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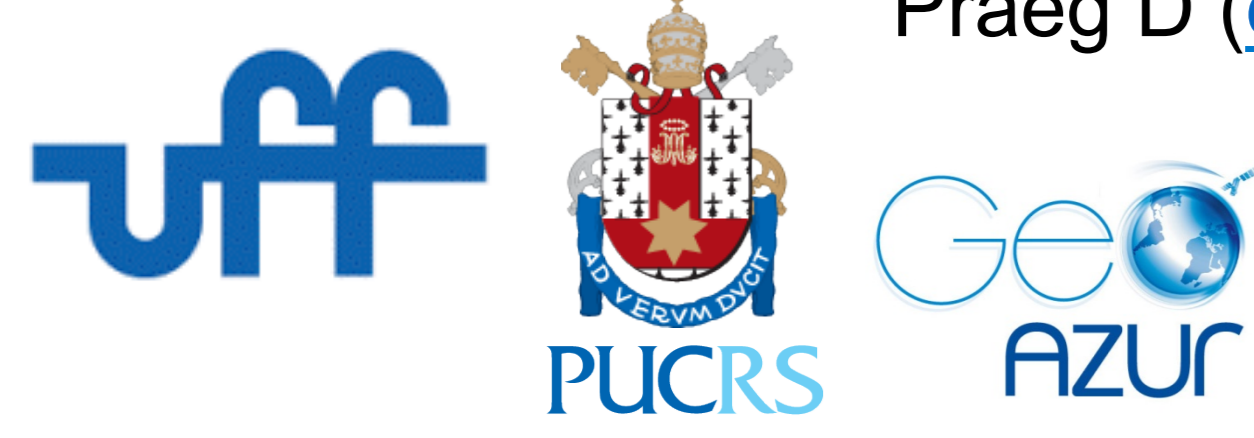
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Gas Hydrates, Fluid Venting and Slope Stability on the Upper Amazon Deep-Sea Fan

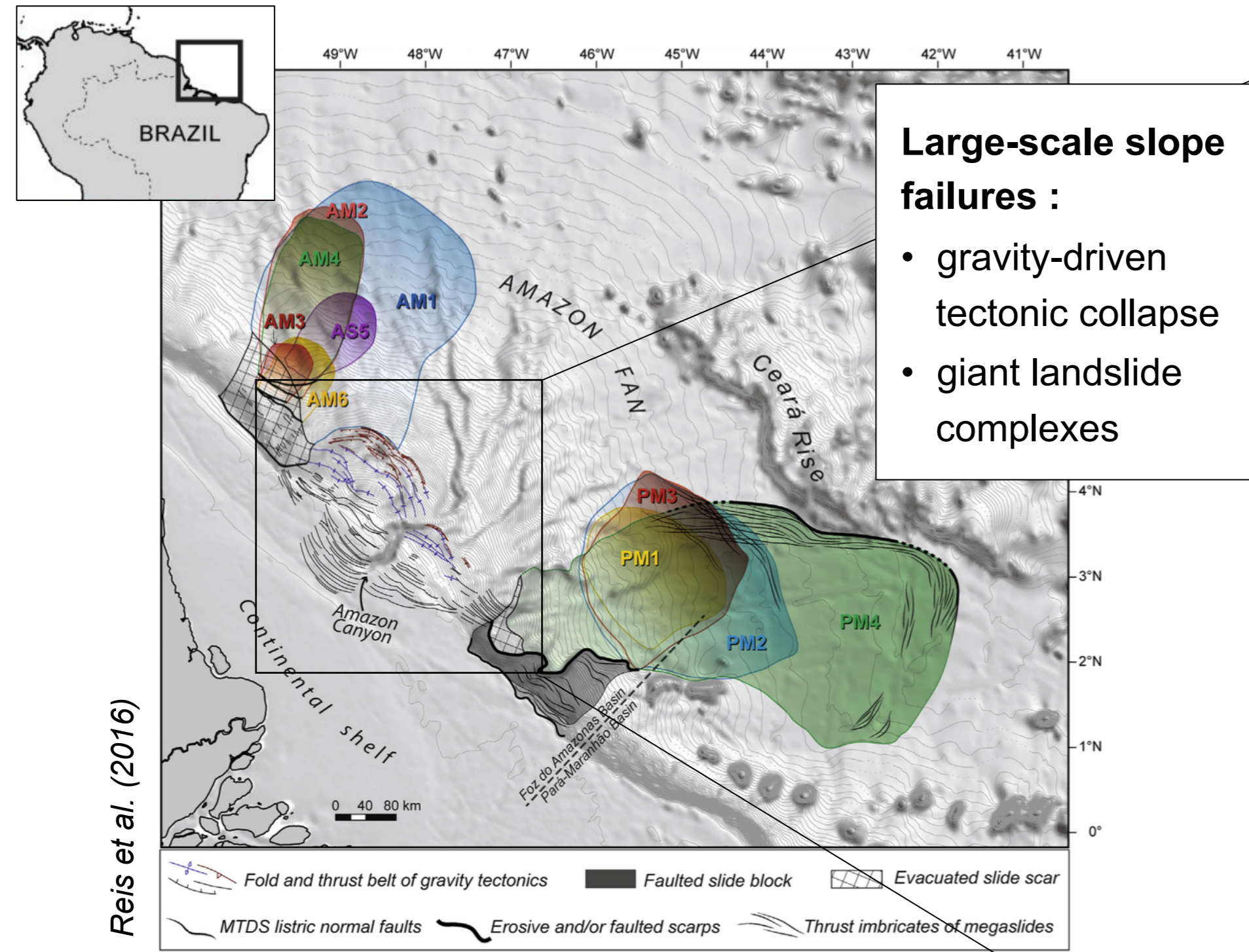
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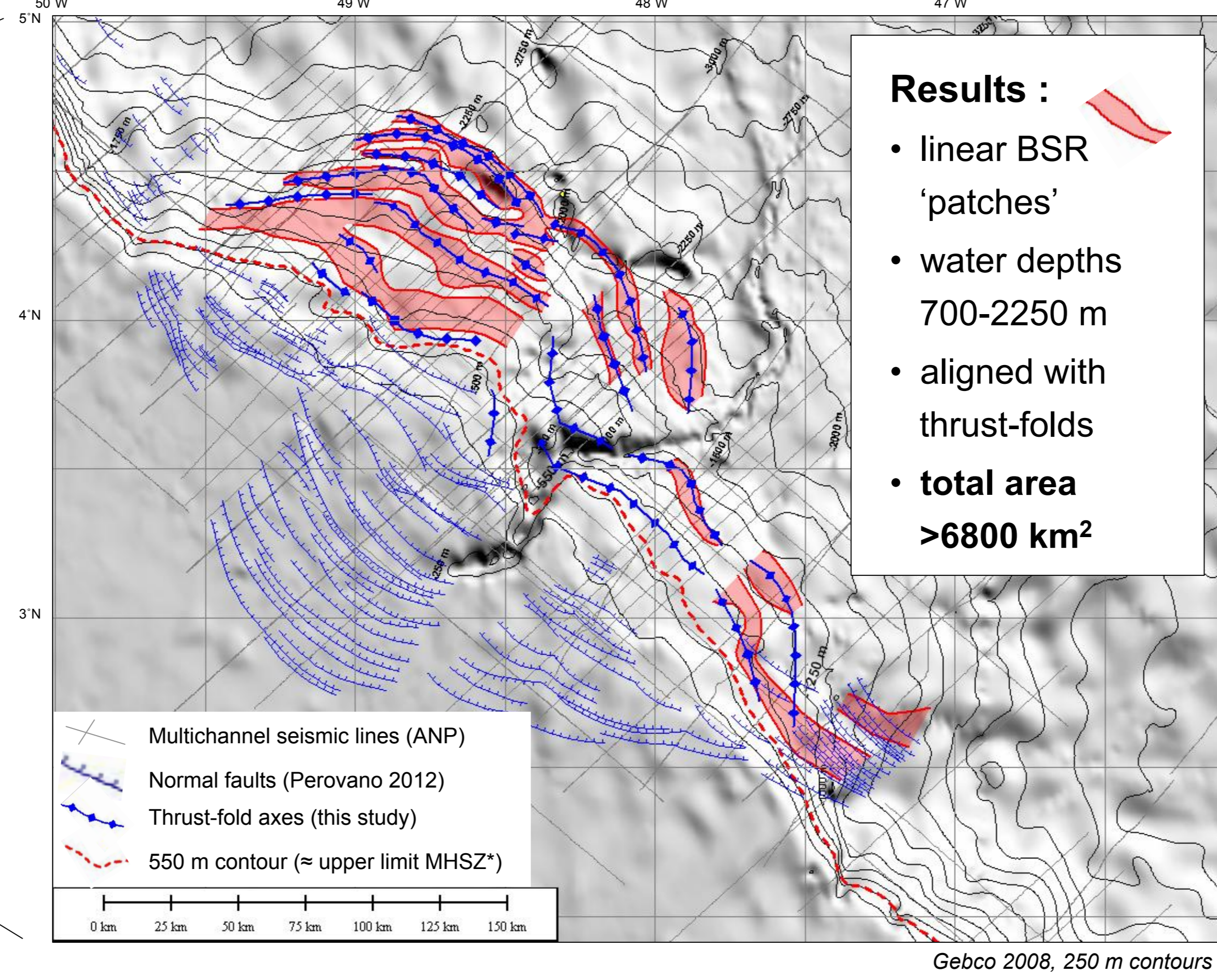
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1. Amazon fan & slope instabilities



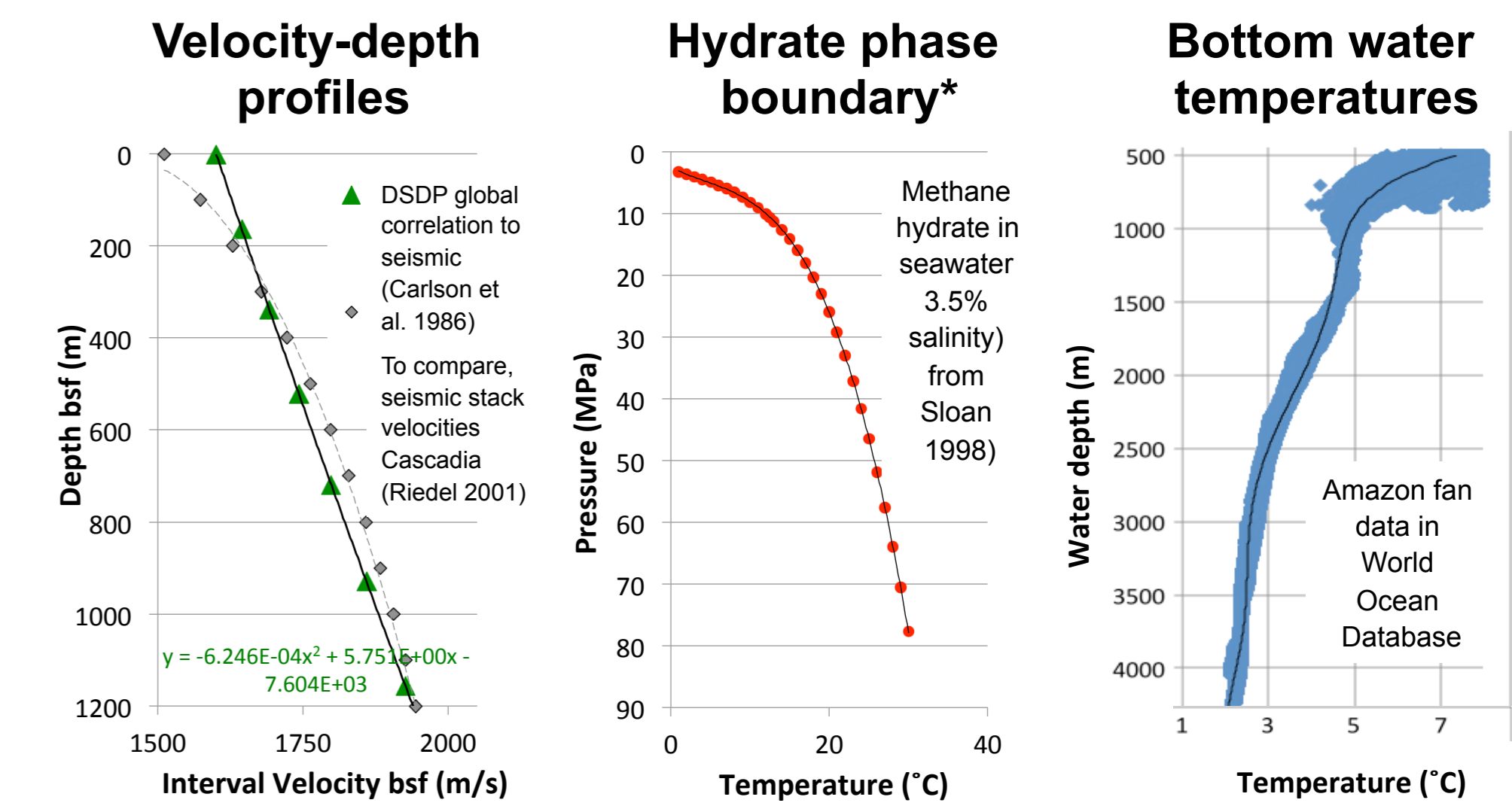
2. Mapping bottom simulating reflections (BSRs)



3. BSR depth inversion to temperatures

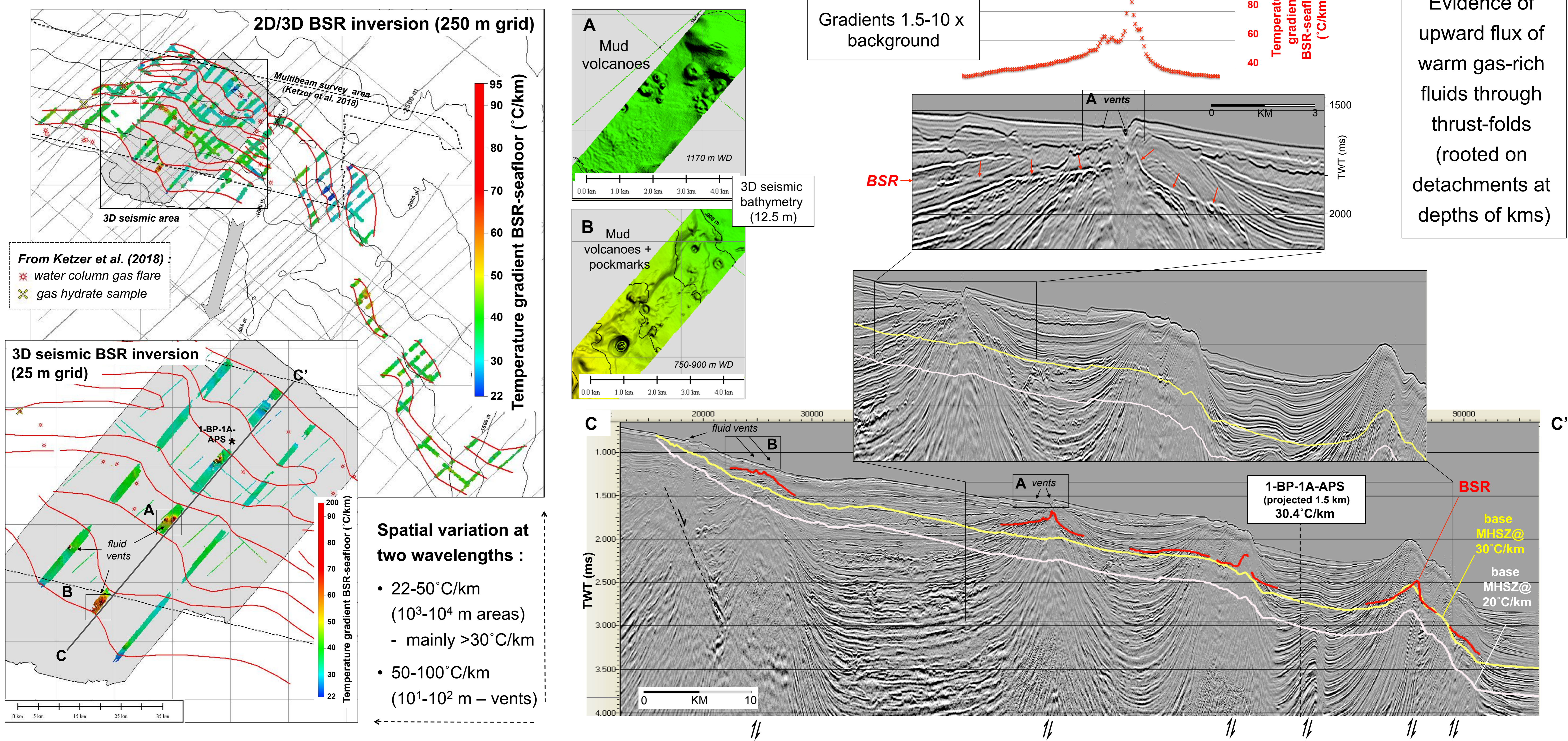
Inversion method (after Riedel et al. 2010)

- BSR TWT → depth (velocity profile from Carlson et al. 1986)
- Depth of BSR → hydrostatic pressure
- Pressure at BSR → temperature at phase boundary (MHSZ*)
- Bottom water temperatures (WOD) → geothermal gradients



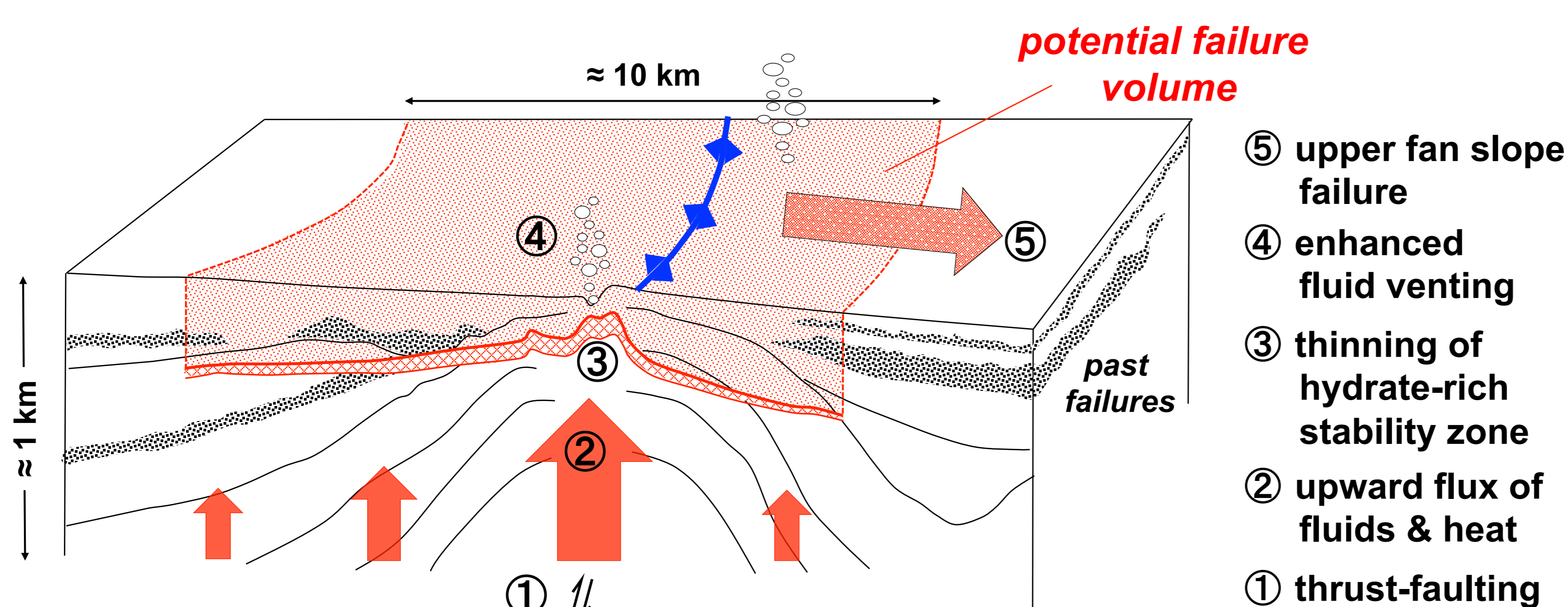
*MHSZ = Methane hydrate stability zone

4. BSR patches → spatially variable temperature gradients + seafloor fluid vents



5. Bottom-up gas hydrate & slope dynamics

- Changes in upward flux of fluid (heat) will modify gas hydrate stability from below
- Increased flux during thrust episodes will thin hydrate-rich zone over wide areas
- Reduced sediment strength at base of stability zone may trigger large landslides



6. Conclusions

- Elongate BSR patches on the upper Amazon fan linked to upward flux of gas-rich fluids through thrust-folds recording collapse above deep detachments
- Tectonically-driven changes in fluid flux will thin gas hydrate-rich zones from below and may trigger recurrent giant slope failures from the upper fan
- Bottom-up mechanism independent of climate-driven changes in hydrate stability

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