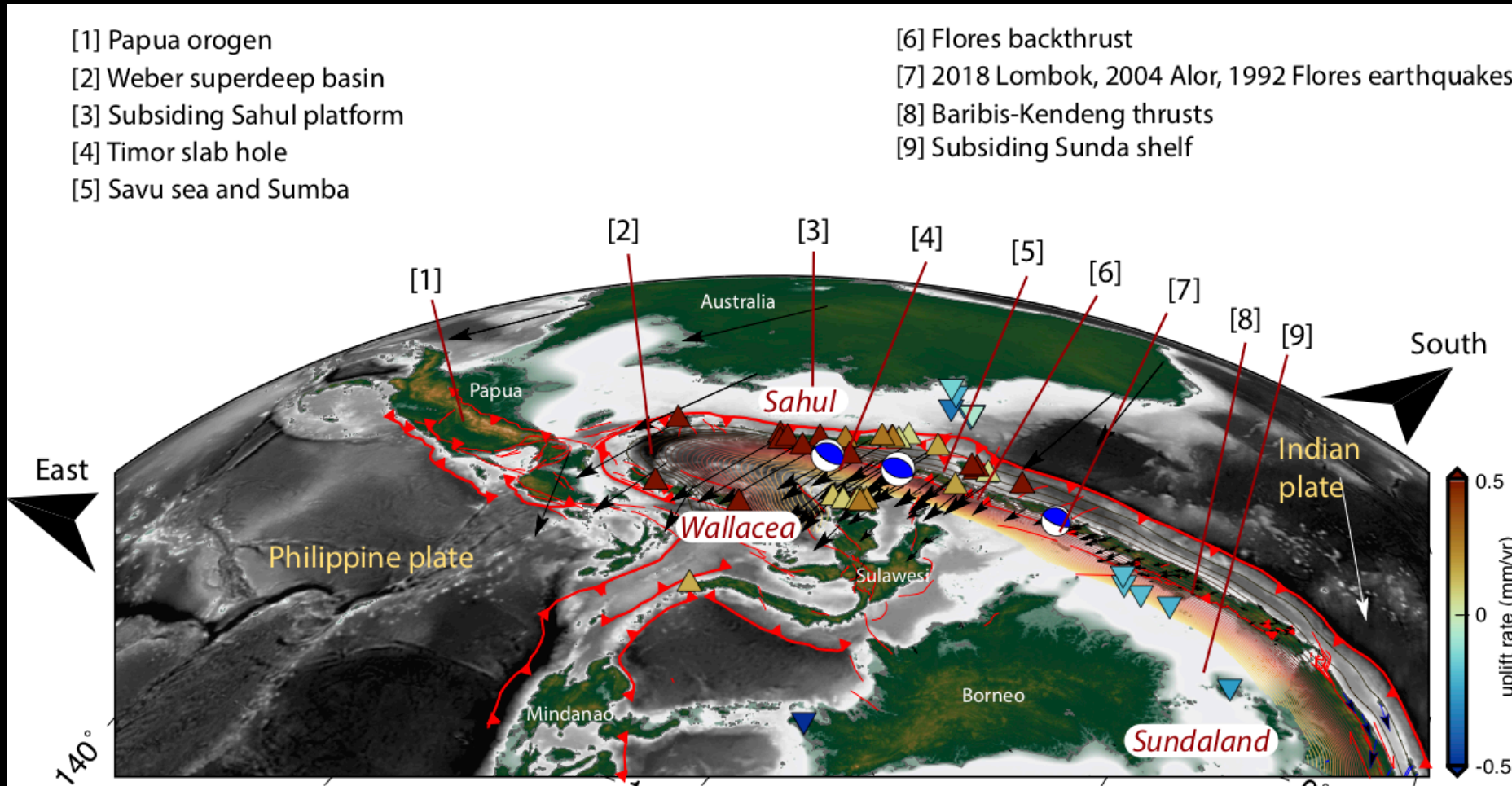


Subduction dynamics, tectonics, and dynamic topography in Banda-Java

Laurent Husson¹, Nicolas Riel², Sonny Aribowo^{1,3}, Christine Authemayou⁴, Danny H. Natawidjaja³, Boris Kaus², Gino de Gelder¹, Kevin Pedroja⁵

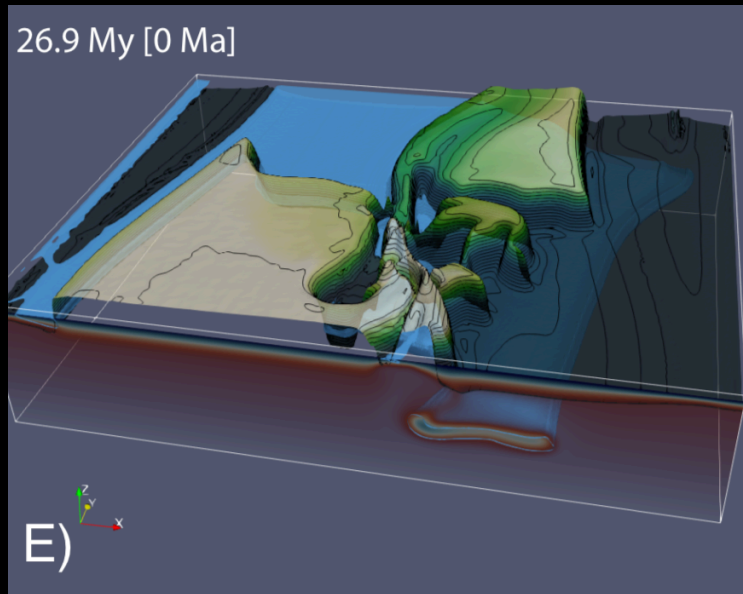


The « Maritime Continent » is home to many geodynamic records:

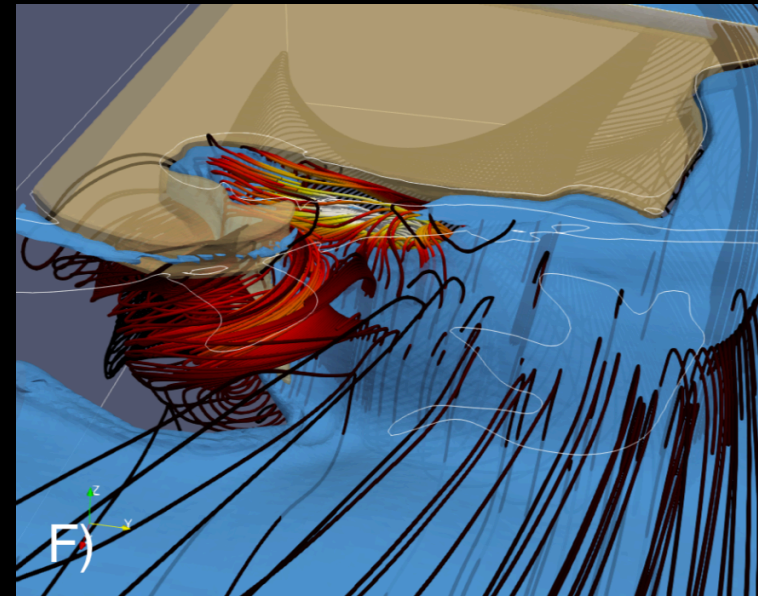
- Deepest backarc basin [2]
- Largest flooded continental units
- Fast regional uplift and subsidence [3,9]
- Slab rollback in the most tightly nested backarc basin [2]
- Backarc earthquakes > 7 Mw [7]
- etc.

Modeling subduction dynamics and surface morphotectonics

3D cartesian, « Earth-like » simulation
(code LaMEM)



animation:
[3D view and topography](#)



animation:
[Subduction dynamics and mantle flow](#)

Modeling subduction dynamics and surface morphotectonics

Surface tectonics

Depth

3D cartesian, « Earth-like » simulation (code LaMEM)

collision in Papua

Papuan orogenesis

Trench retreats, convexity increases

Subsidence in Sahul

Subsidence in Sundaland

Continent-arc collision

Poloidal (« vertical ») mantle flow

Slab detachment in Papua

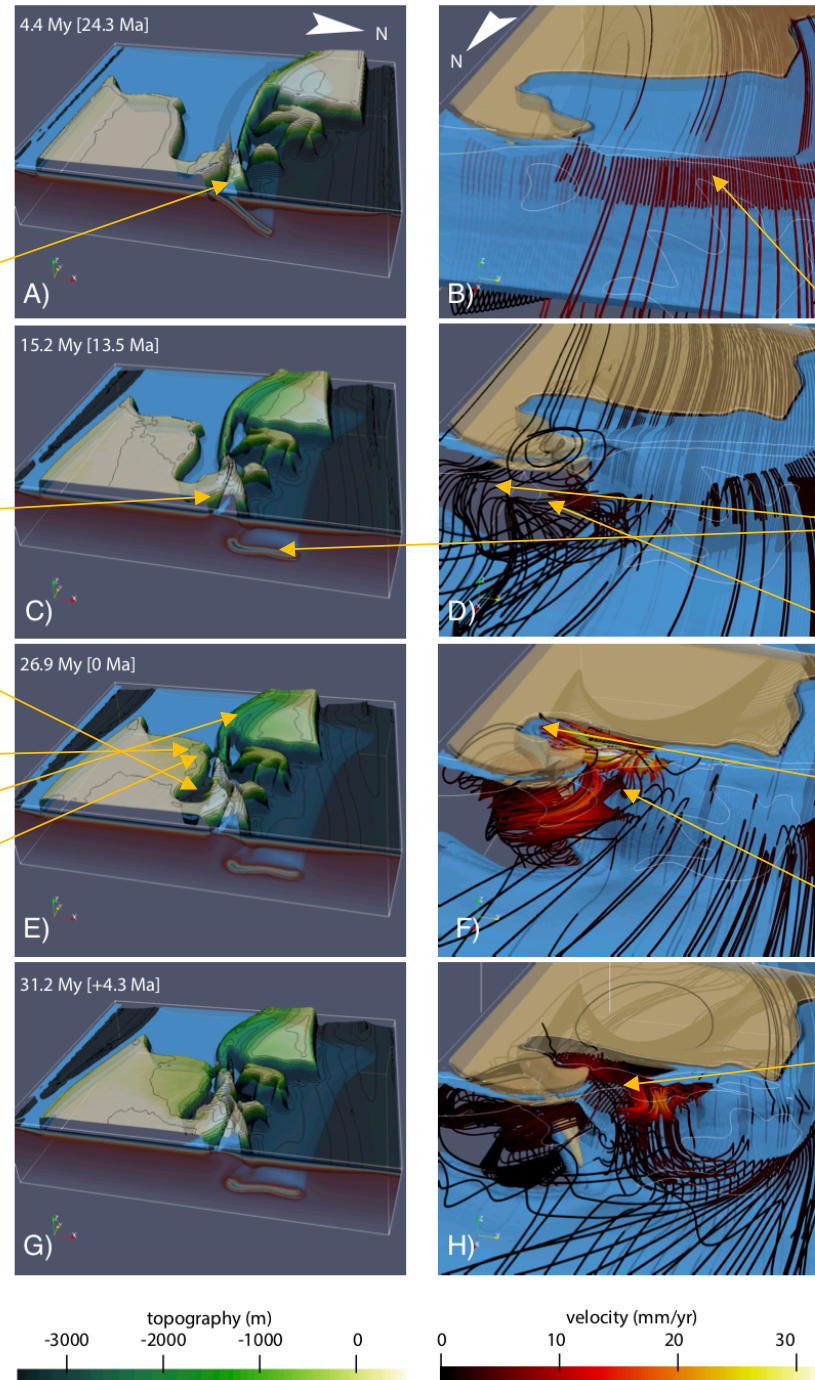
Toroidal (« horizontal ») adds up to poloidal mantle flow

Slab rollback, Banda embayment

Slab tear underneath Timor

Slab detachment

time



Modeled surface kinematics and tectonics

[1] arc-continent collision, N Papua

[2] Southward tilt, Sundaland

[3] incipient compression, Java

[4] back-arc thrust, Wetar-Flores

[5] Central range orogeny, Papua

[6] Northward tilt, Australia

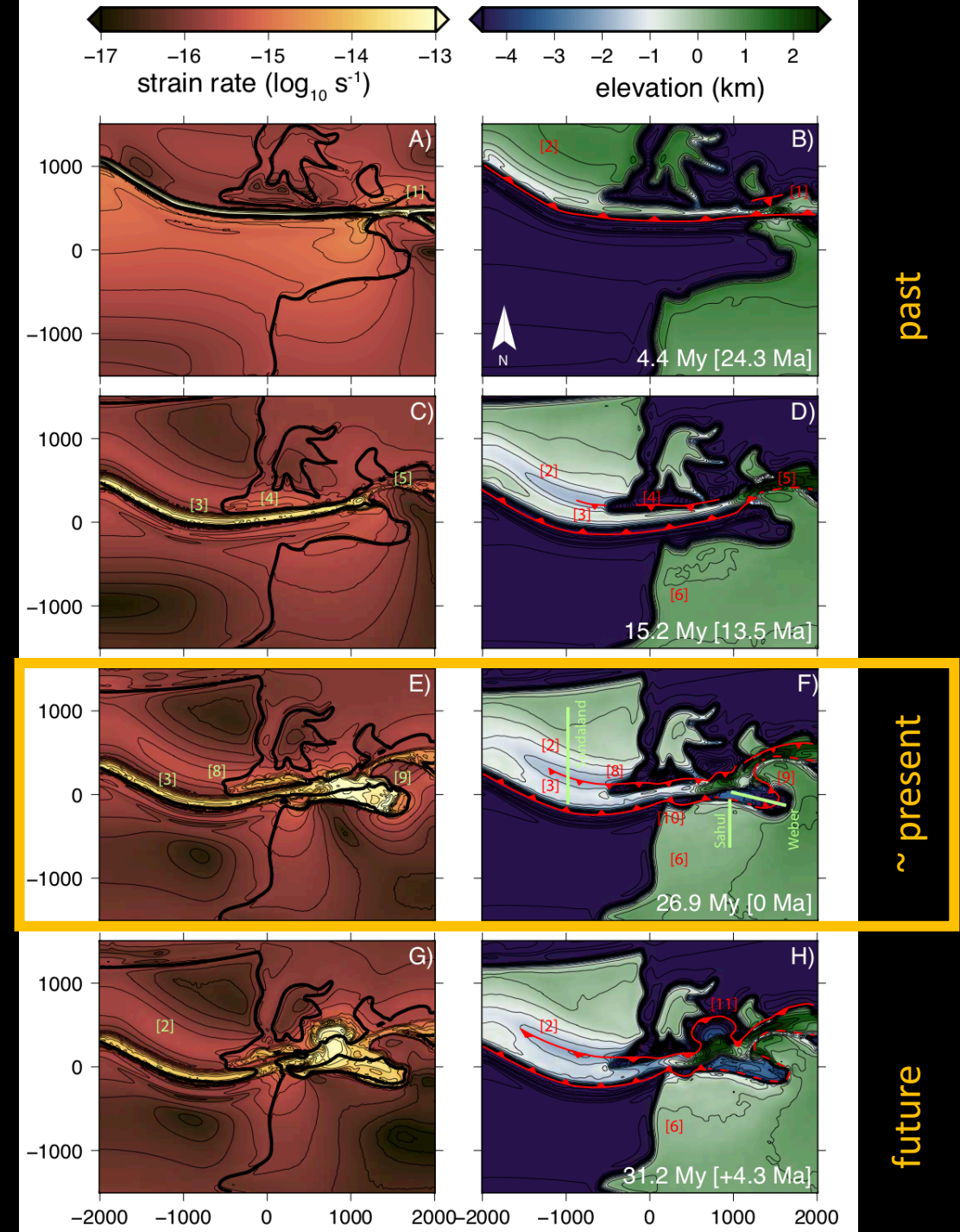
[8] back-arc propagation to Sundaland

[9] slab rollback and backarc opening, Banda sea

[10] Savu sea opening, compression in Sumba

[11] subduction polarity reversal.

time



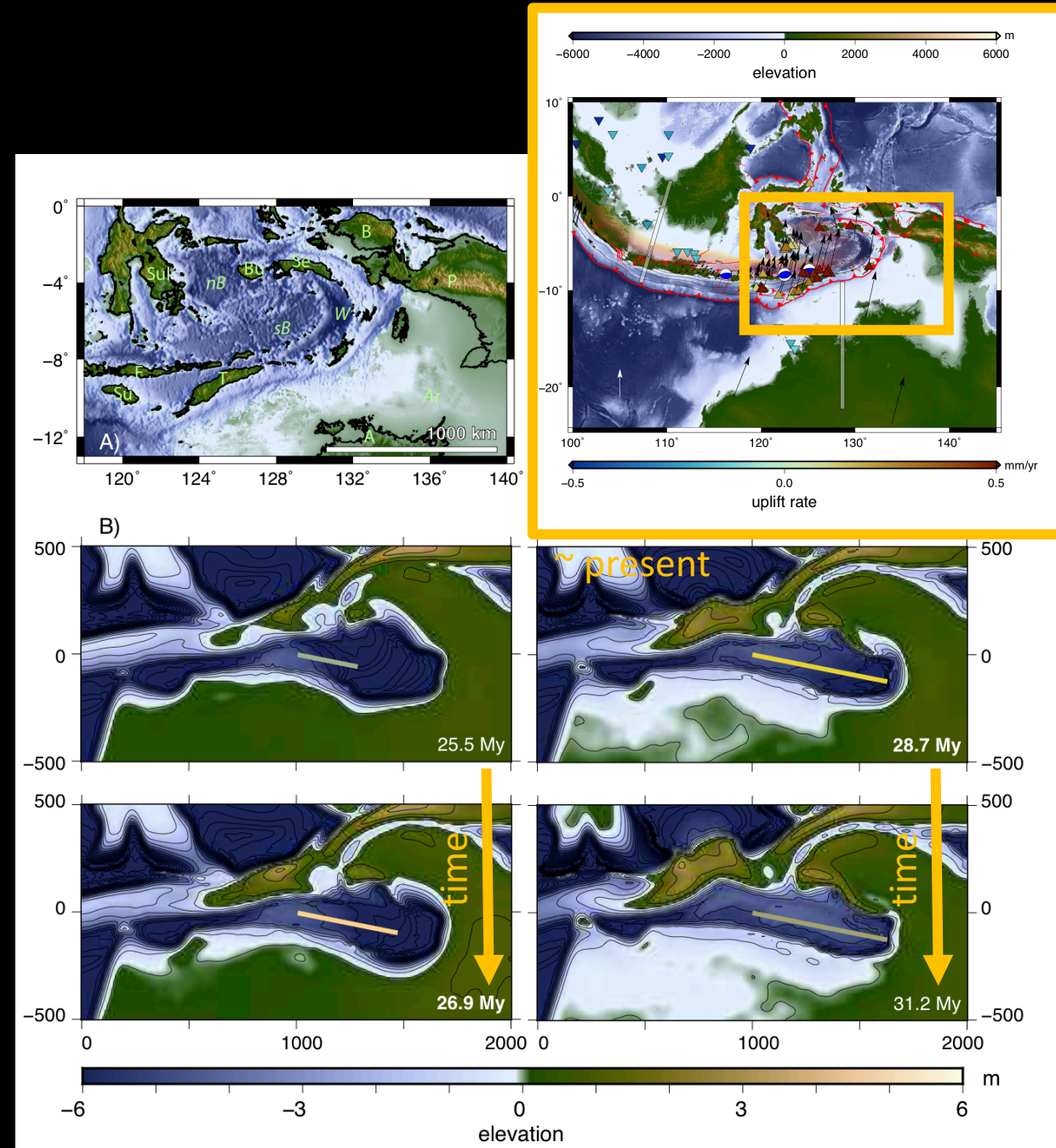
Dynamic topography in the Weber Deep

Weber basin is the deepest place (7 km) on Earth (besides subduction trenches). Yet it is a young backarc.

- Non isostatic bathymetry (« residual topography ») in excess of several km
- It is currently uplifting

Model results:

- Dynamic topography pulls the Weber basin to abyssal depths (not crustal or lithospheric tectonics)
- Deeper basin in the past
- Currently uplifting: dynamic topography relaxes above sinking slab.



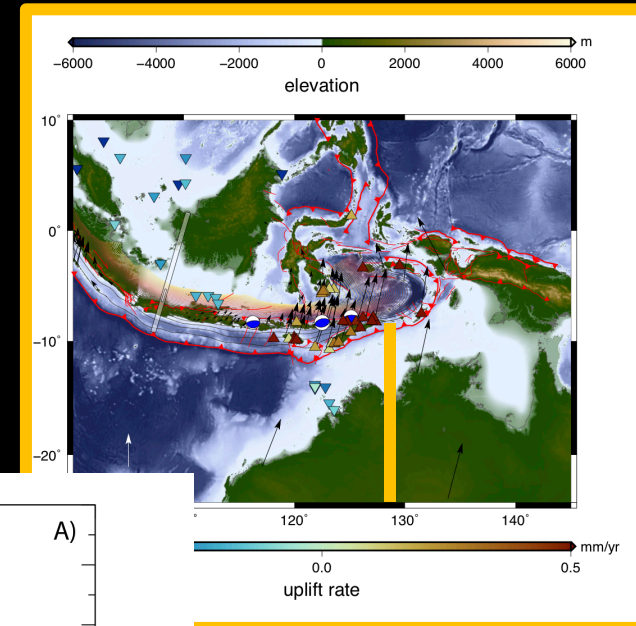
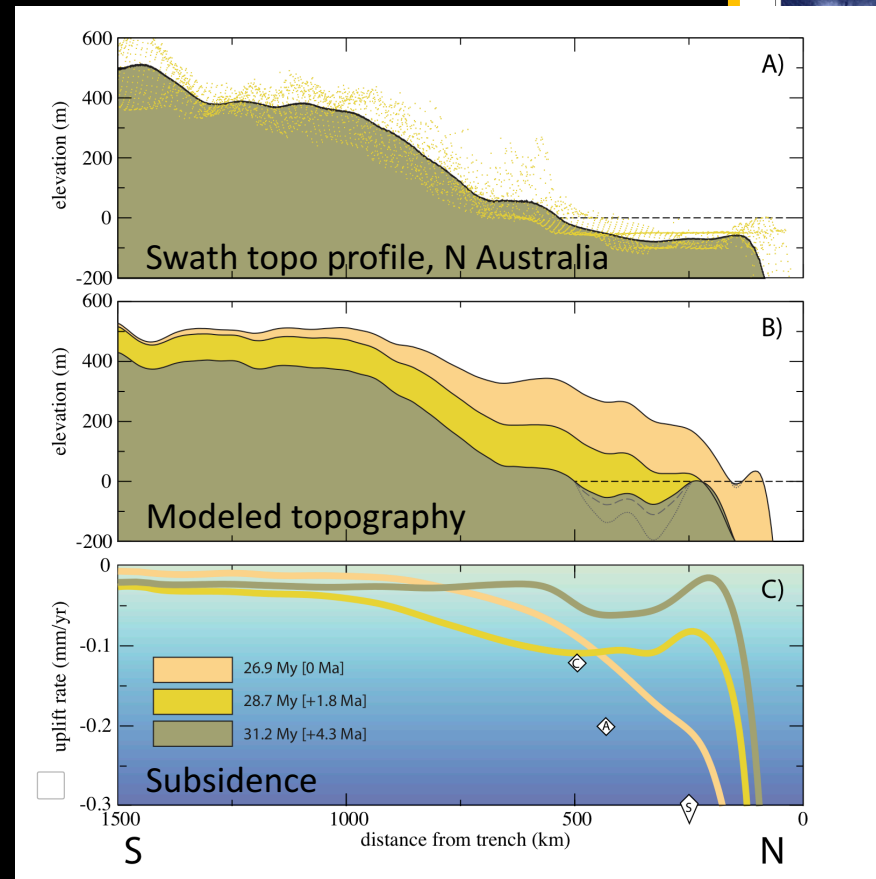
Dynamic subsidence in Sahul

Australia, the « tilted continent » (Sandiford 2007).

- tilt **ED** to the North (subsided)
- tilt **ING** to the North (subsiding)

Model results:

- Dynamic topography tilts Australia
- Subsidence continues as Australia advances over its own detaching slab



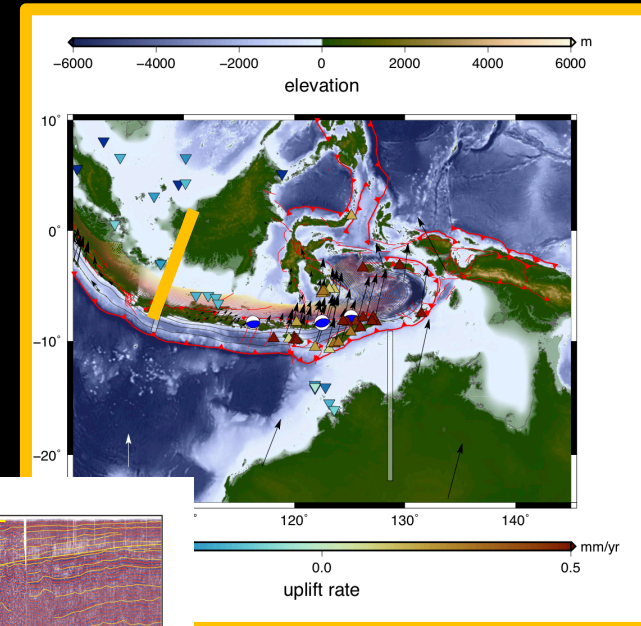
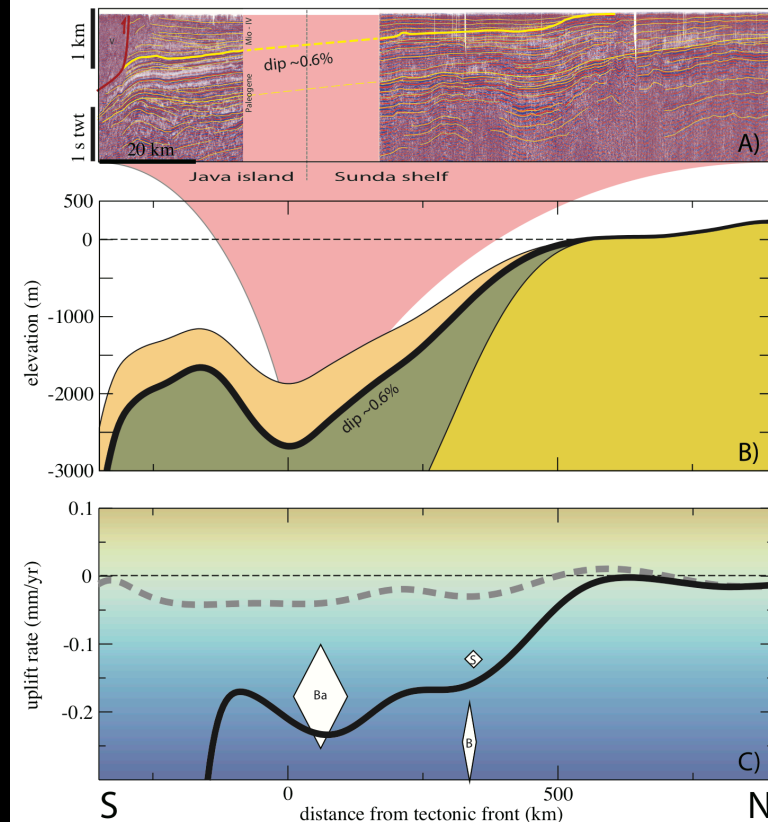
Dynamic subsidence in Sundaland

Sundaland, the other « tilted continent »

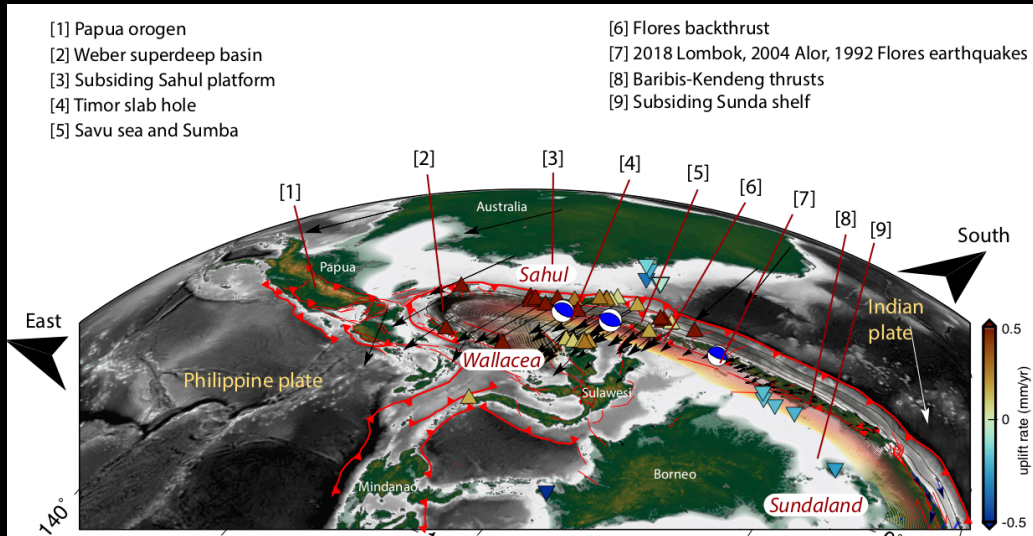
- tilt **ED** to trenchward (subsided)
- tilt **ING** trenchward (subsiding)

Model results:

- Dynamic topography tilts Sundaland
- Subsidence continues as the slab detachment reinforces the toroidal flow, and the vigor of the Indian oceanic slab underneath Sundaland



Conclusions



- The « Maritime continent » reveals many morphotectonic features at different space and time scales.
 - Dynamic topography explains the depth of the Weber basin
 - Dynamic subsidence tilts Sahul as Australia overrides its own slab
 - Dynamic subsidence in Sundaland due to reinforced vigor of Indian subduction dynamics
 - Complex surface morphotectonics is explained by :
 - simple subduction dynamics.
 - A unique process
- What matters is the transience of mantle flow, not its complexity

