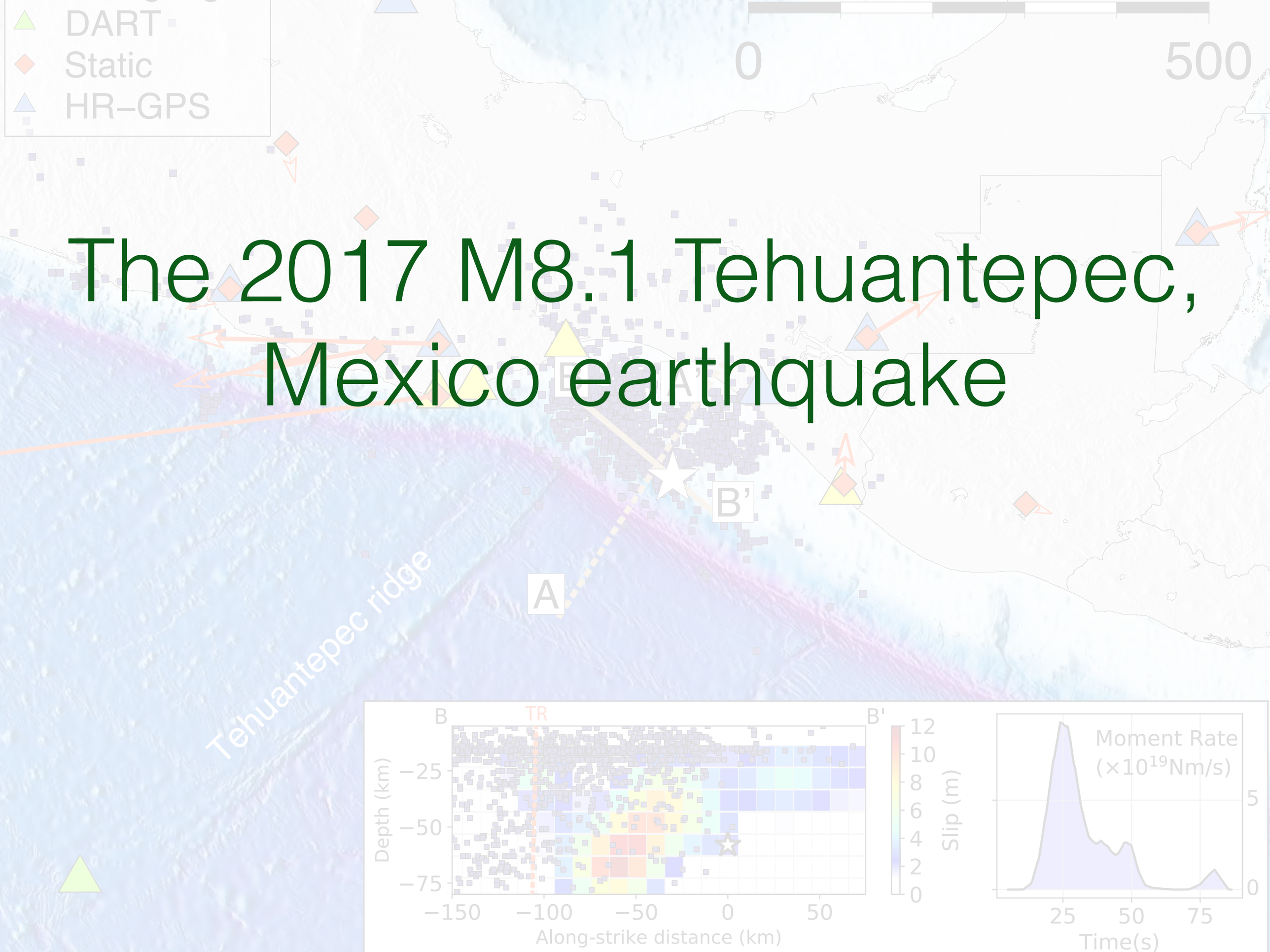
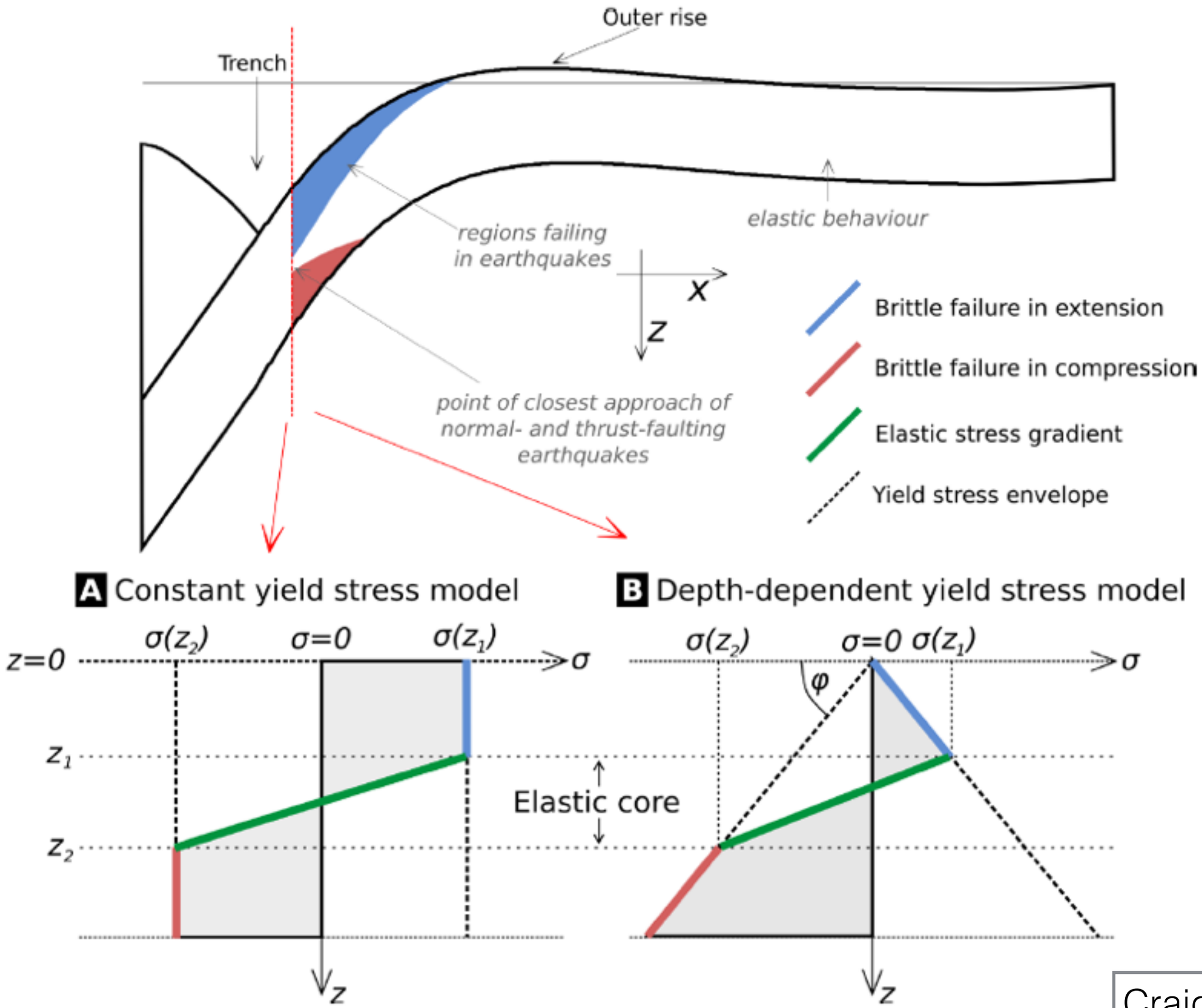


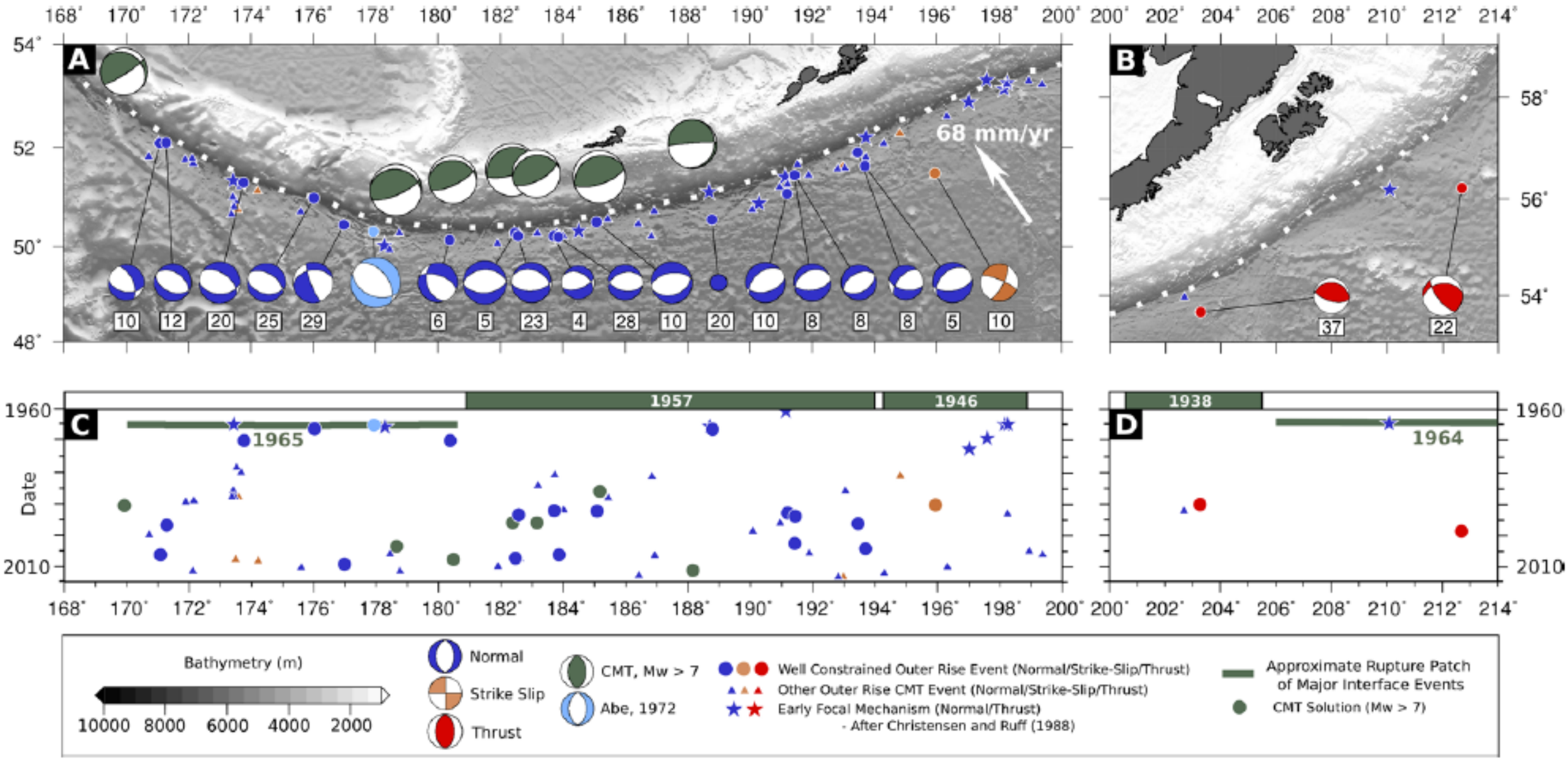
The 2017 M8.1 Tehuantepec, Mexico earthquake

Flexure and subduction zones



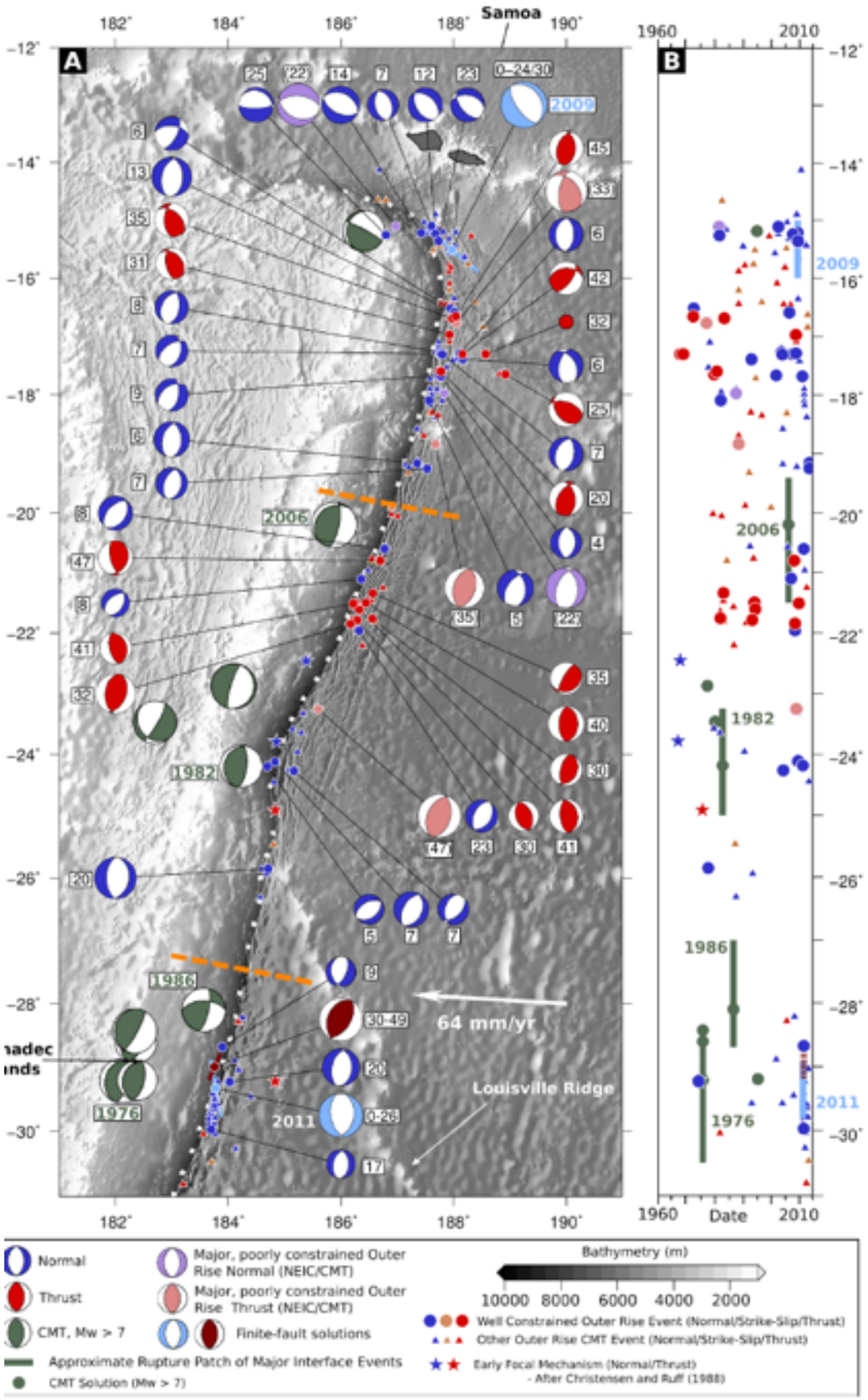
Craig et al., 2016

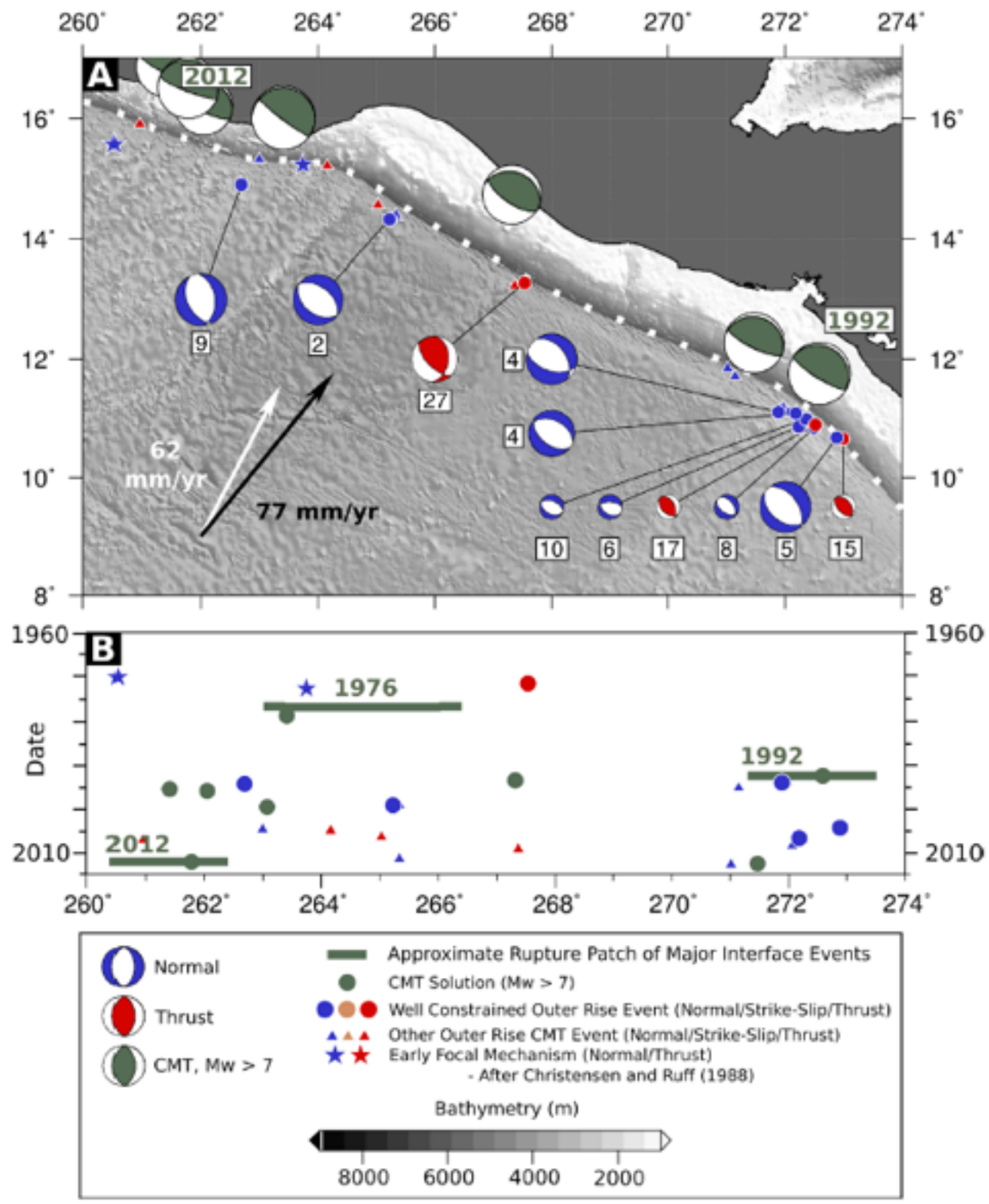
Flexure and subduction zones



Craig et al., 2016

Flexure and subduction zones





Craig et al., 2016

Flexure and subduction zones

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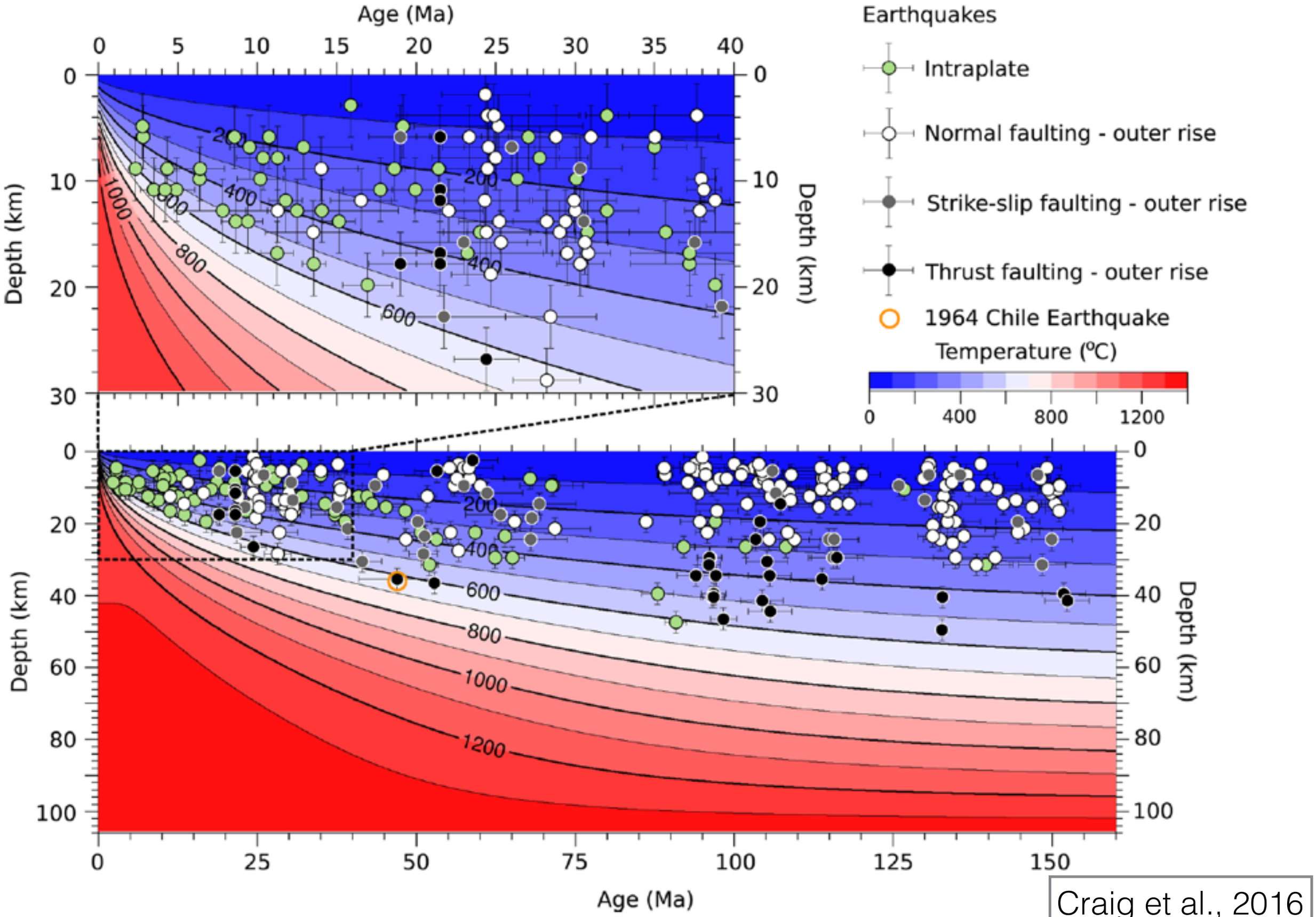
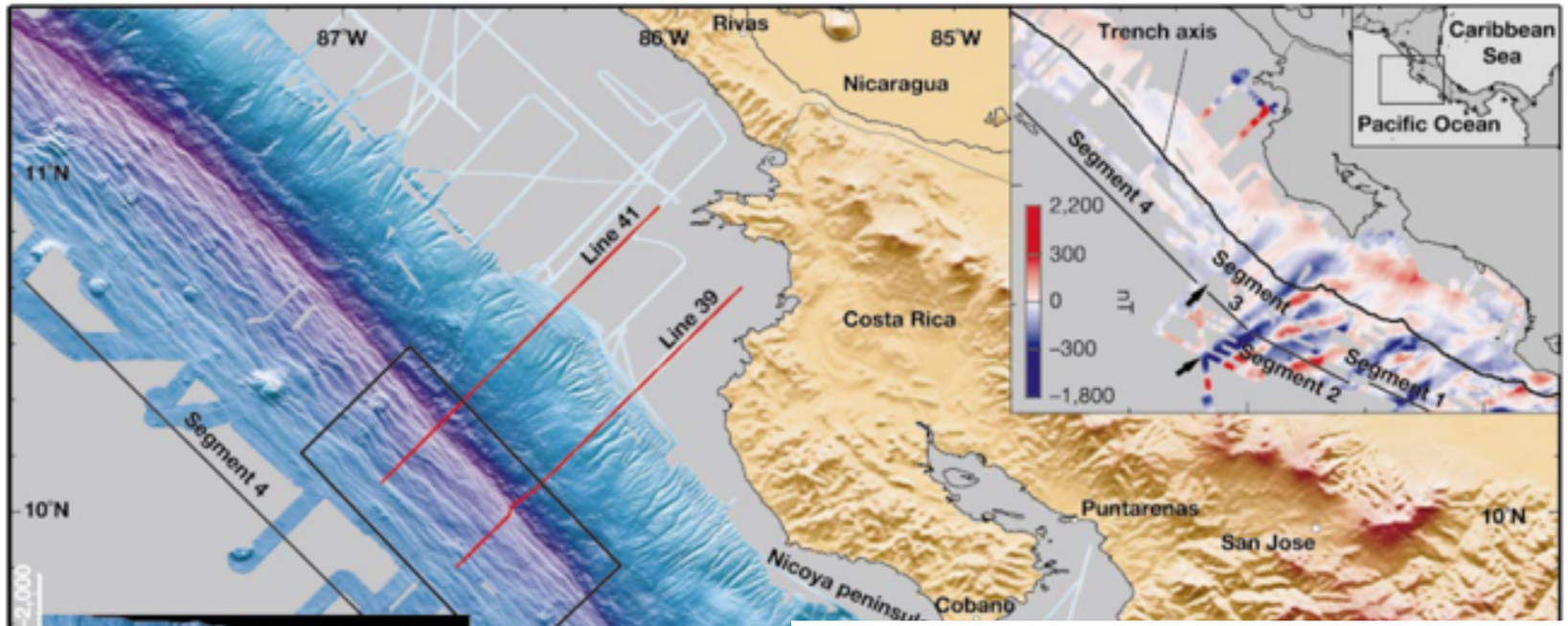
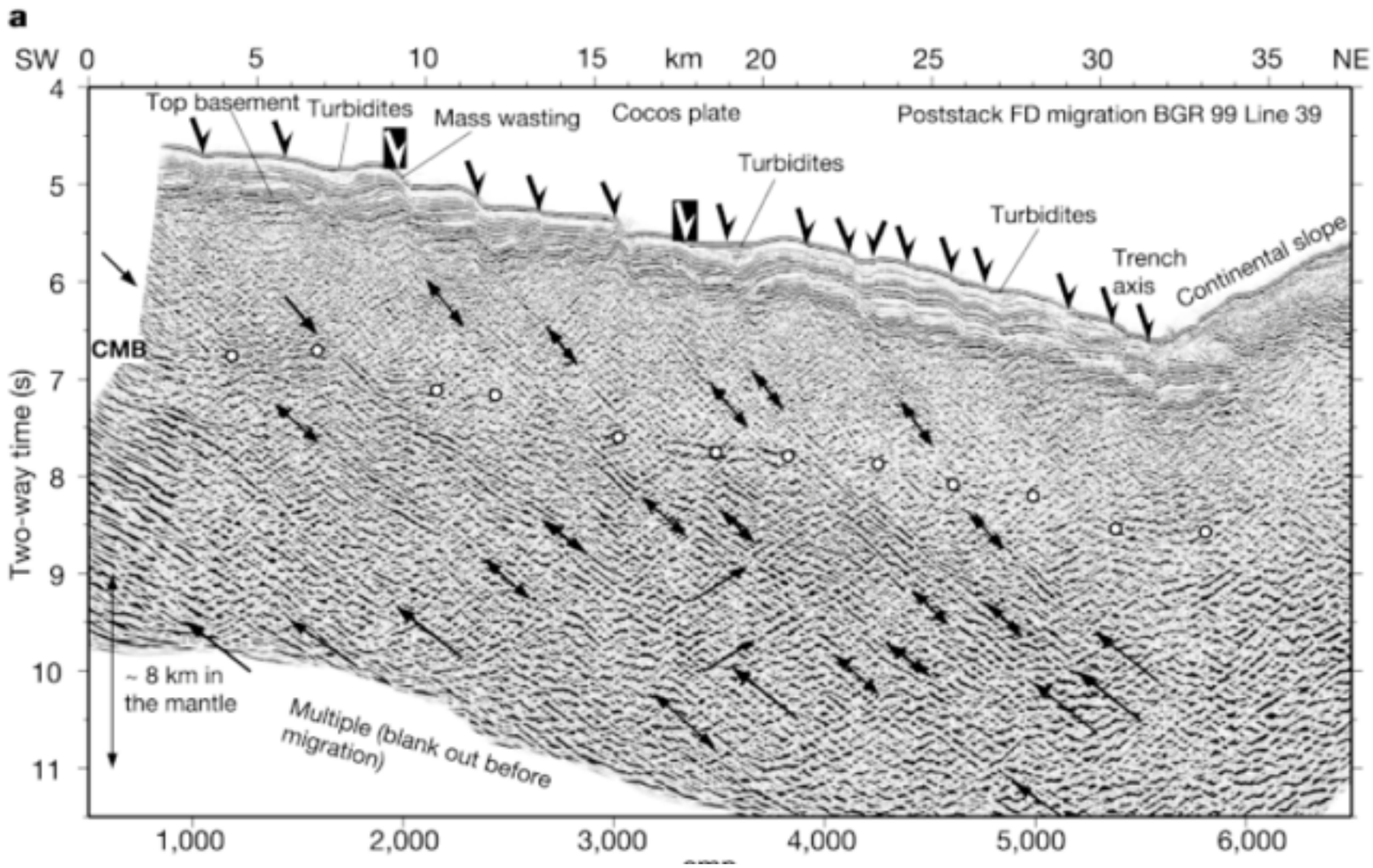


Craig et al., 2016

Flexure and subduction zones

Normal faulting in the outer rise





Ranero et al., 2003

Normal faulting in the outer rise

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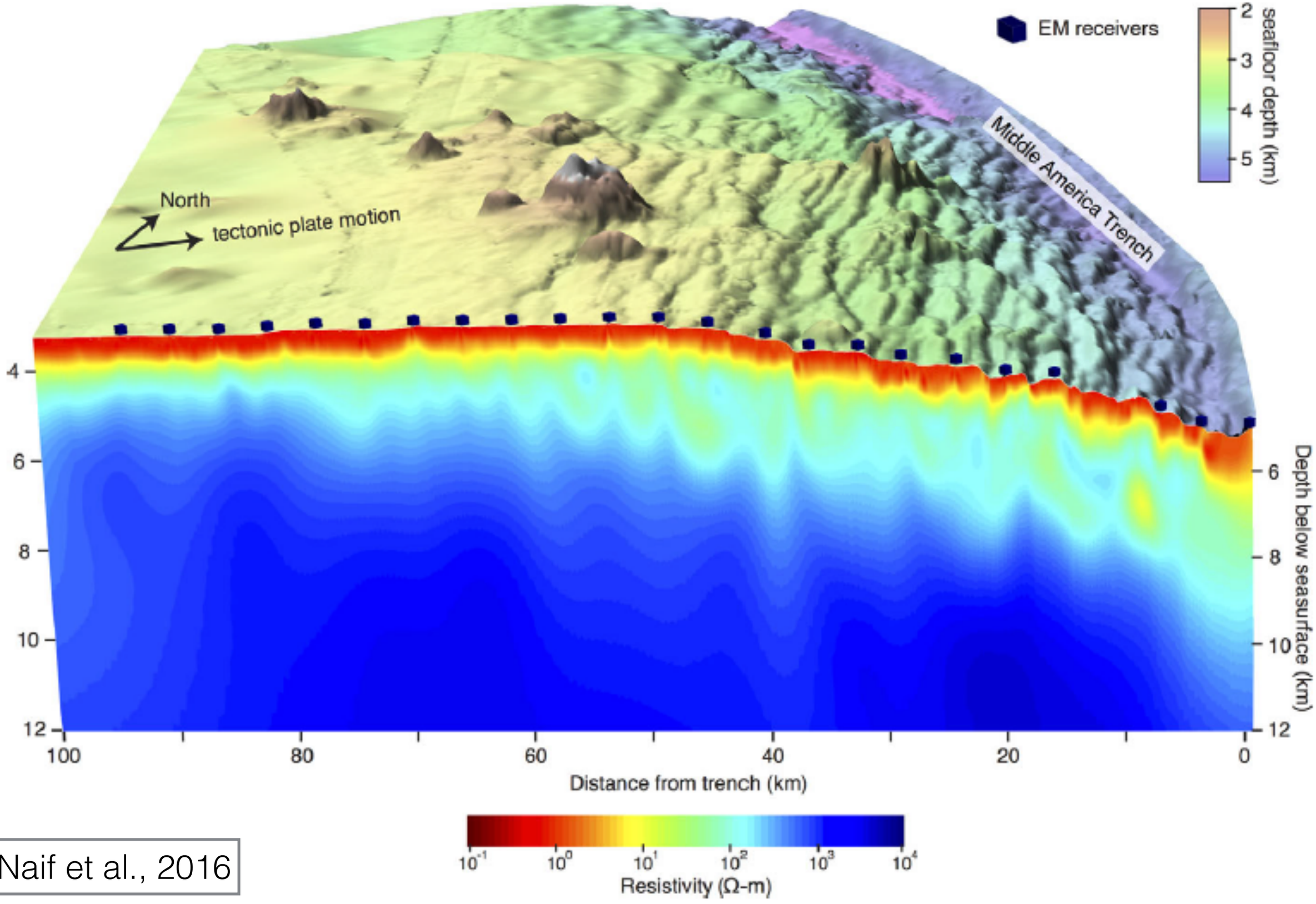
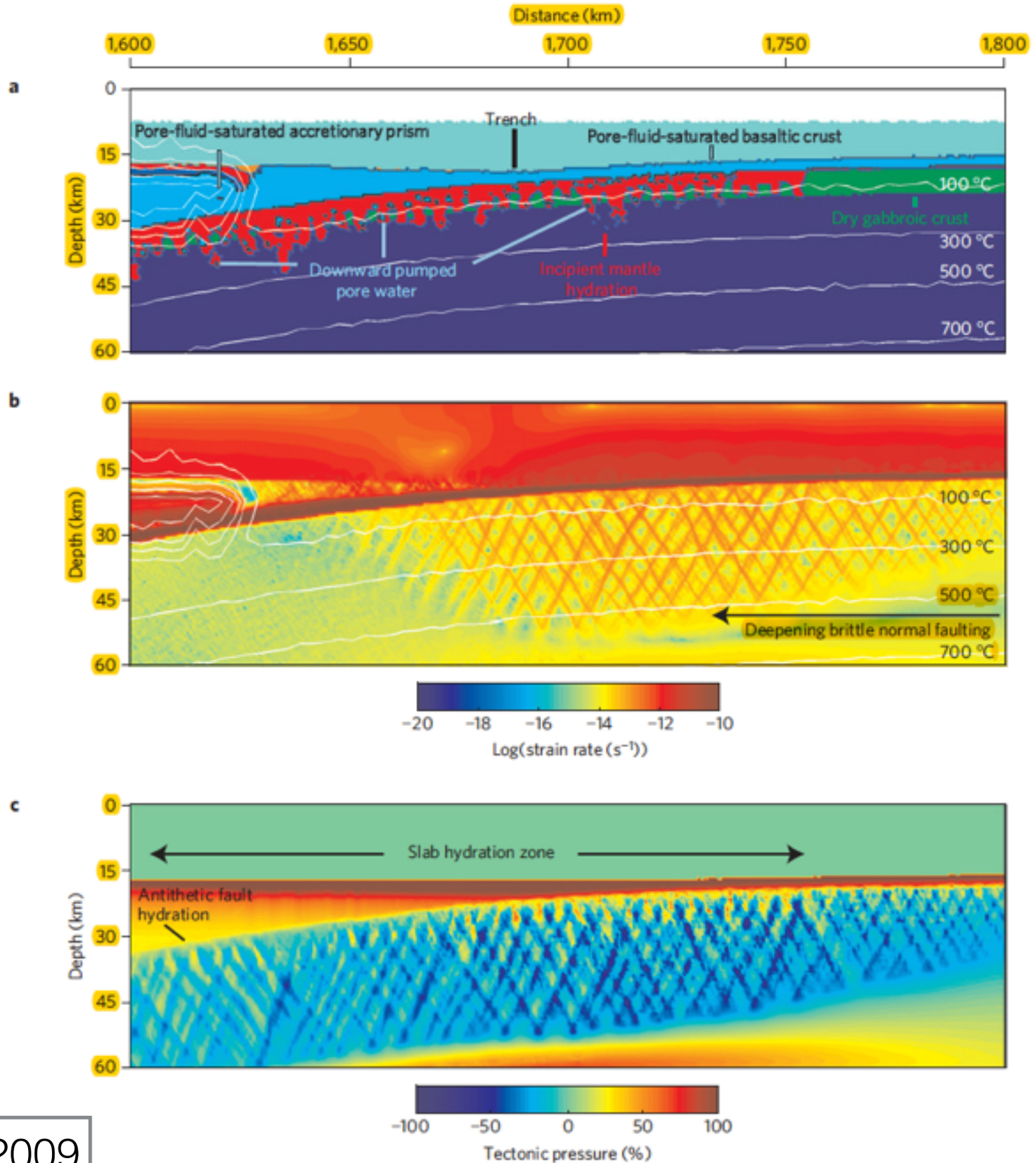


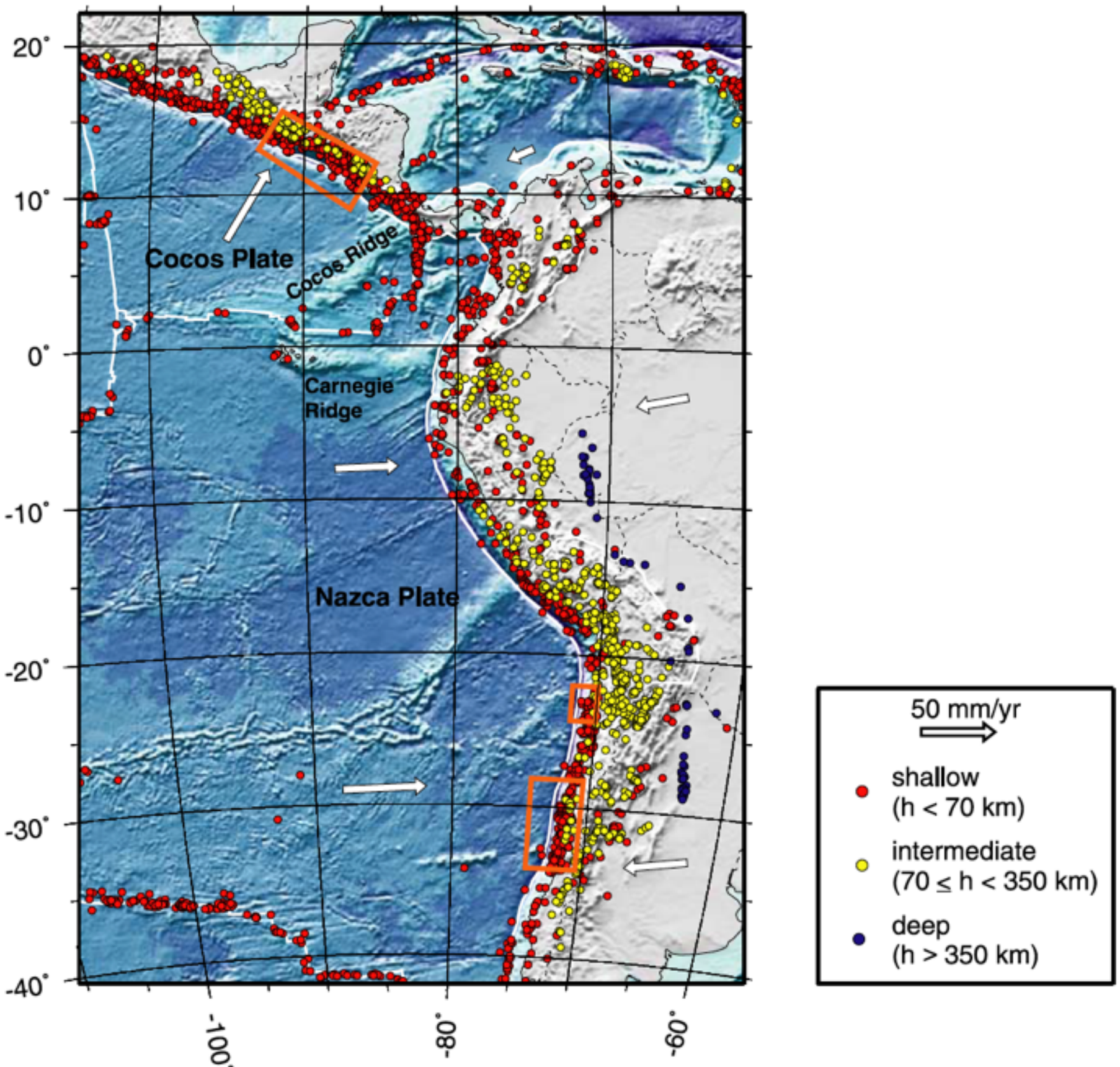
Naif et al., 2016

Normal faulting in the outer rise

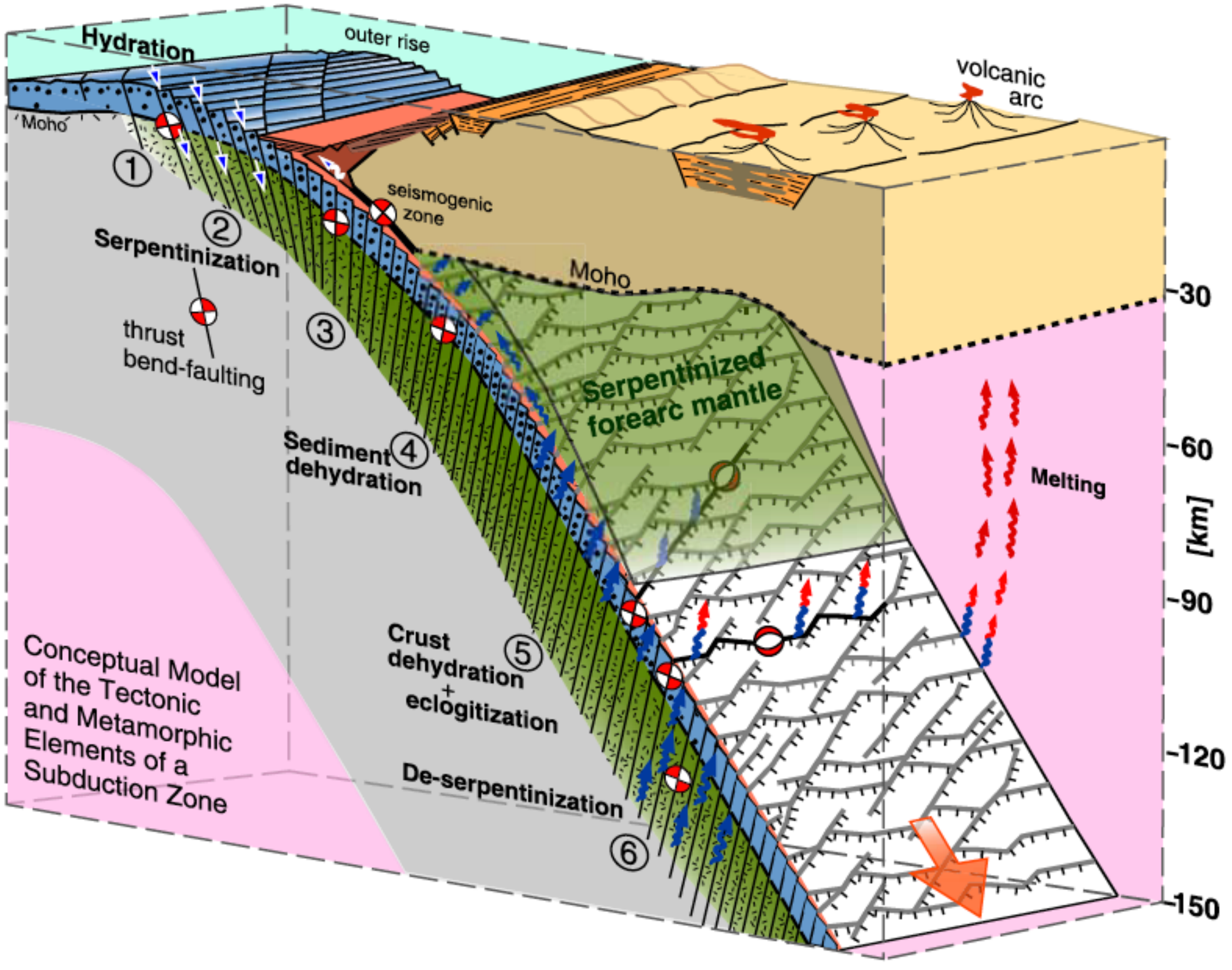


Faccenda et al., 2009

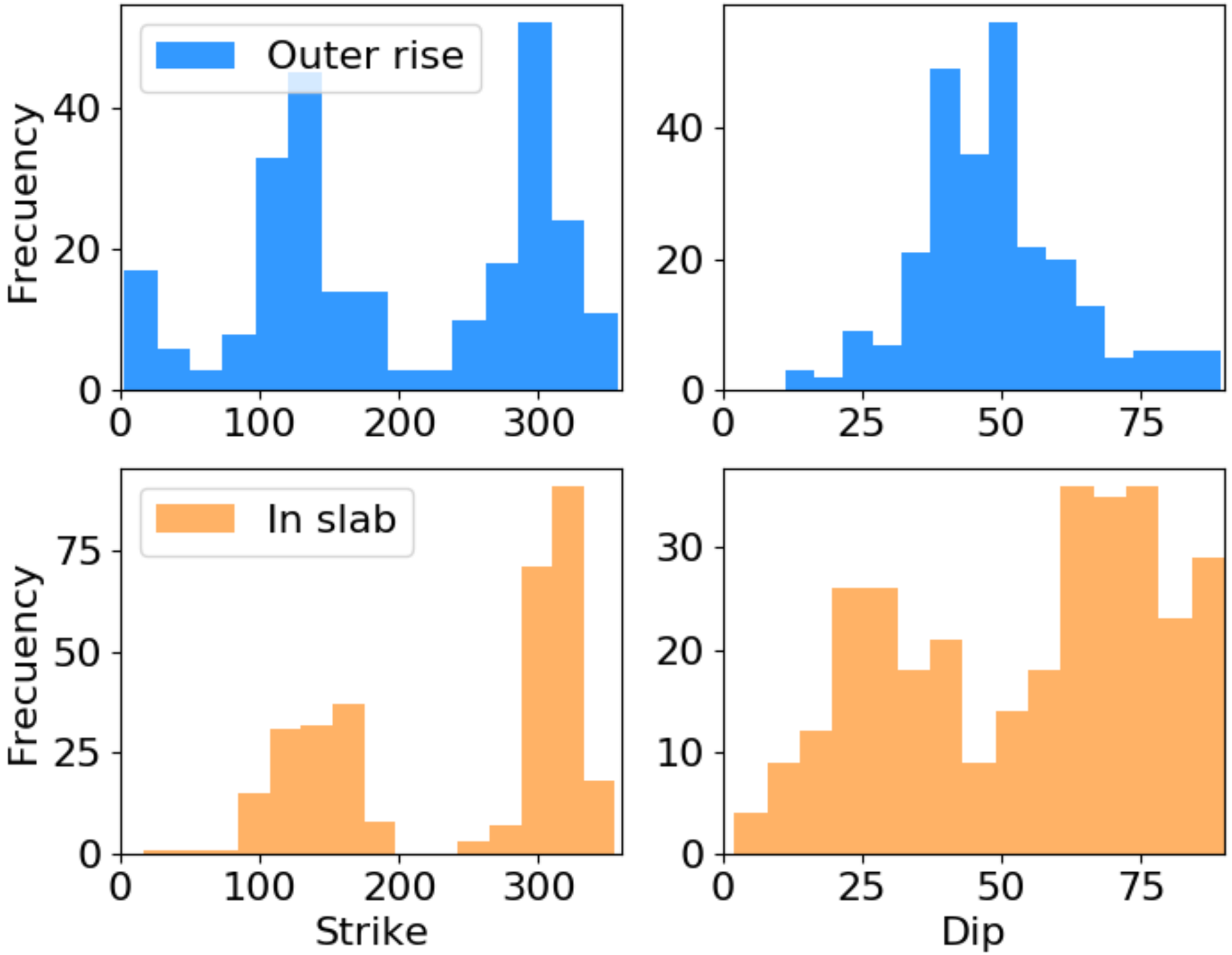
Intermediate depth EQs



Intermediate depth EQs



This makes sense for Mexico



M8.1 Tehuantepec

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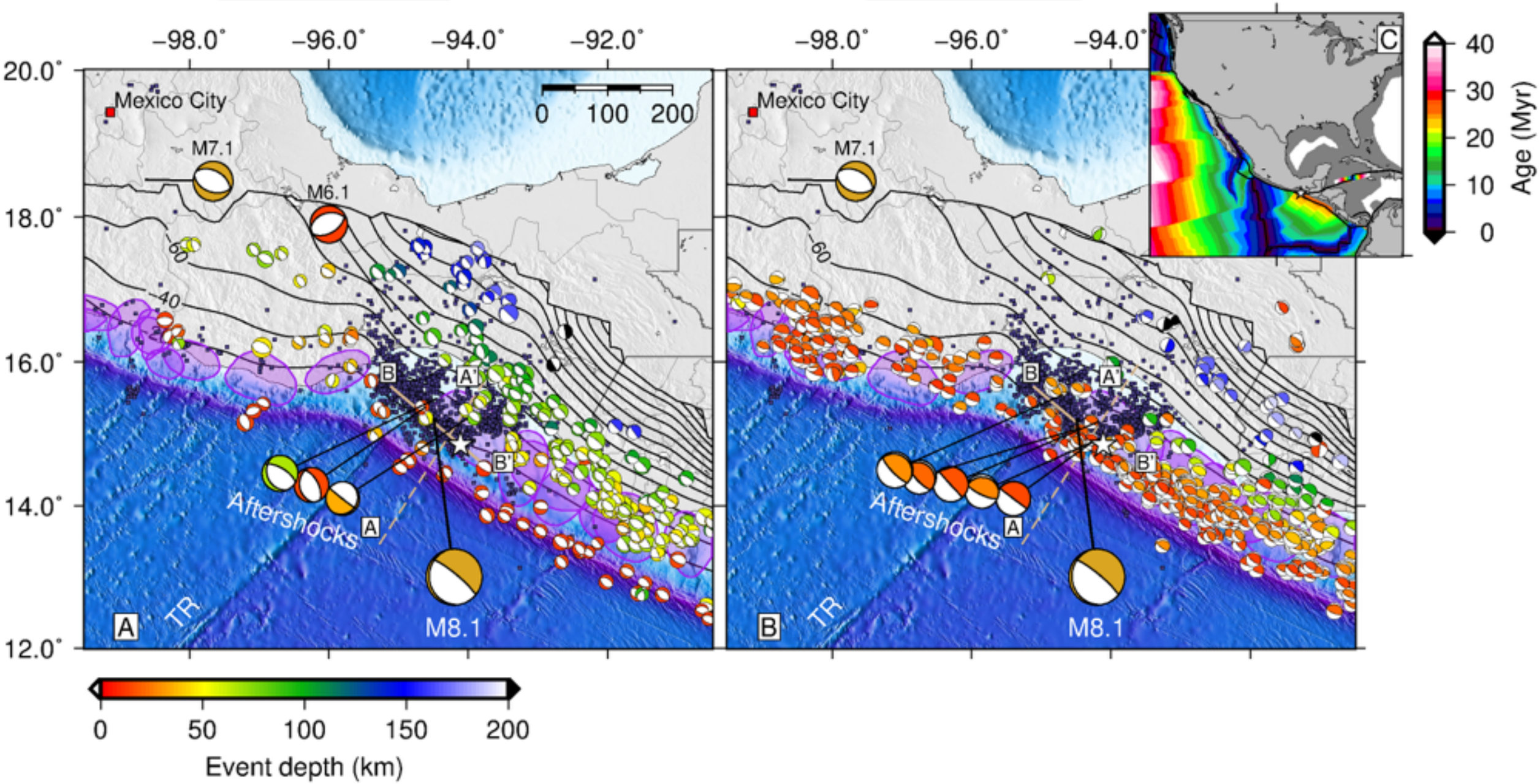
Normal faults

Thrust faults



M8.1 Tehuantepec

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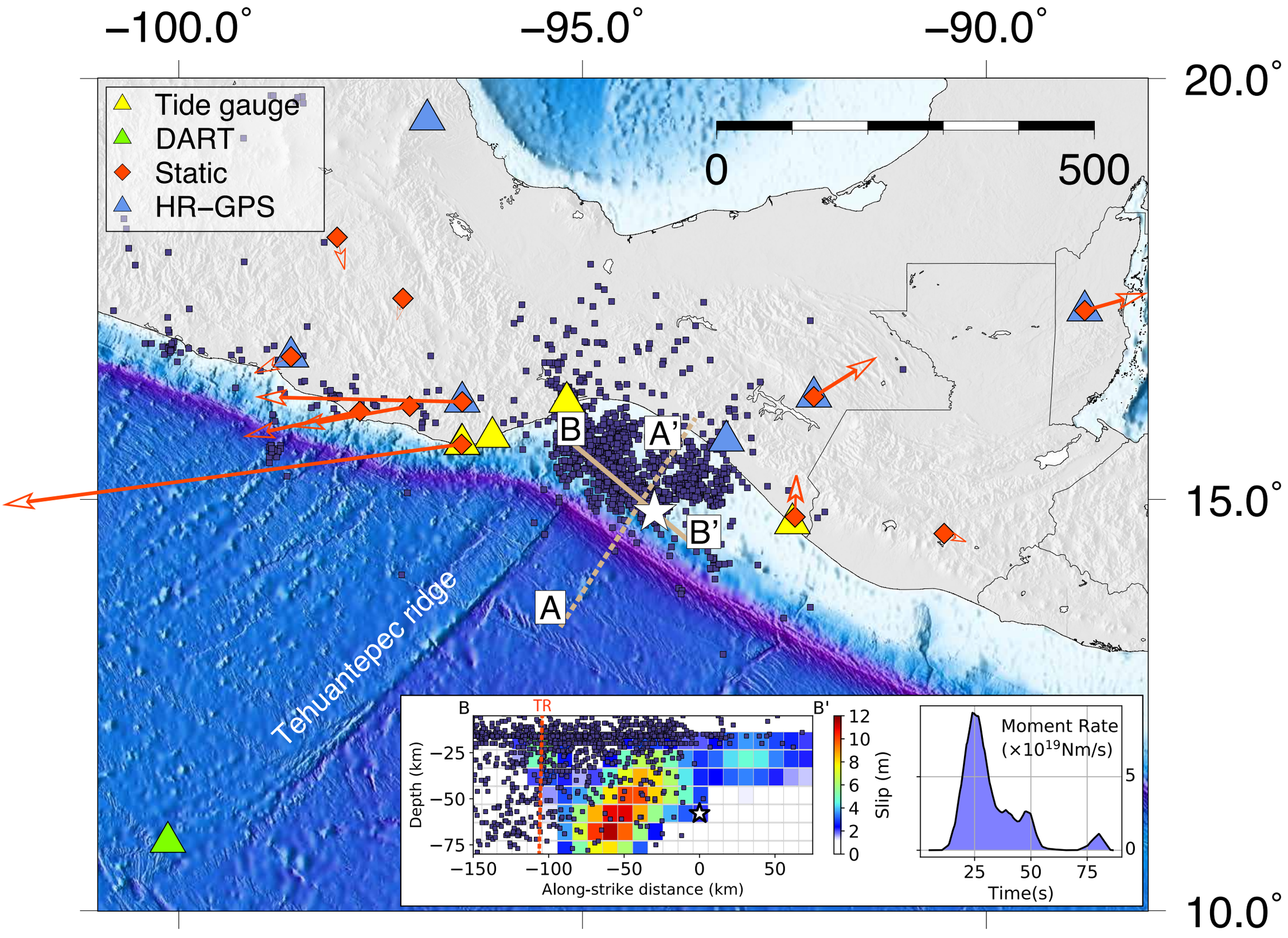
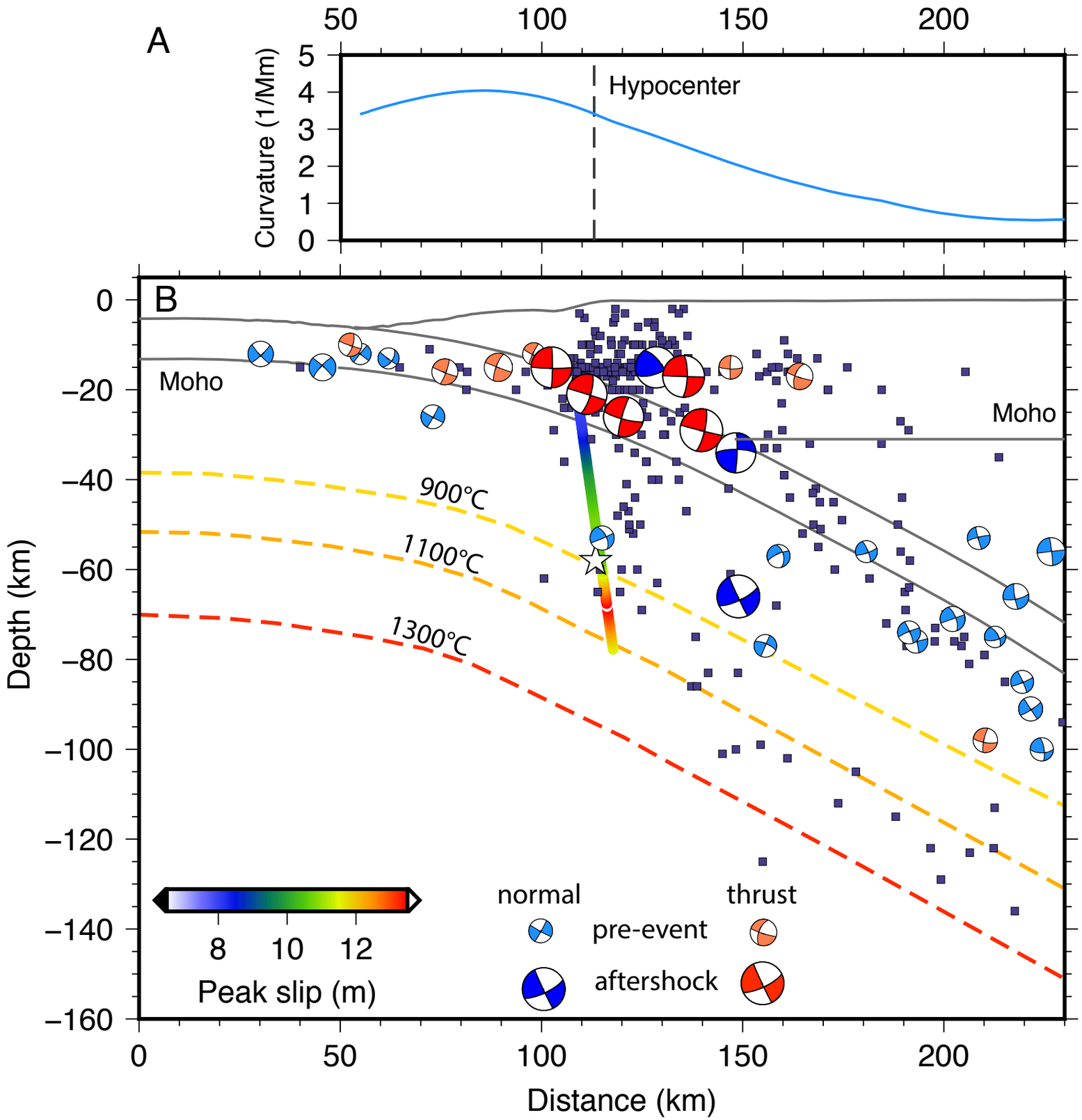
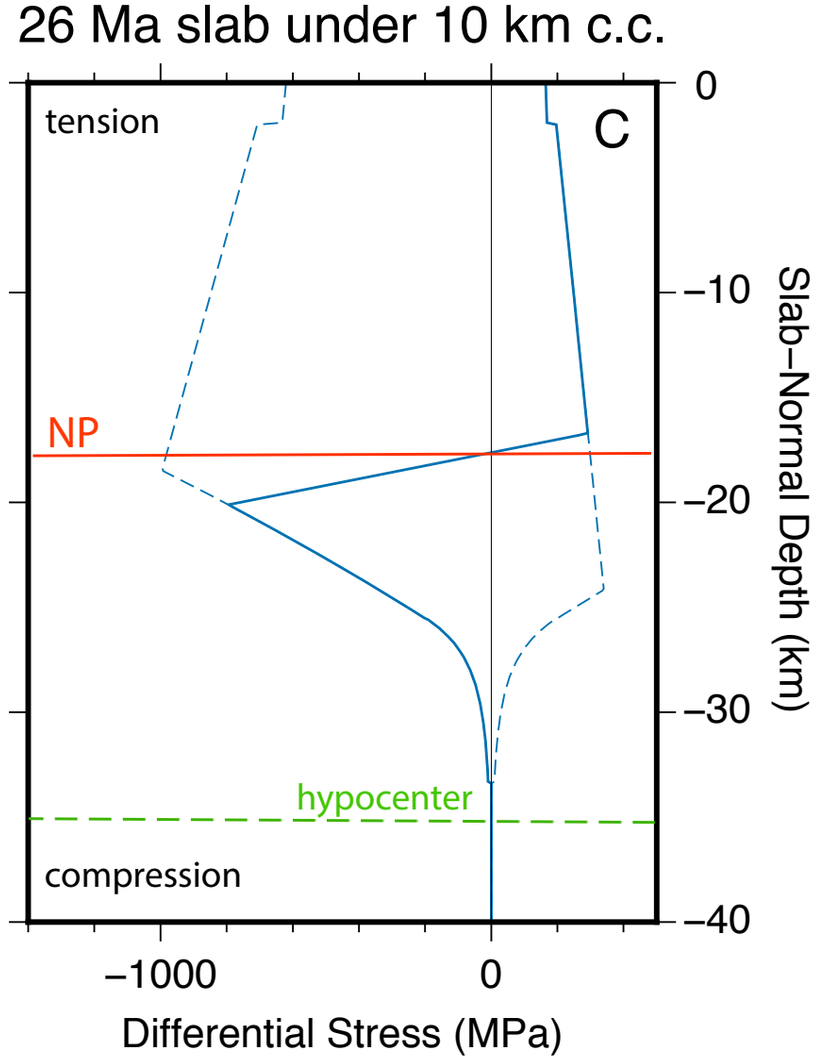


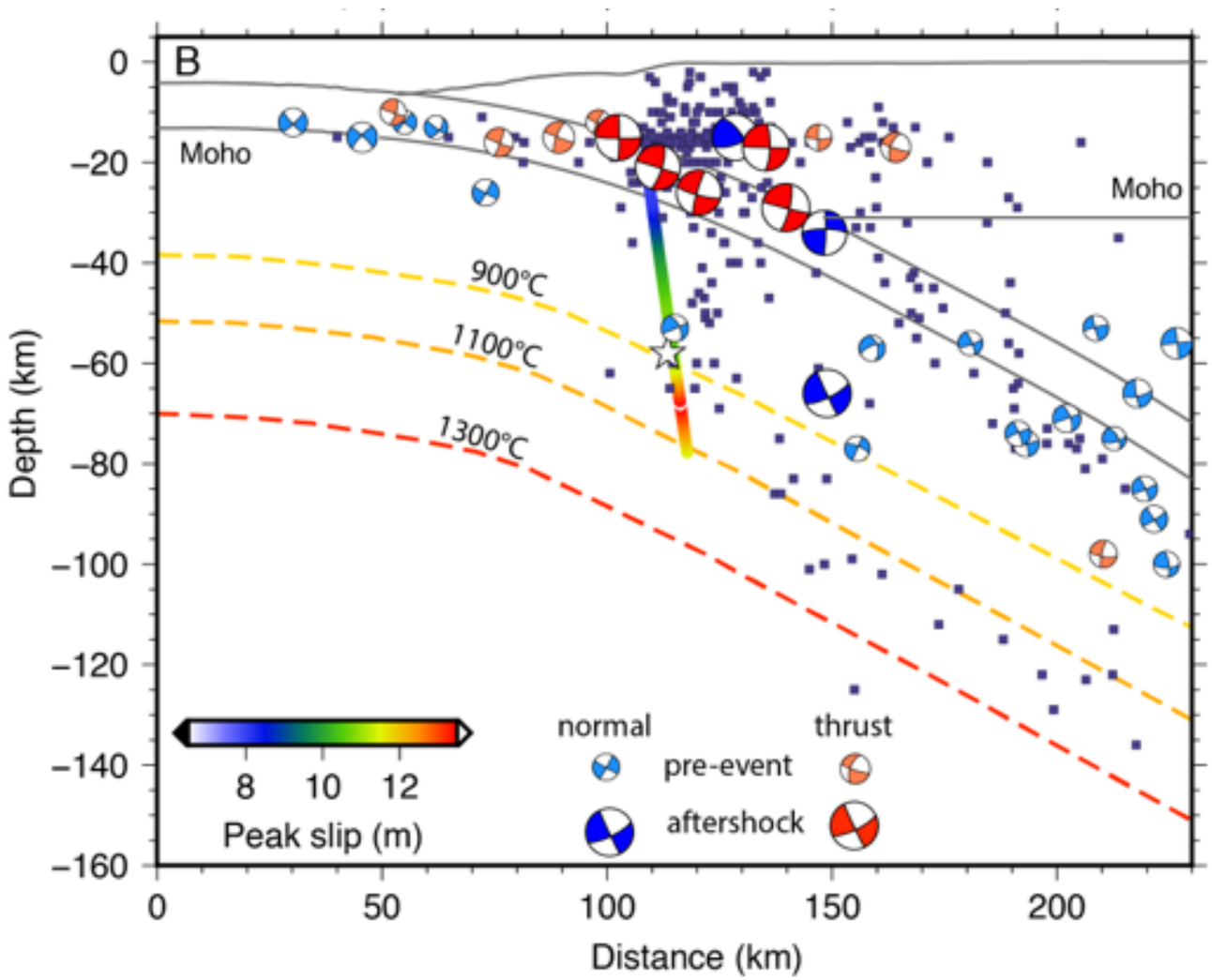
M8.1 Tehuantepec



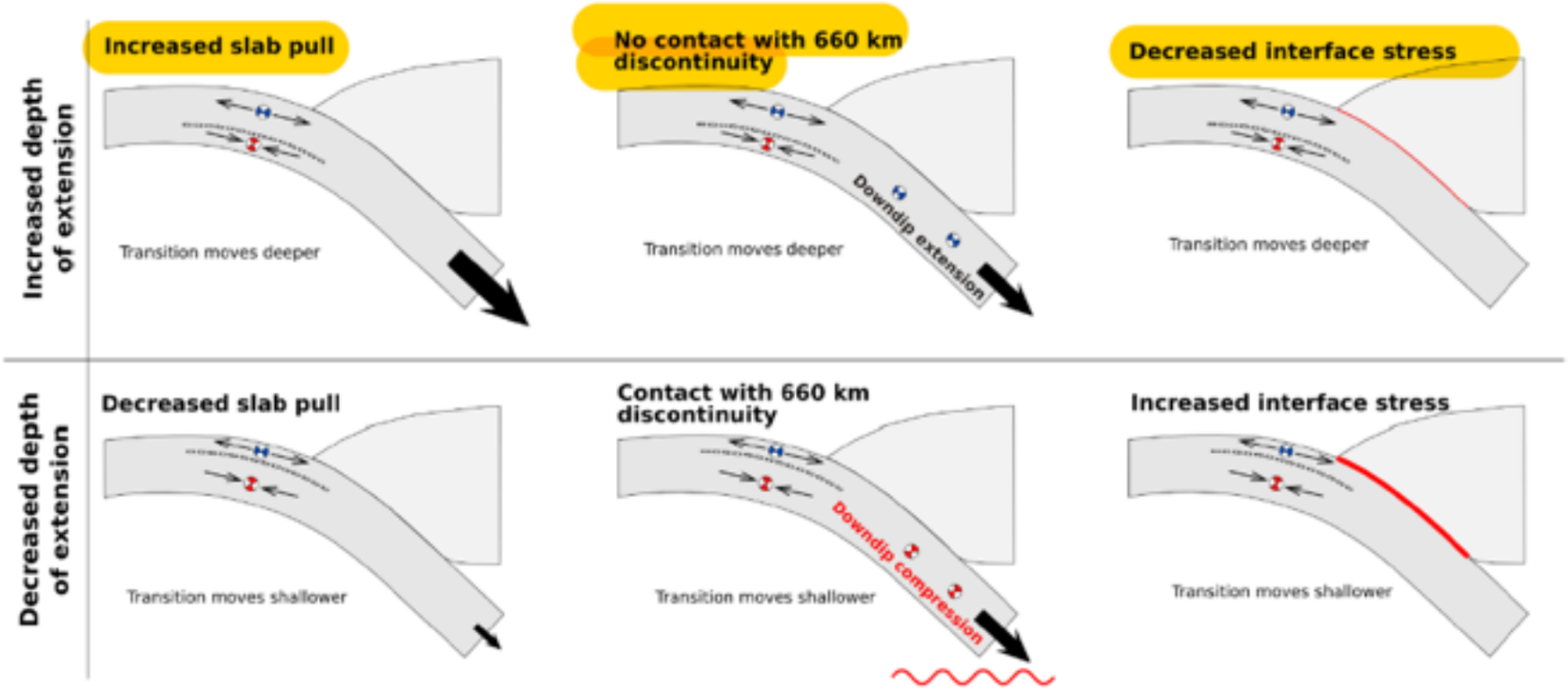


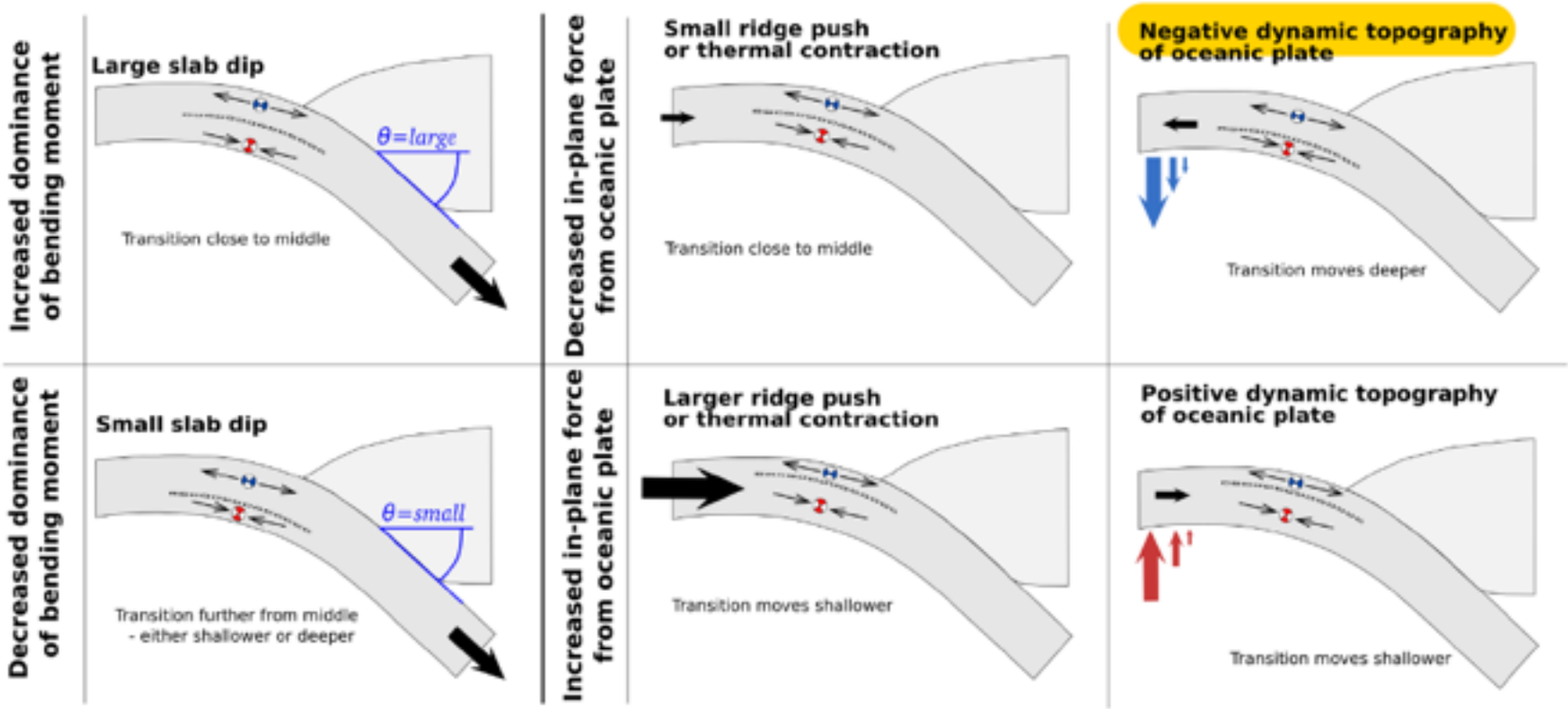
So what gives?

- (i) A large normal fault, the result of flexure, that is dipping at 45 degrees or greater starts in the outer rise region
- (ii) Below the megrathrust it is now dipping at a steeper angle because of the geometry of the subducting slab and finally…
- (iii) unbending and <u>wholesale deviatoric tension</u> within mechanism activates the normal fault, even though the surrounding slab is predicted to be in a compression and creep regime.



So what gives?





Craig et al., 2016

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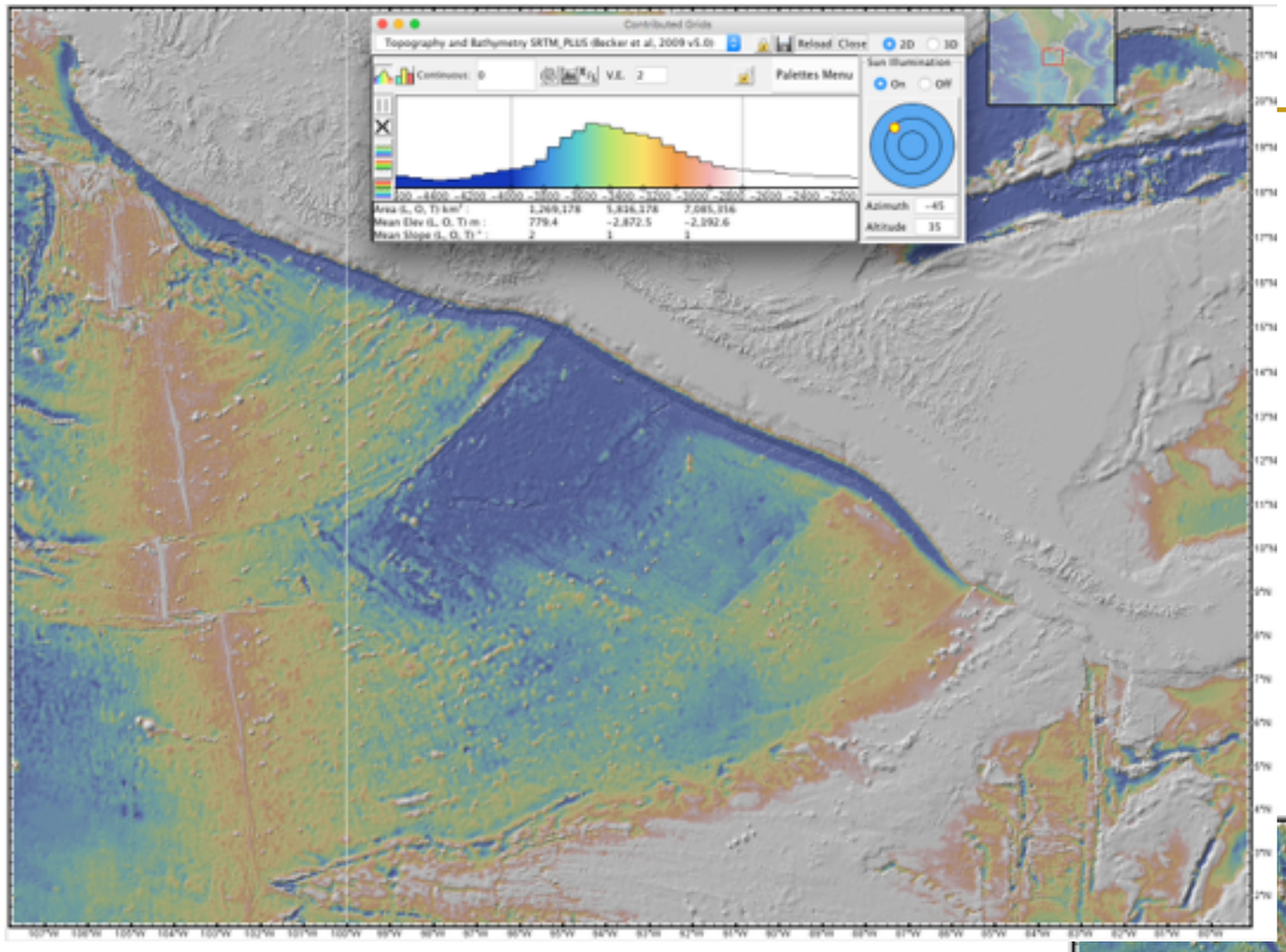
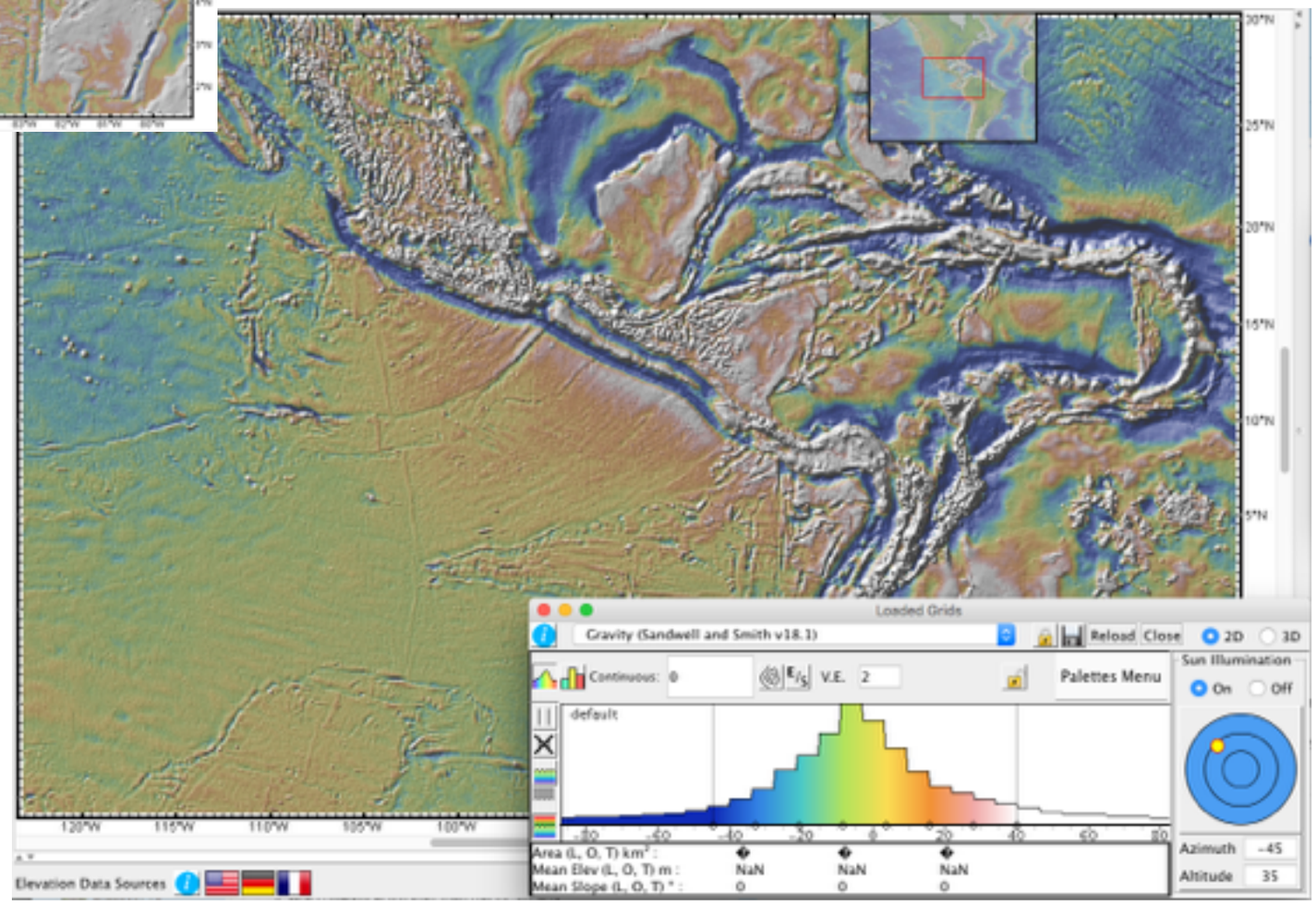
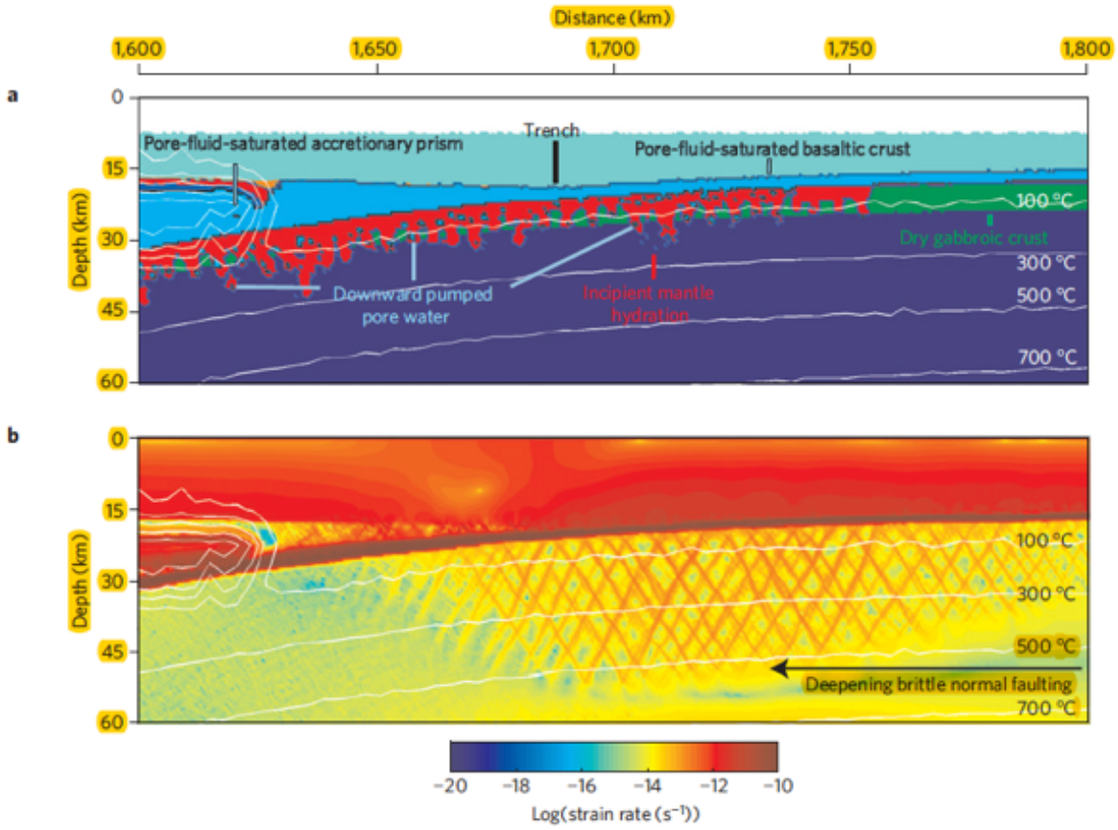
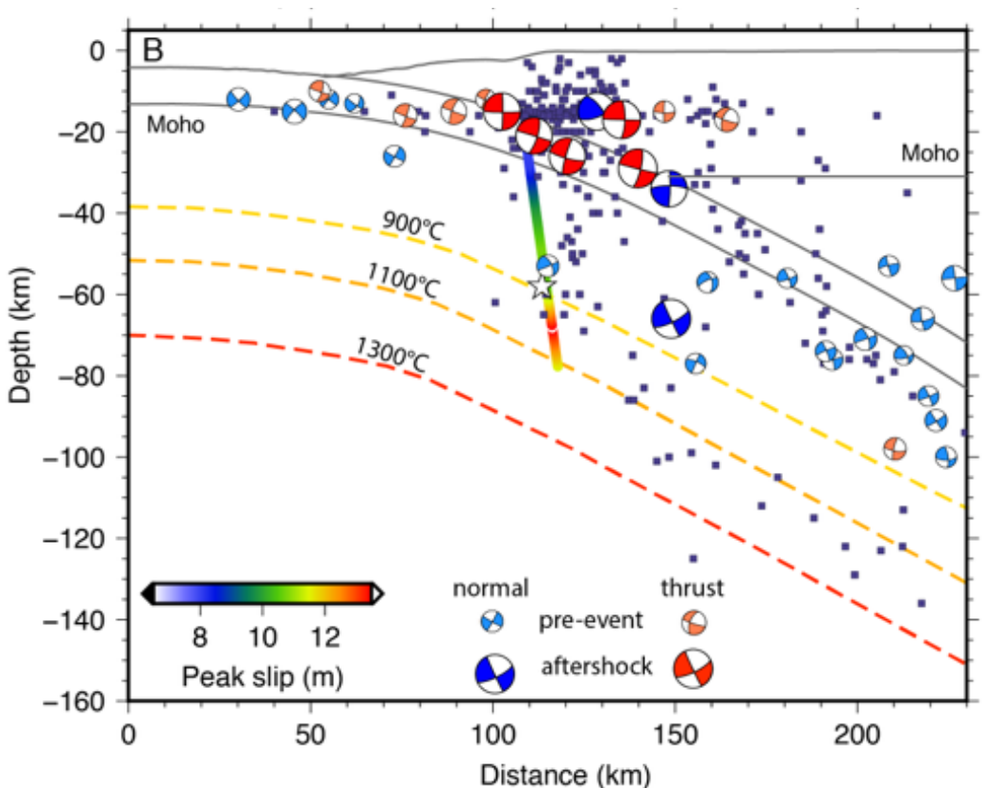




So what gives?

- Two main problems:
  - 1) How can rupture nucleate at 900C in no strength lithosphere?
  - 2) How can rupture span all (or most) of the lithosphere with a normal faulting mechanism?
- The lithosphere is NOT in compression, anywhere.
- Something must either cool or embrittle the lithosphere at those depths.
  - Water and/or hydrous minerals are penetrating waaaay past the 650C isotherm, or being brought in from deep in the mantle





Oh, and there was also a tsunami

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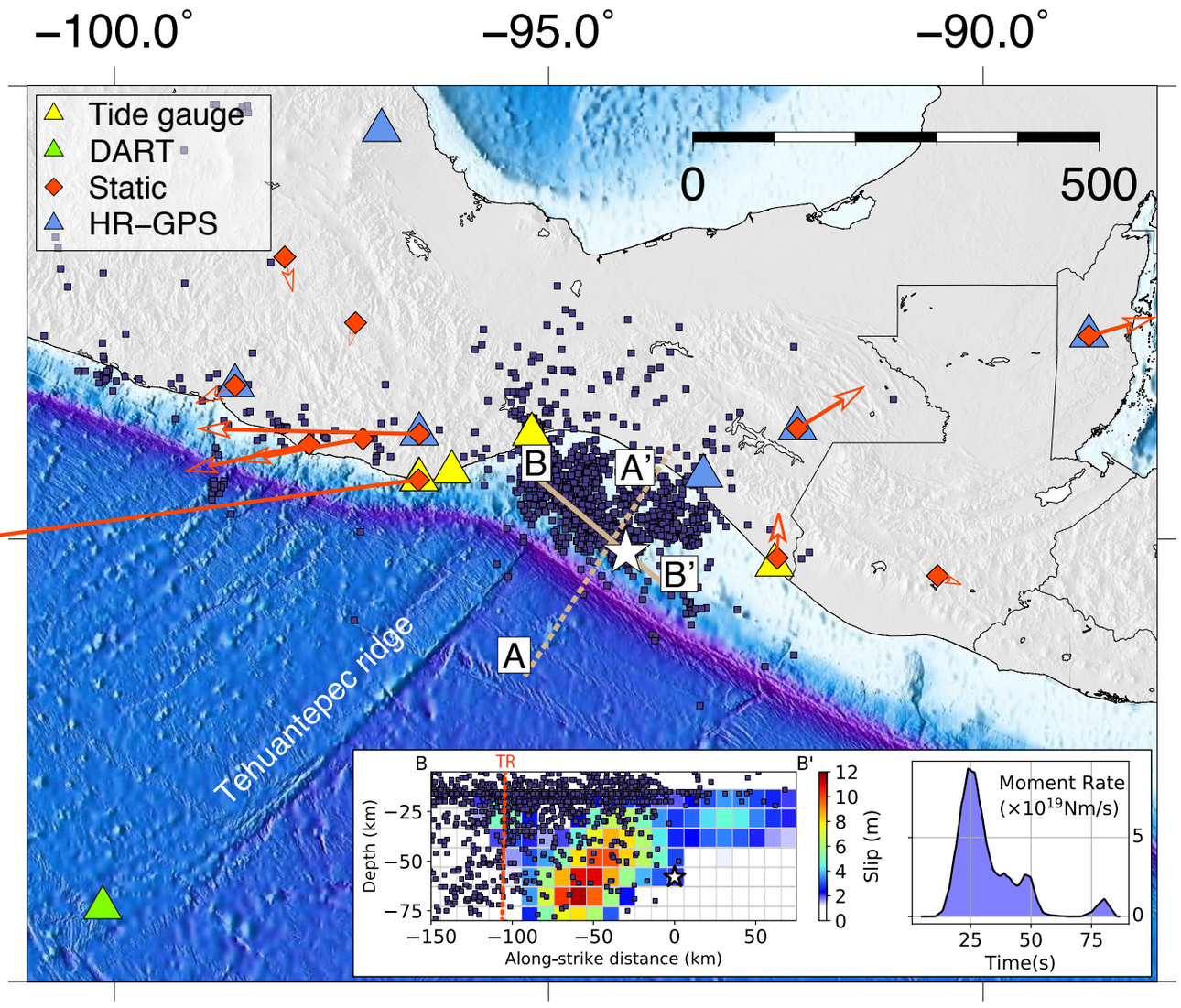
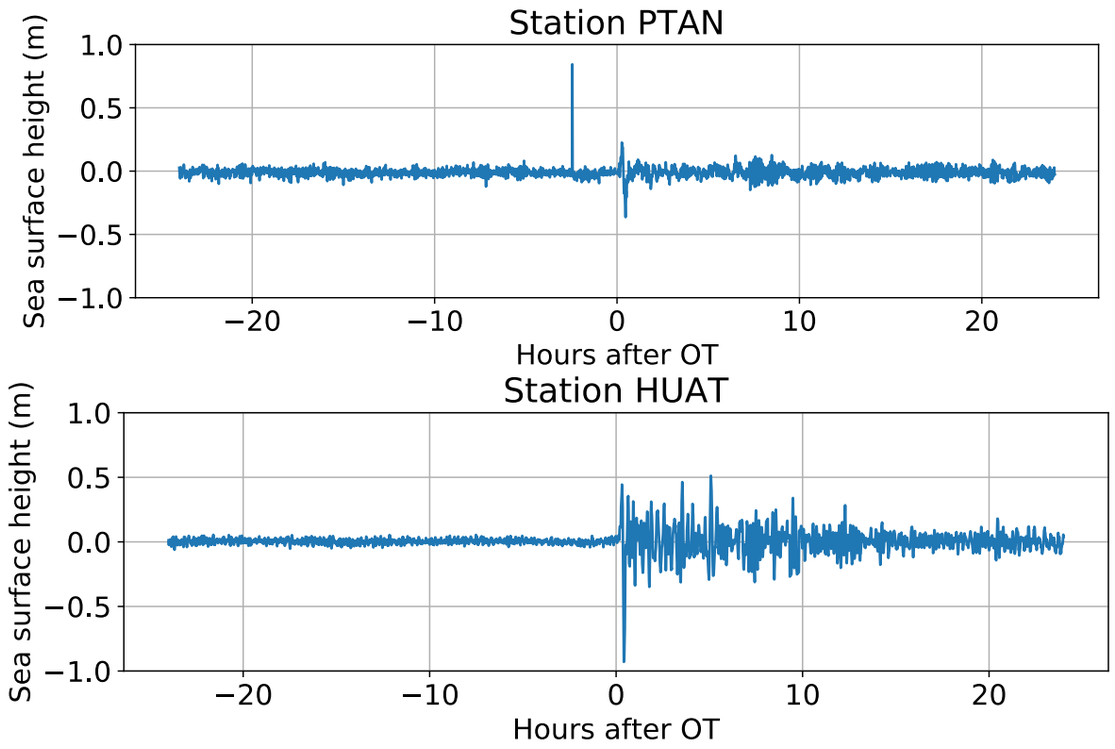
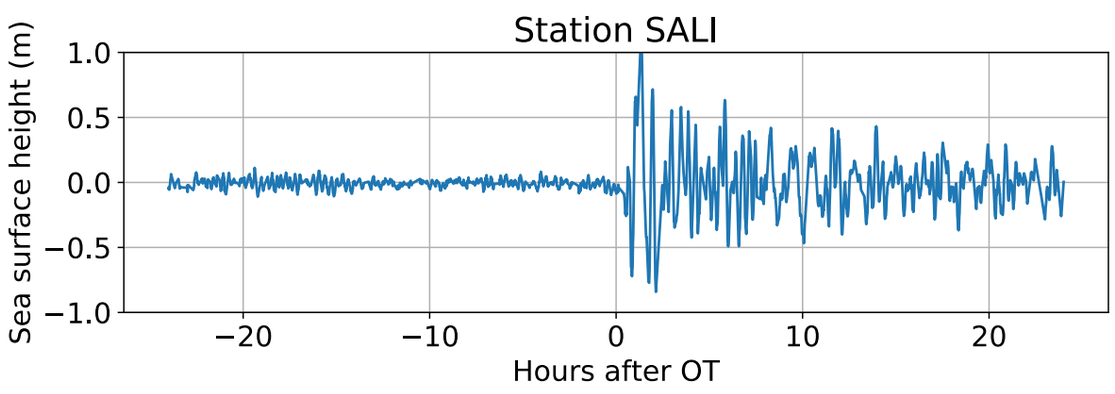
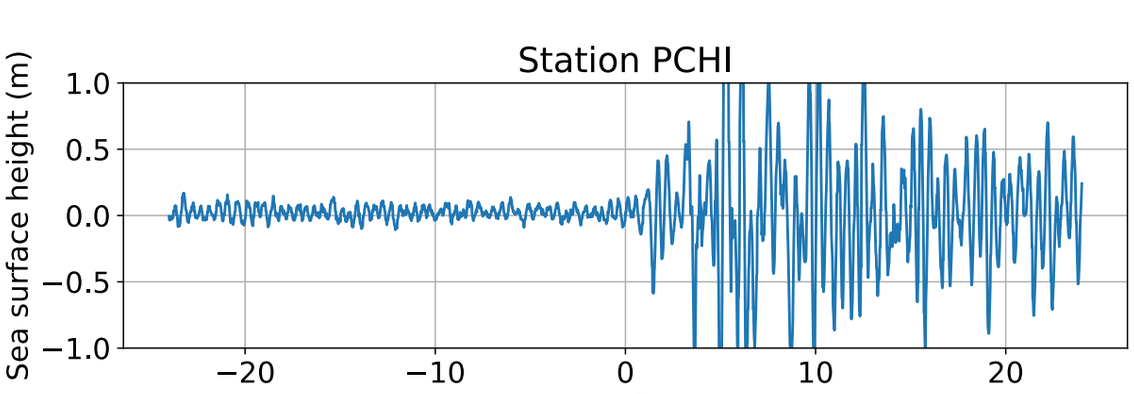
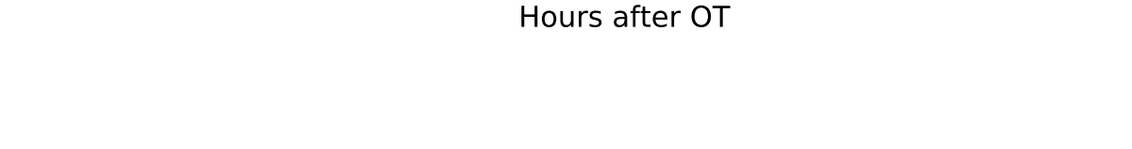


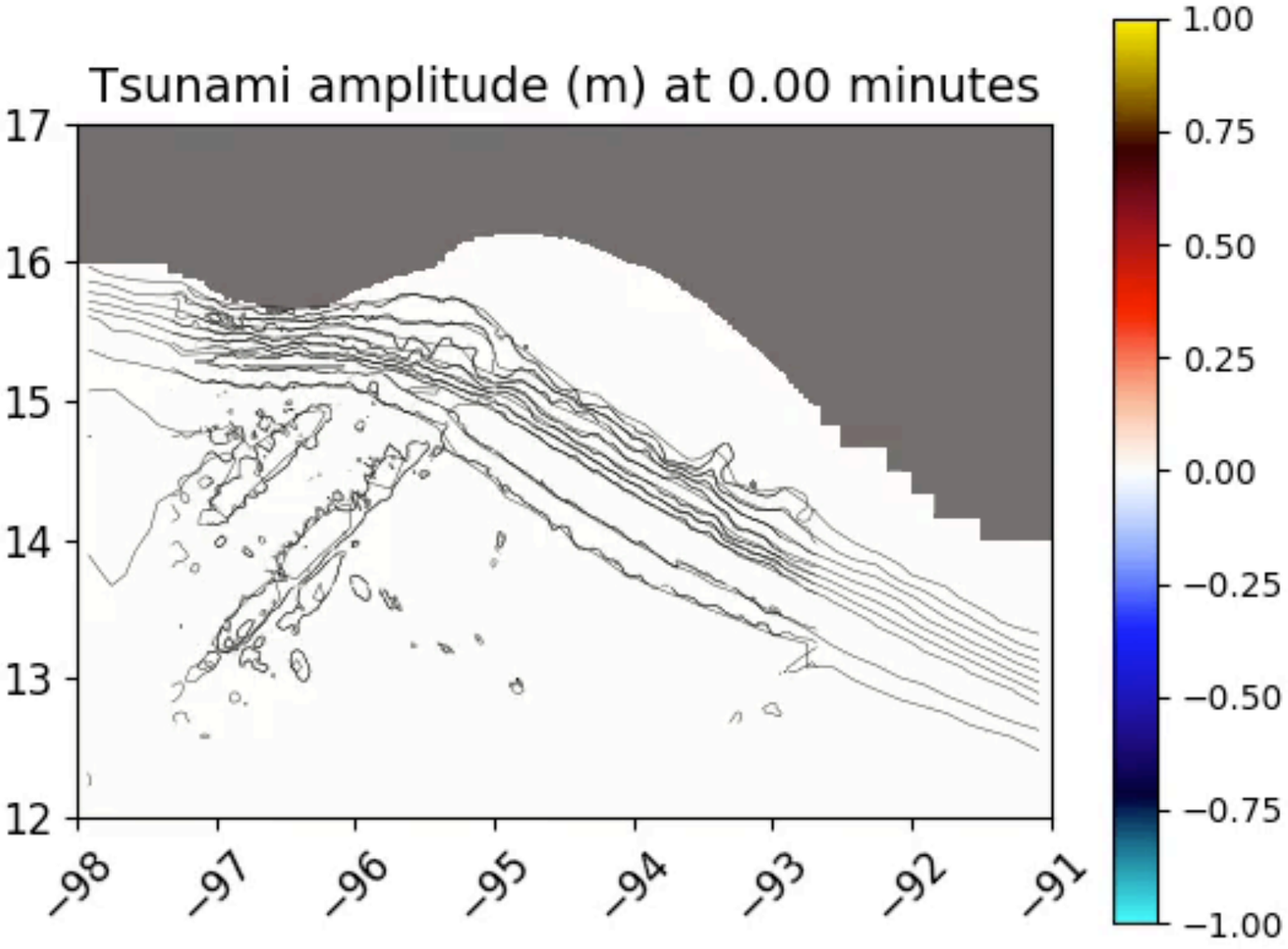


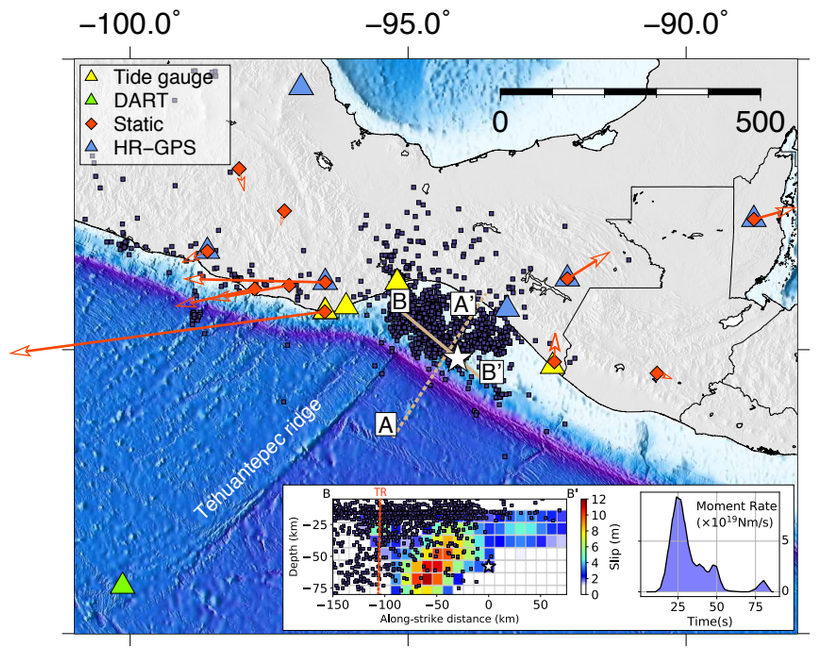




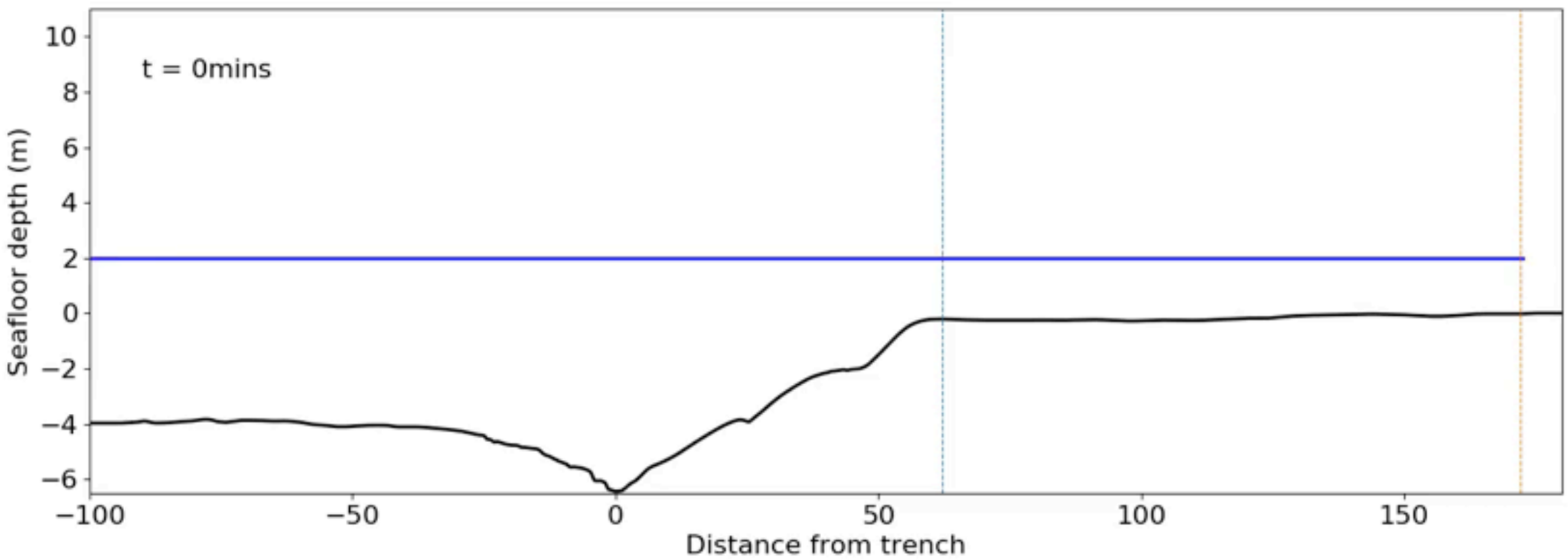


Oh, and there was also a tsunami





Edge waves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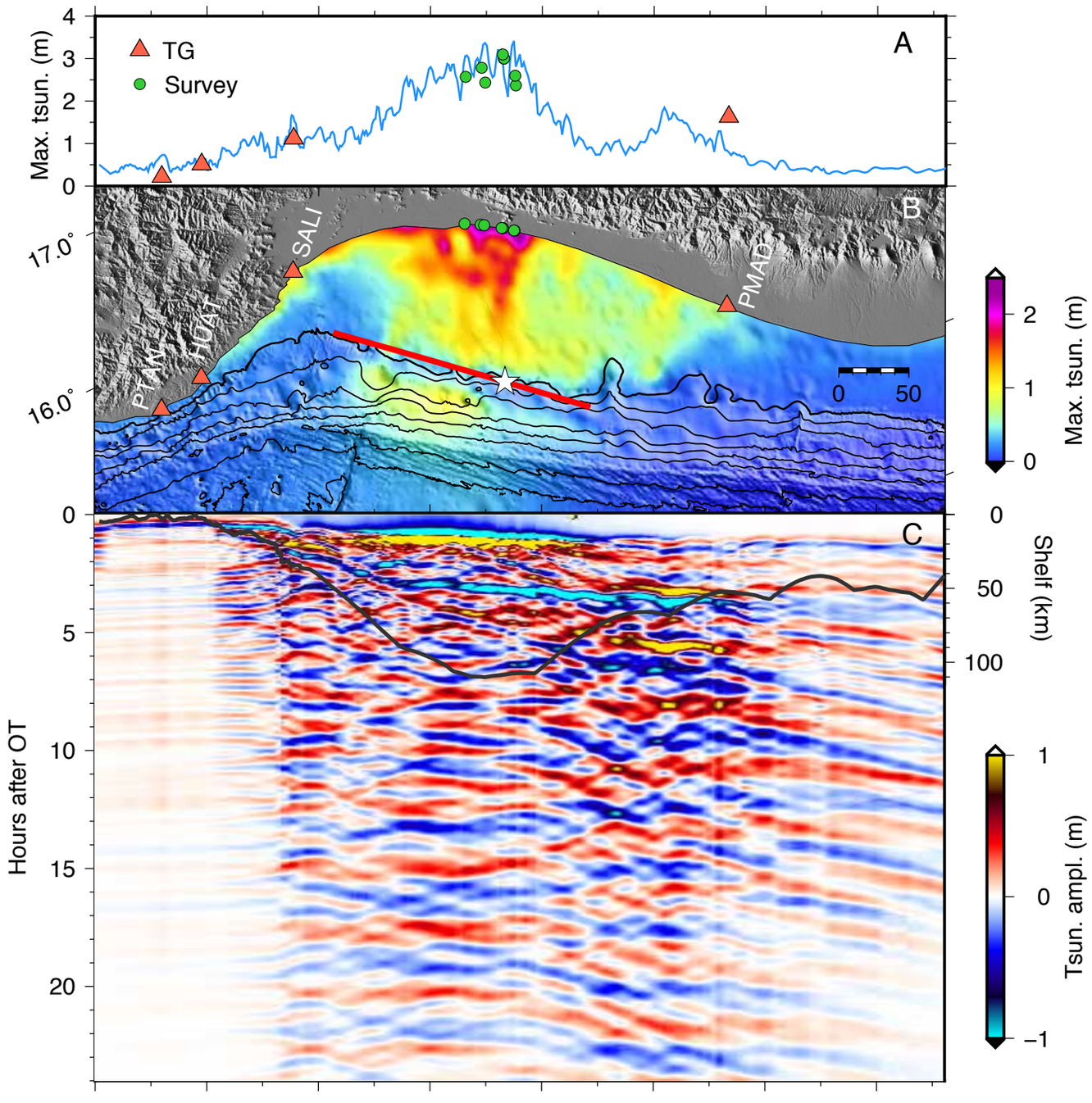
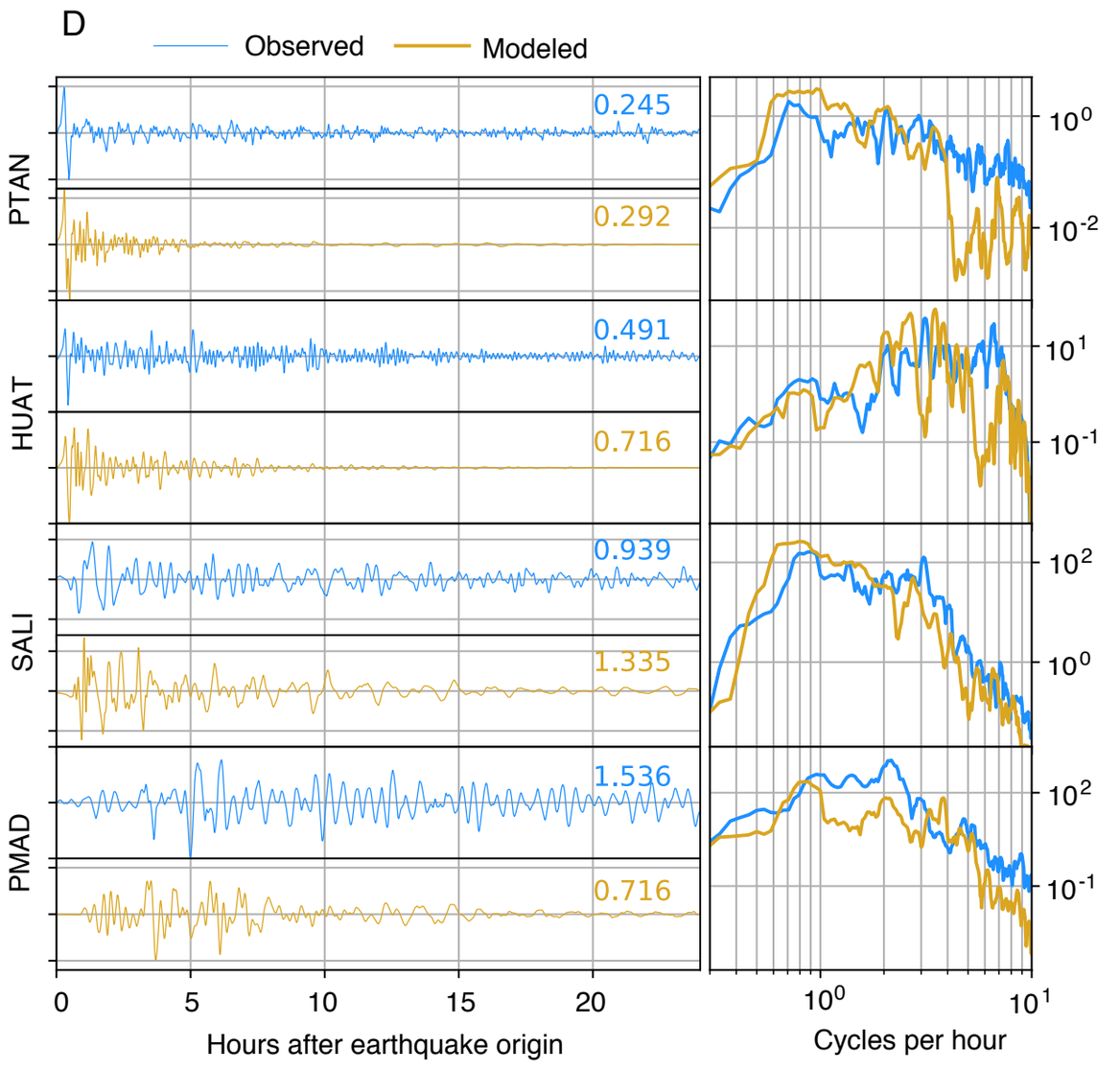
Seafloor depth (m)
10
8
6
4
2
0
−2
−4
−6
−100
−50
0
50
100
150
Distance from trench

Edge waves





What if this had been a more tsunamigenic megathrust event???

Thanks!

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