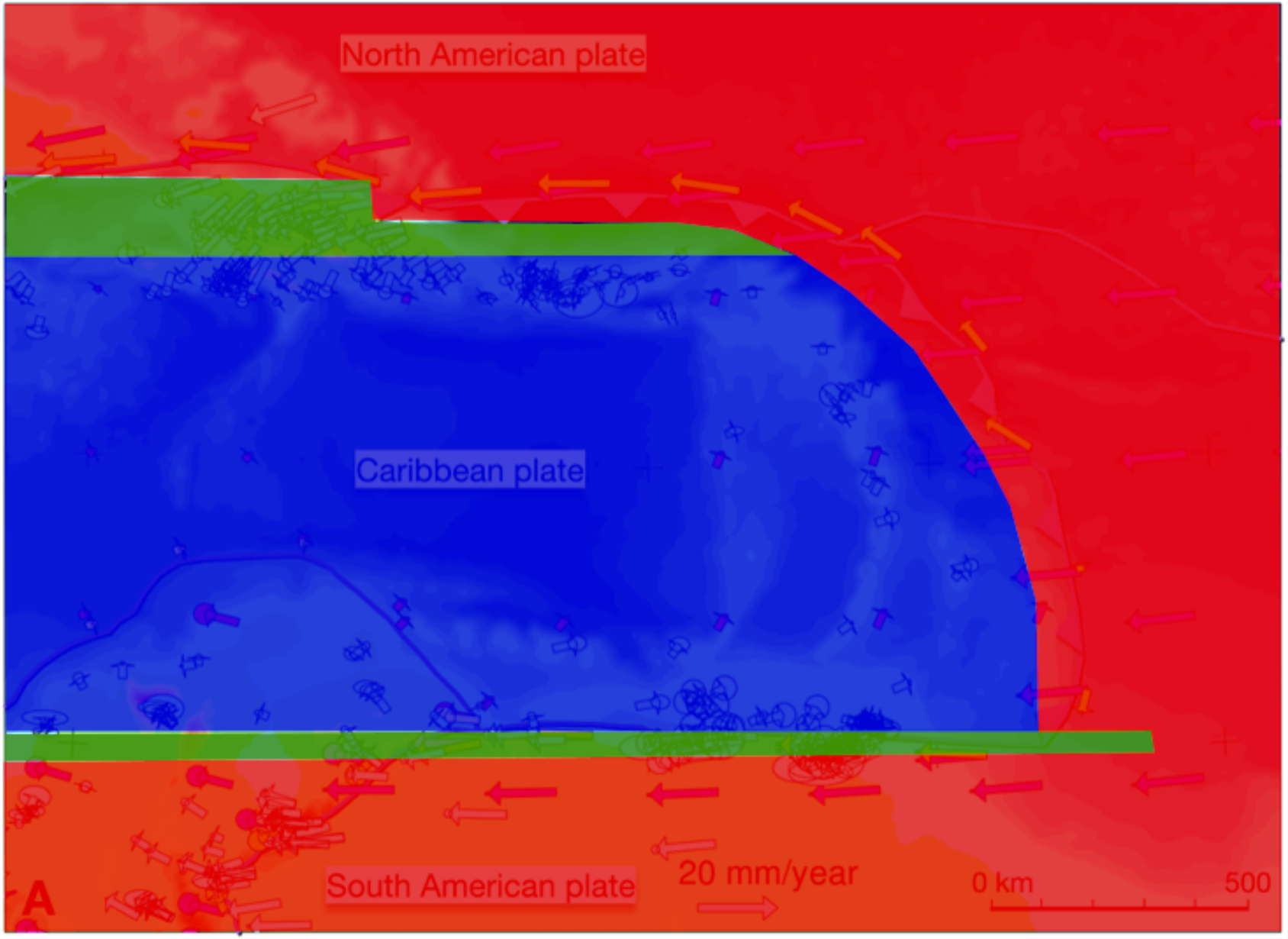
- No consensus on the 3D geometry and structure of the slab
- Model based on tomography by Harris et al. 2018:



Model design: 2D setup



Model design: 2D setup



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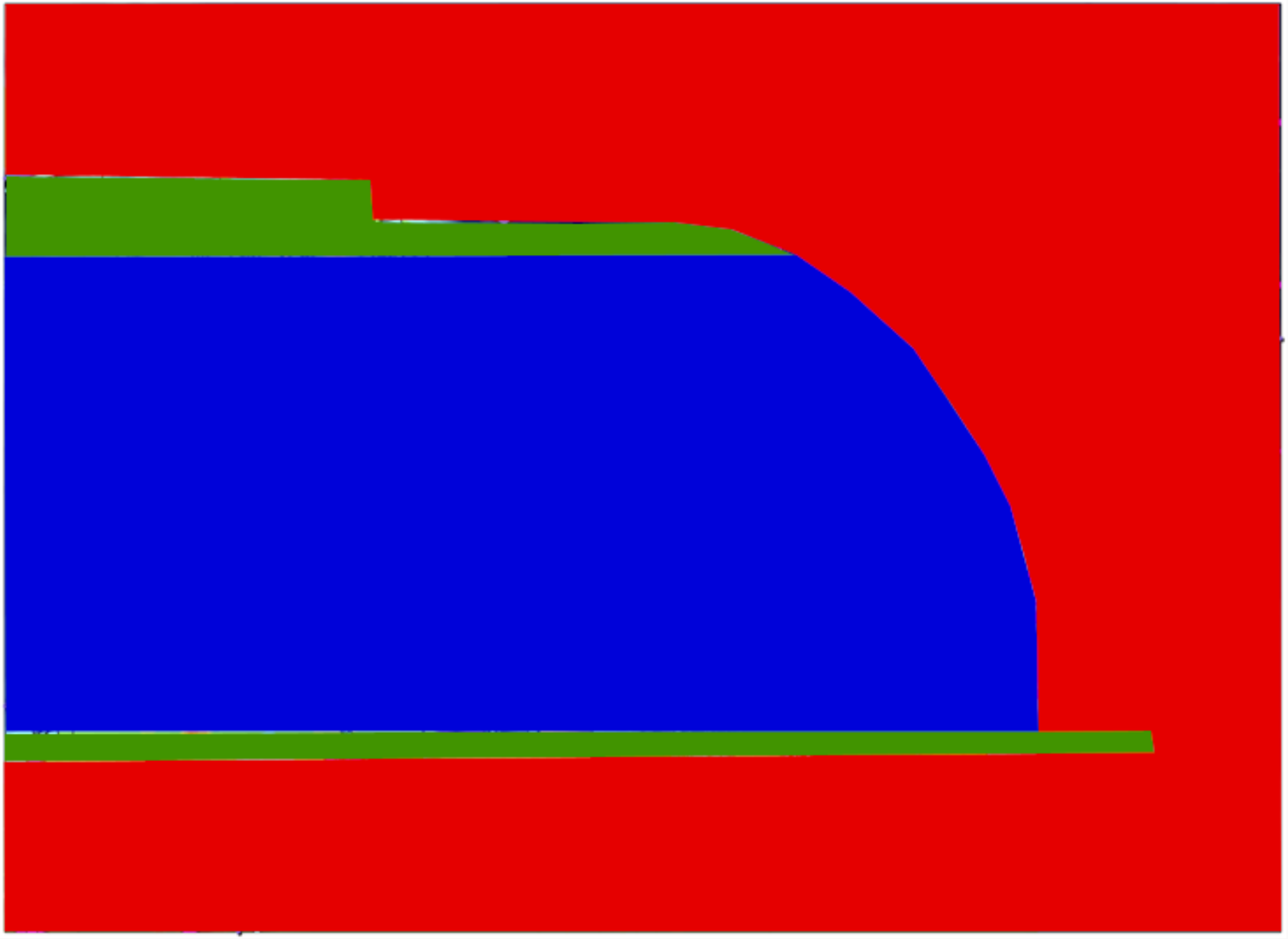
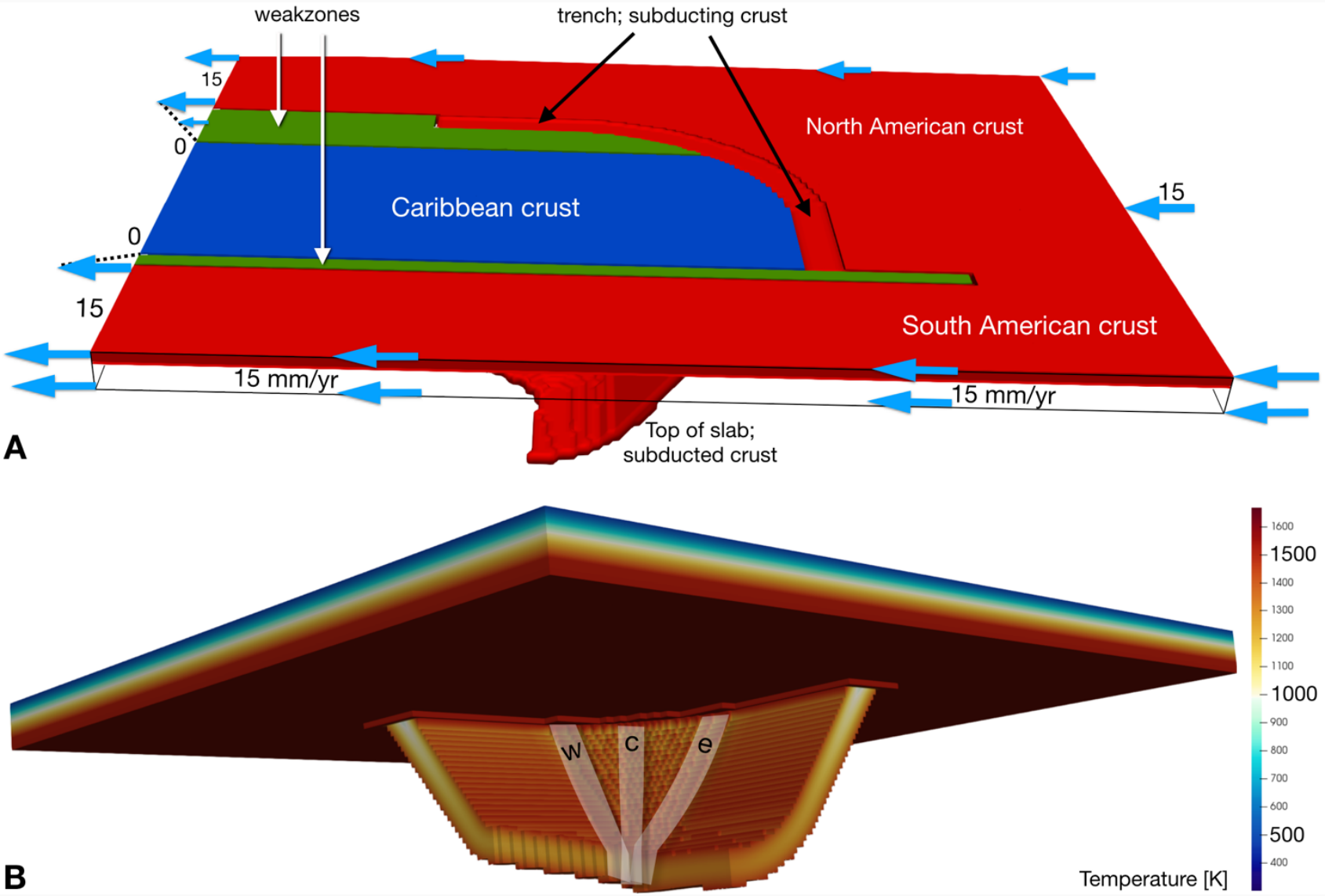
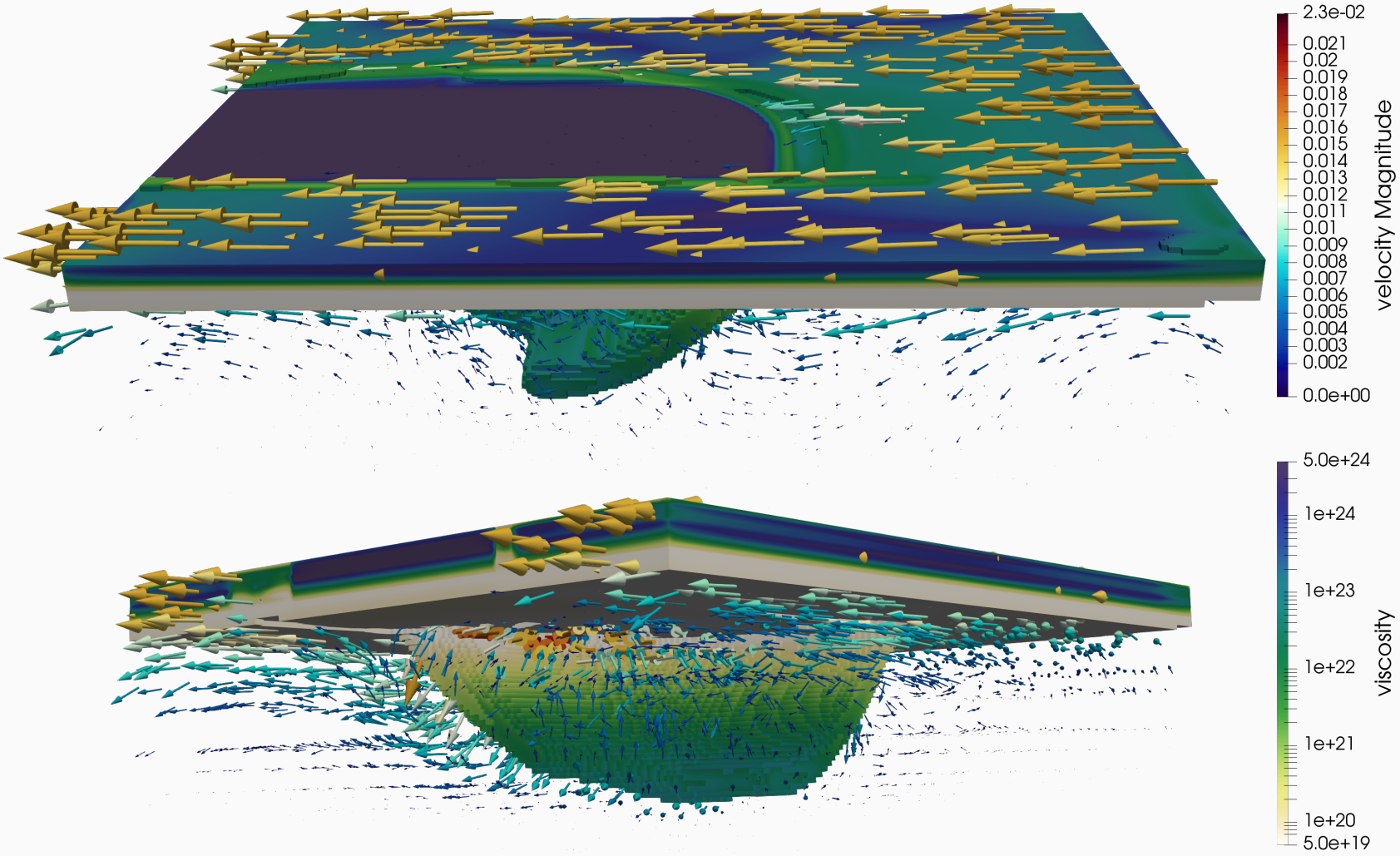


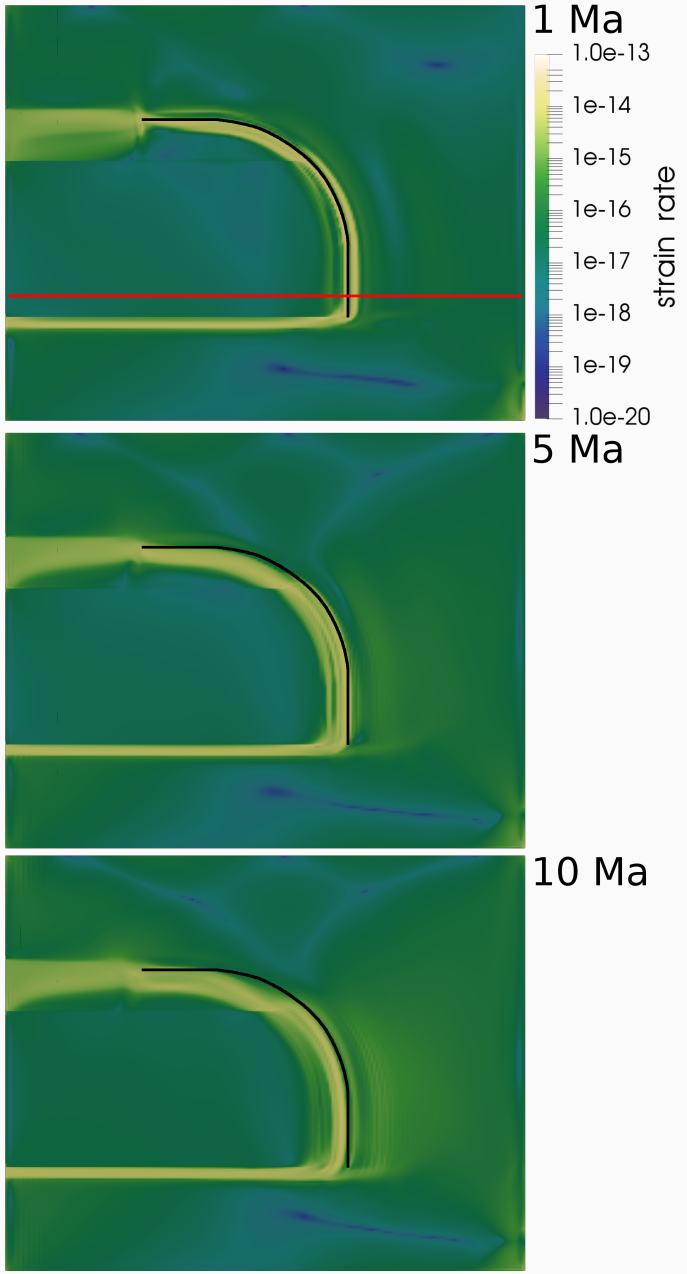
Model design: 3D setup



Back to the Caribbean question



The eastern trench is stationary



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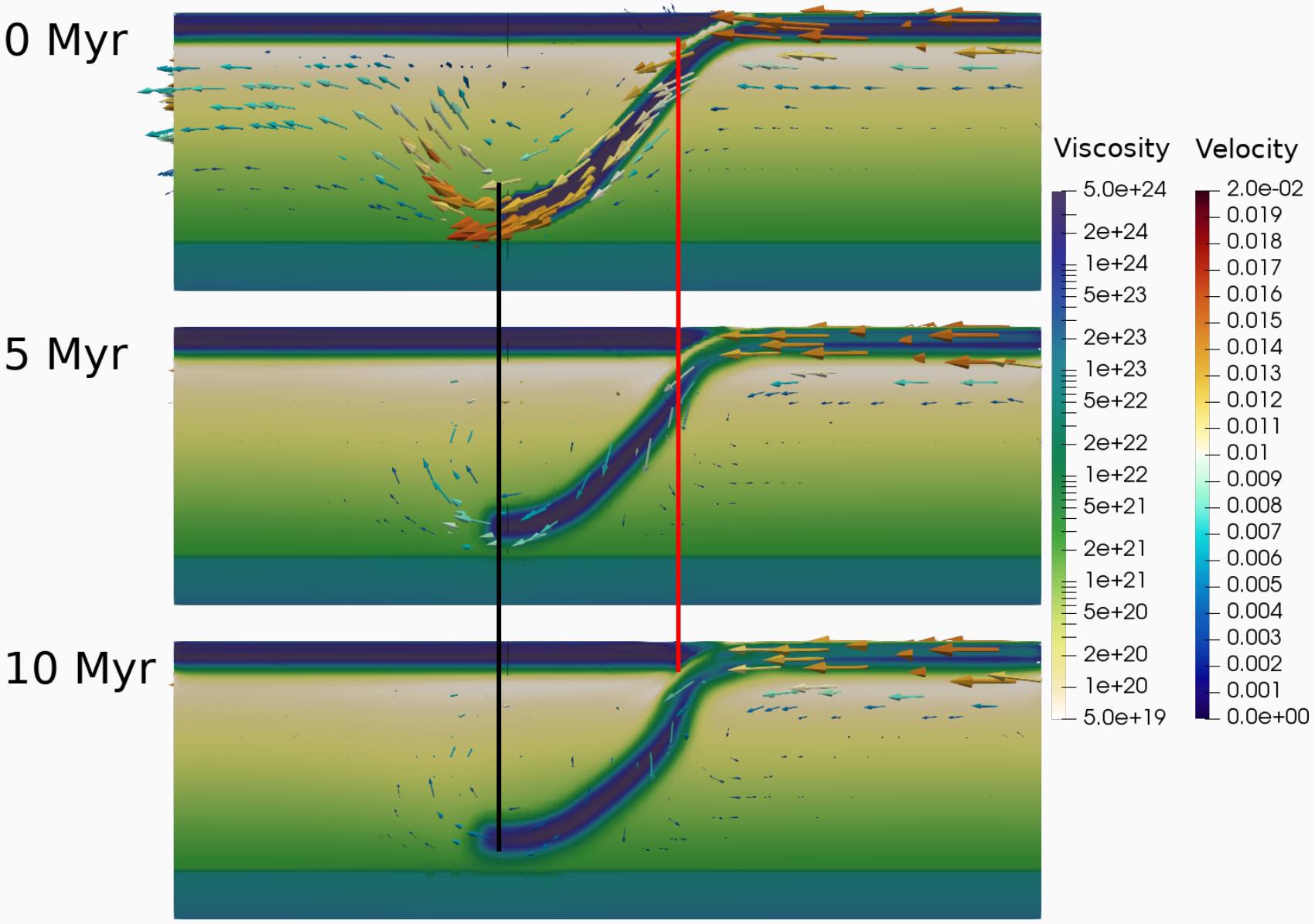
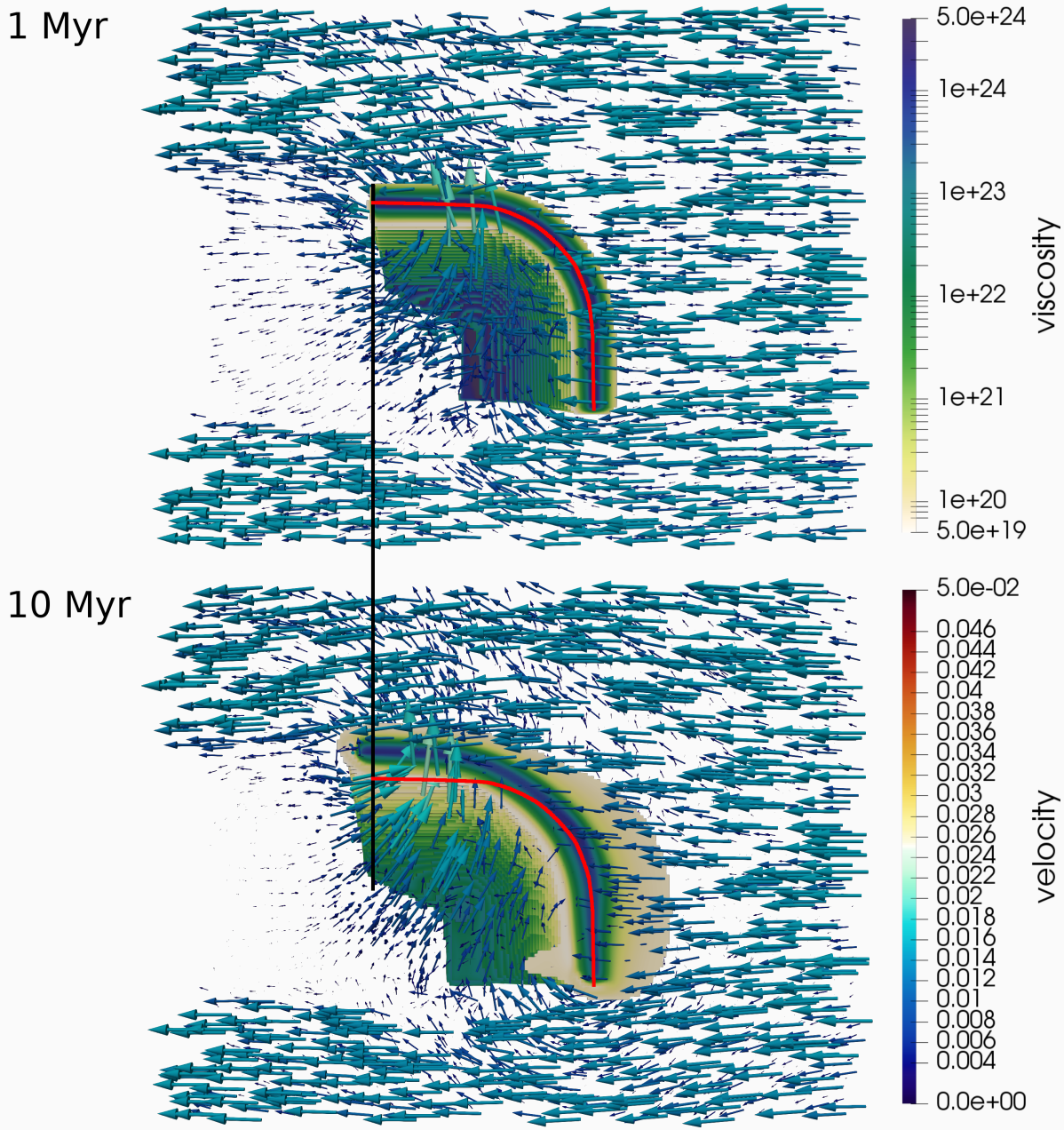
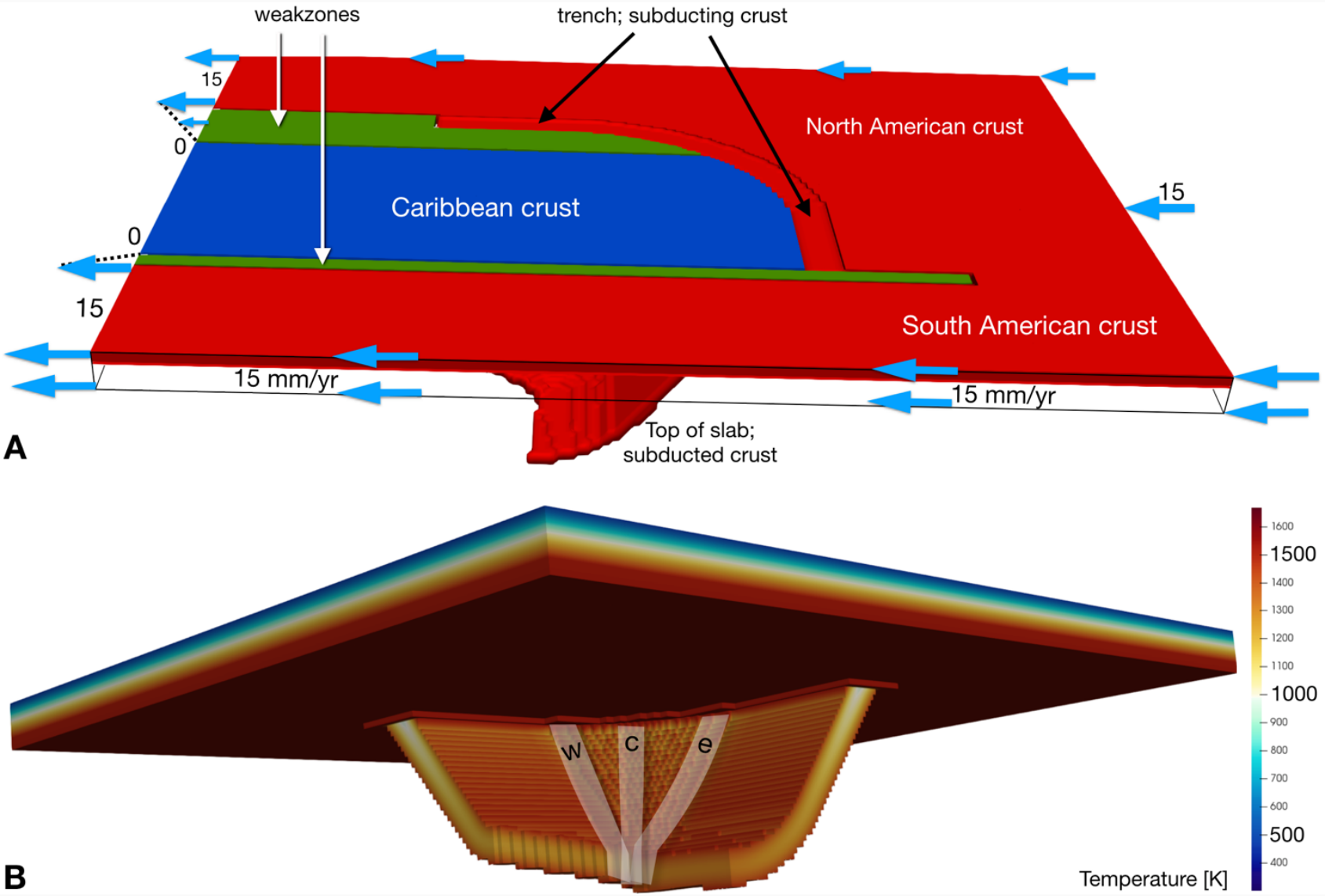


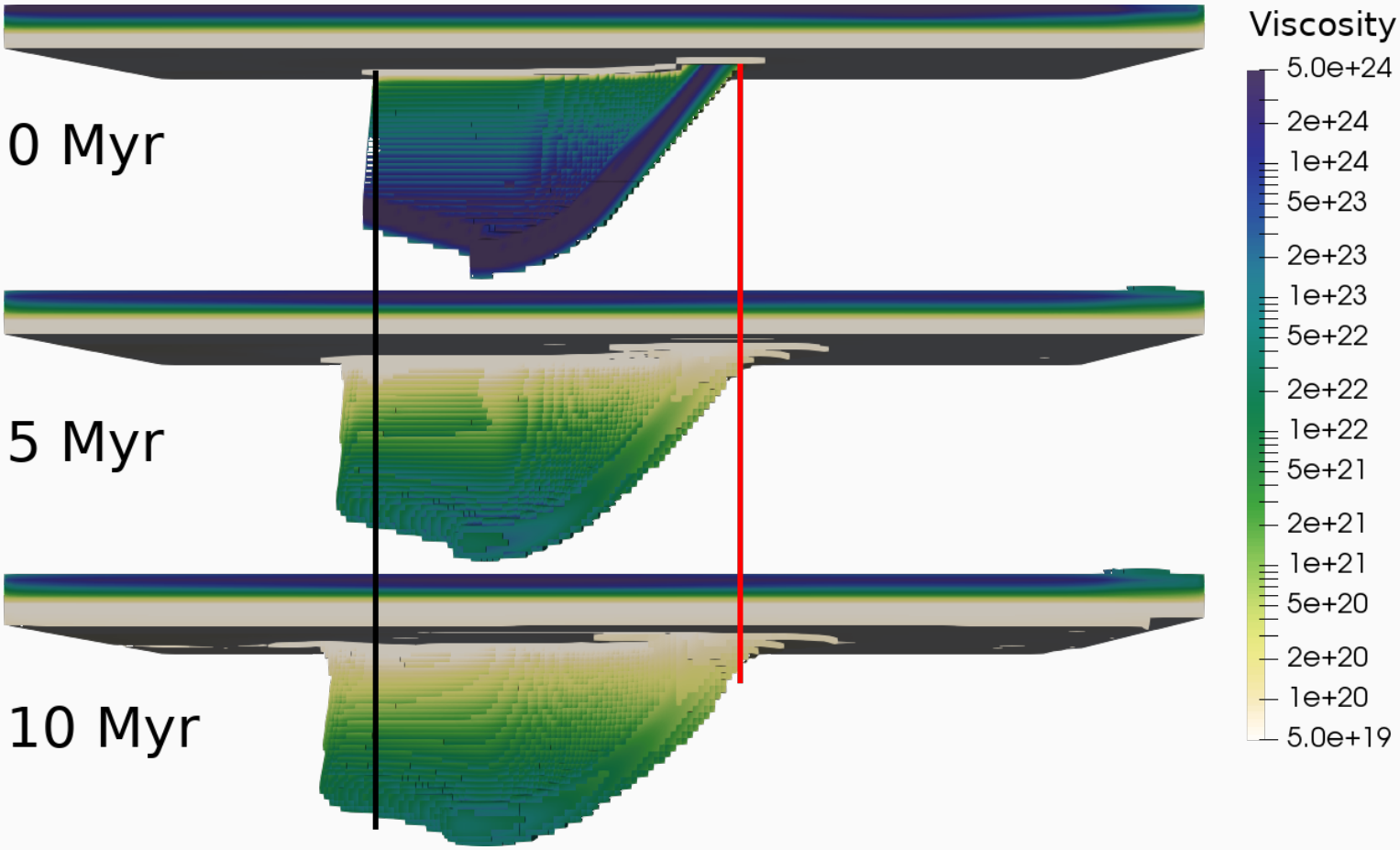
Slab dragging and stationary eastern slab



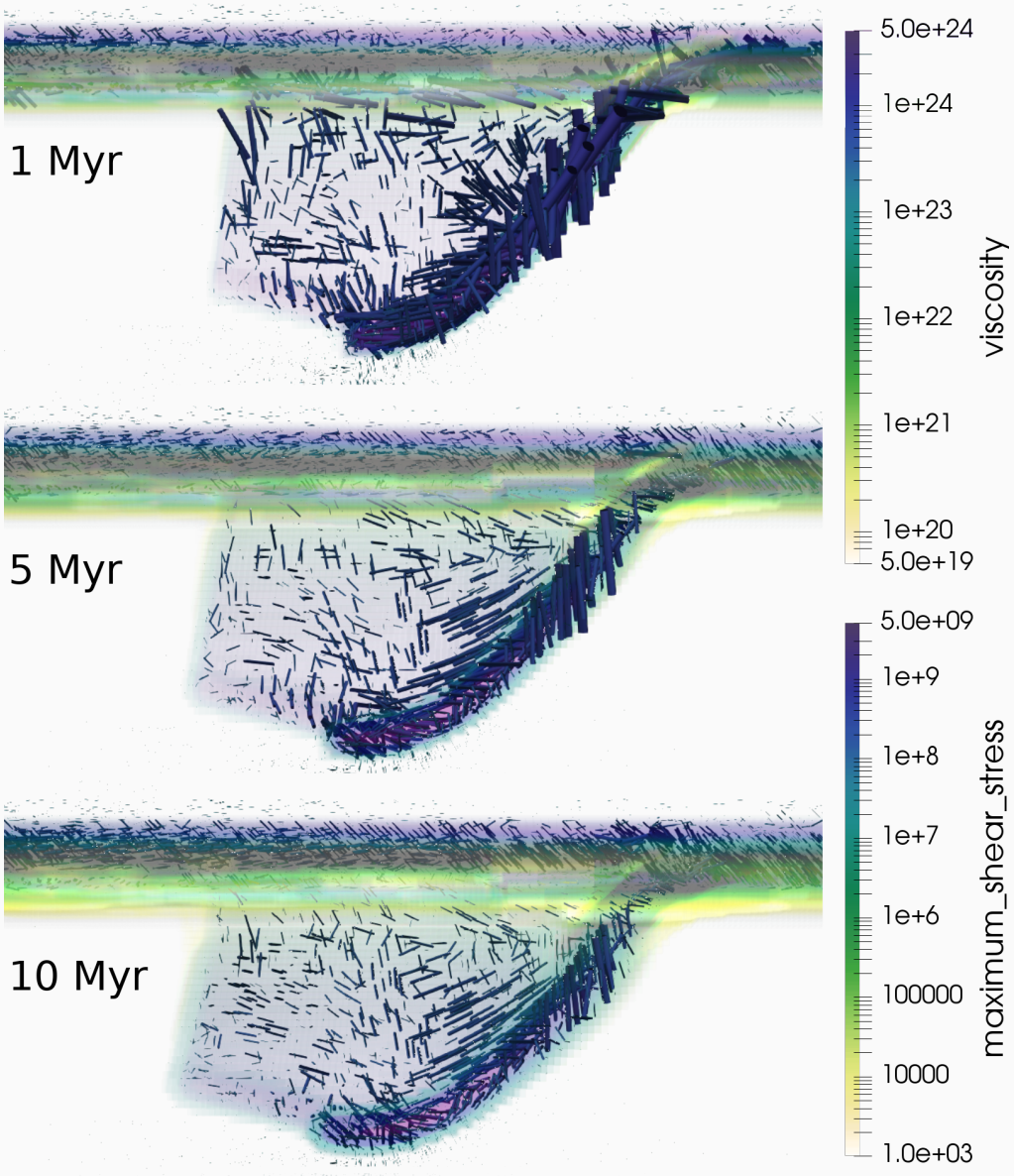
Next images we look from the South and West



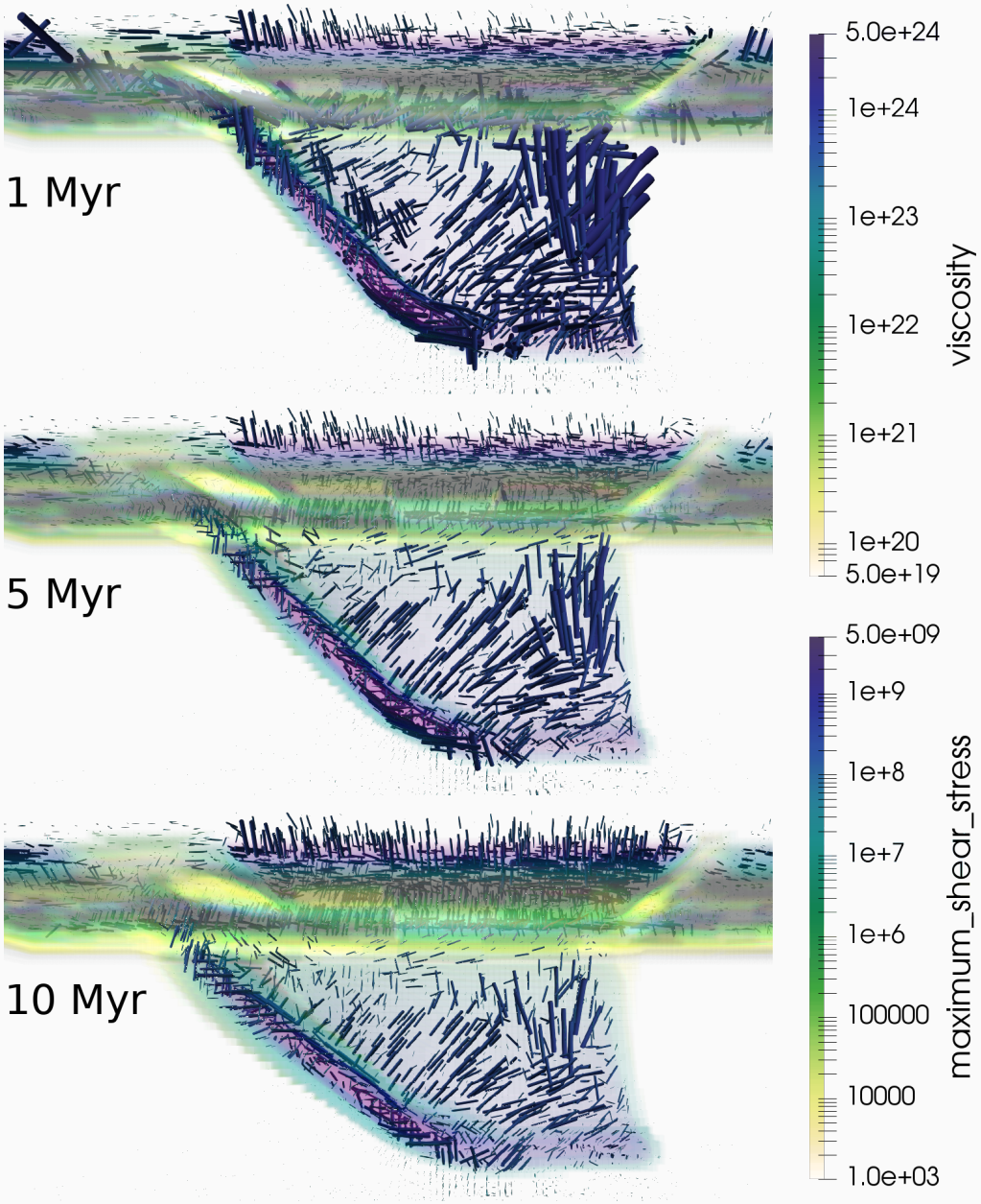
More slab dragging



Direction of maximum shear stress from south



Direction of maximum shear stress from west



Conclusions

1. Assessed the first-order characteristics of strongly arcuate subduction zones through the Caribbean example
2. Started with an advanced stage subduction
3. Showed slab dragging as a feasible process
4. Found that the direction of maximum shear stress is non-trivial