Early stages of evolution of an axial detachment fault at the ultraslow spreading mid-ocean ridge (64°40'E SWIR)

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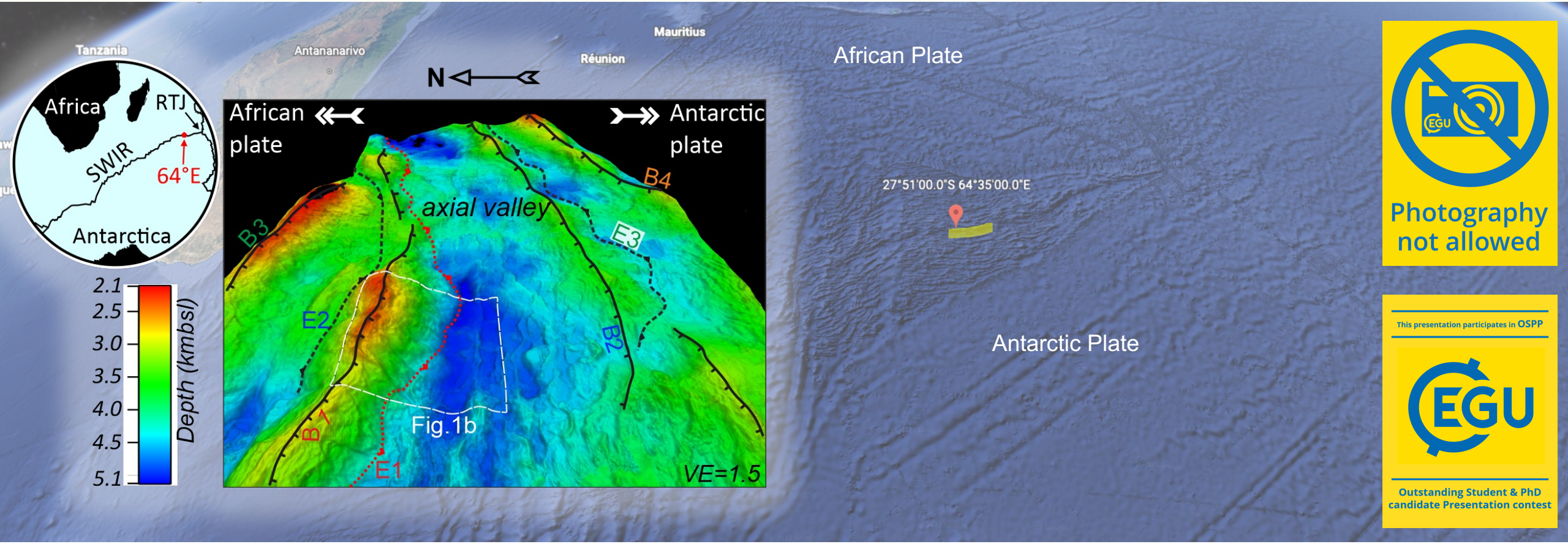

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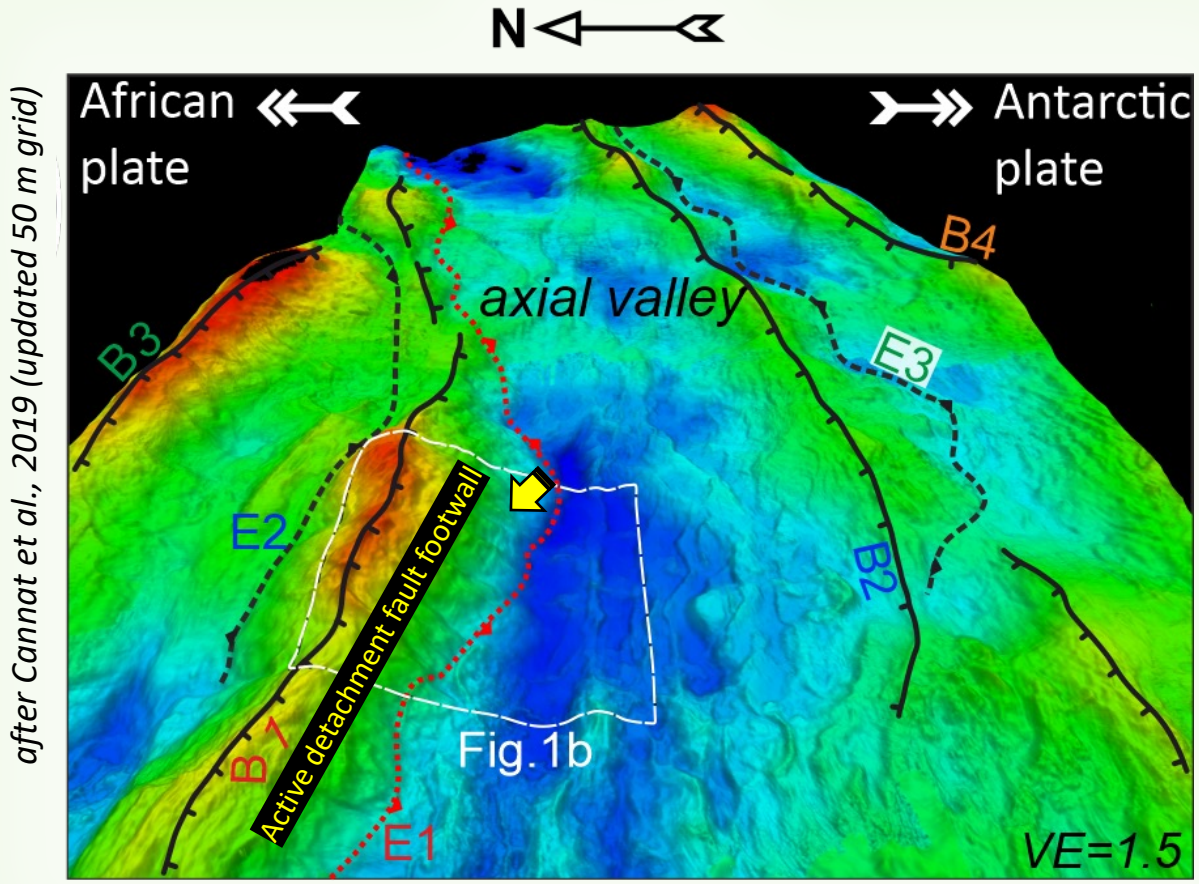
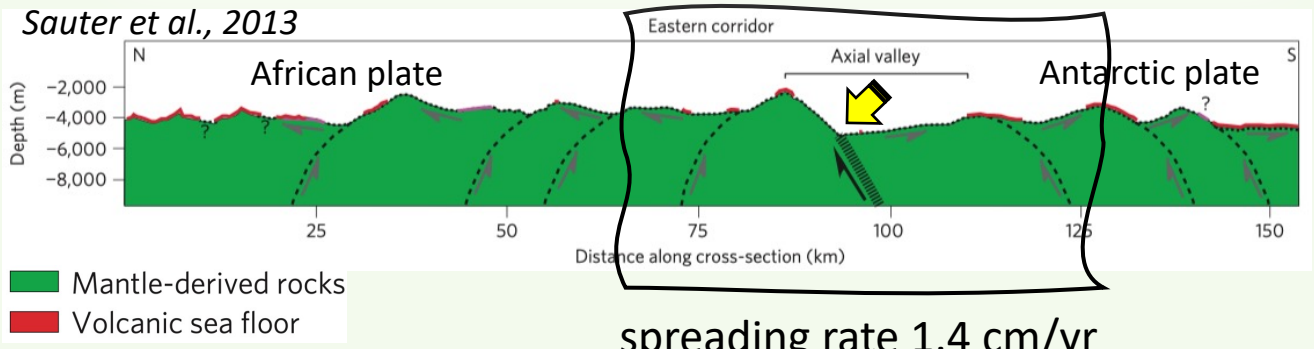
THE CONTEXT



- nearly amagmatic spreading
- flip-flop detachment faults exhume mantle-derived serpentinized peridotites
- each fault has max offset 9-20 km (0.6-1.5 myrs)
- the presently active fault is about 300 kyrs old

(Cannat et al., 2019)

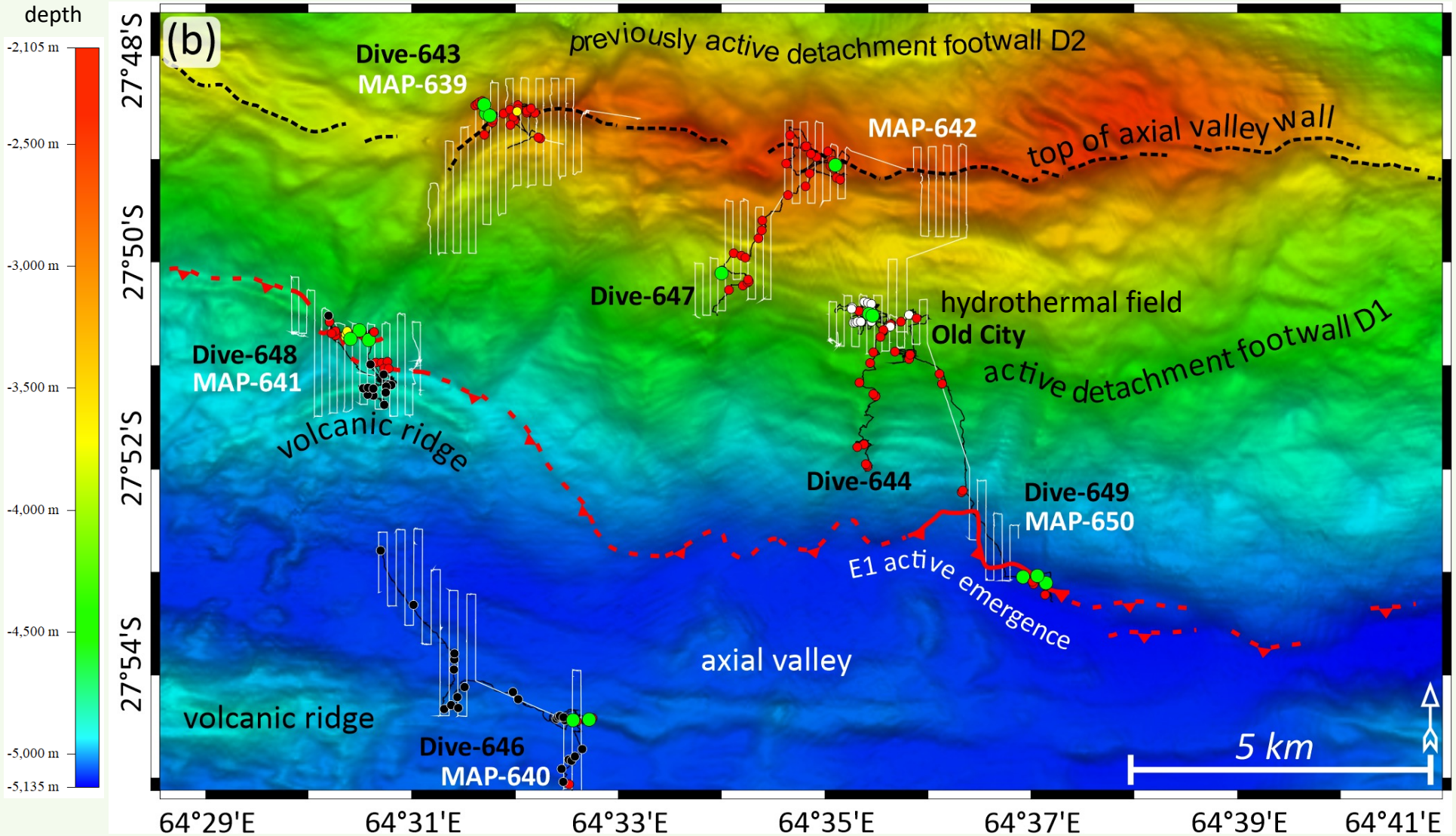
Sauter et al., 2013



spreading rate 1.4 cm/yr

What is the nature of the deformation in the exhumed fault zones ?

DATA



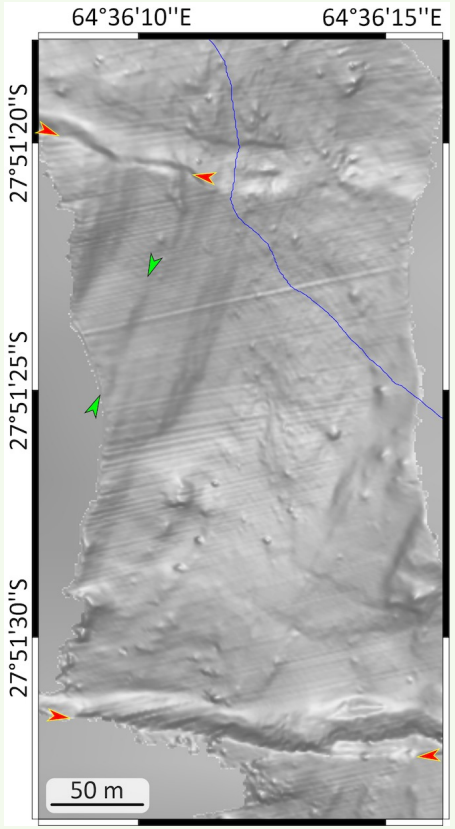
The study is based on:

- High resolution bathymetry map
- ROV dive observations
- Recovered rock samples

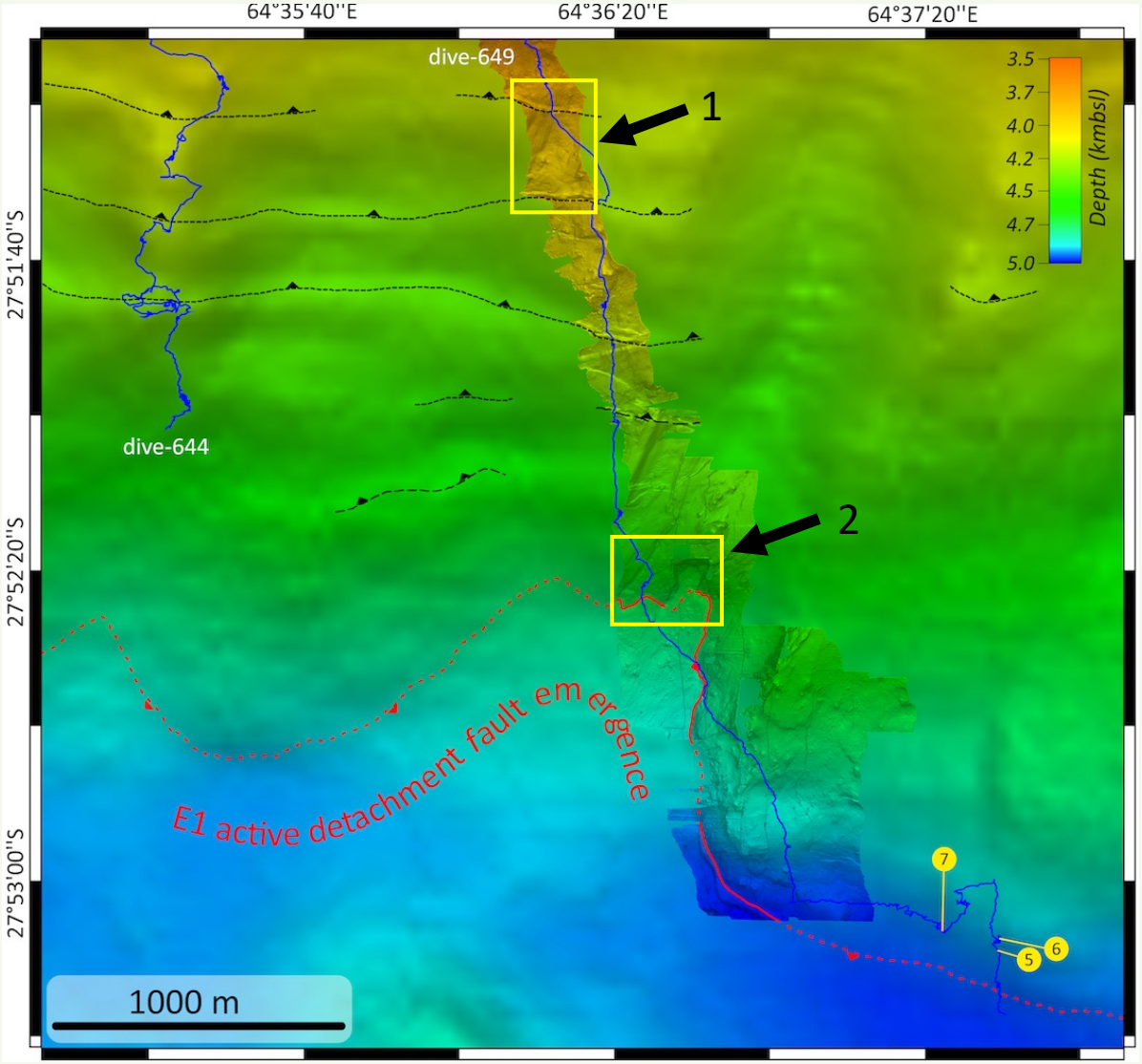
- basalt
- gabbro
- carbonate
- serpentinized peridotite
- gouge bearing microbreccia

THE LOWER SLOPES

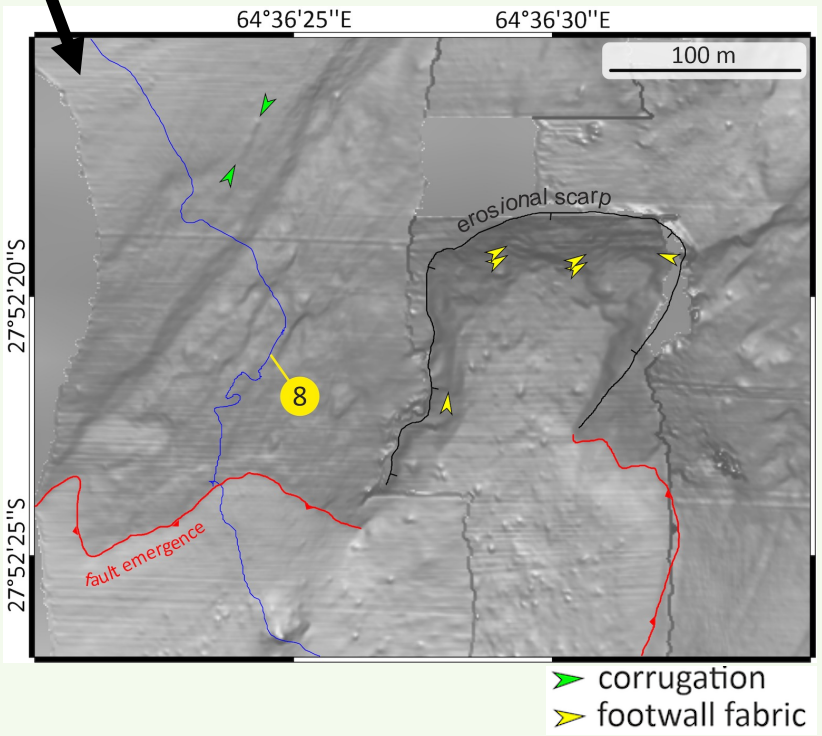
1- corrugations and antithetic normal faults

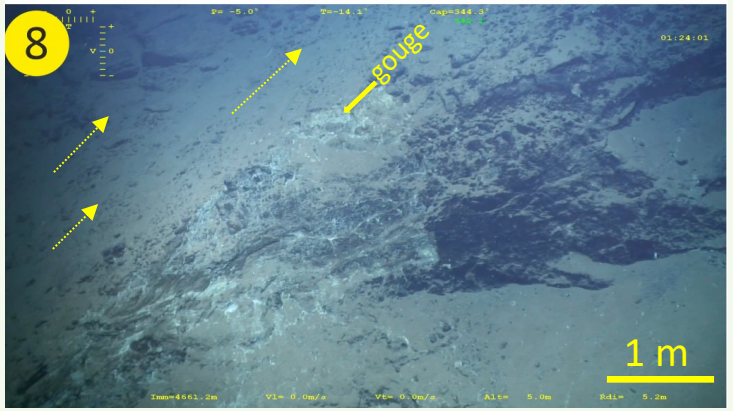


spreading direction



2- internal fabric of detachment fault

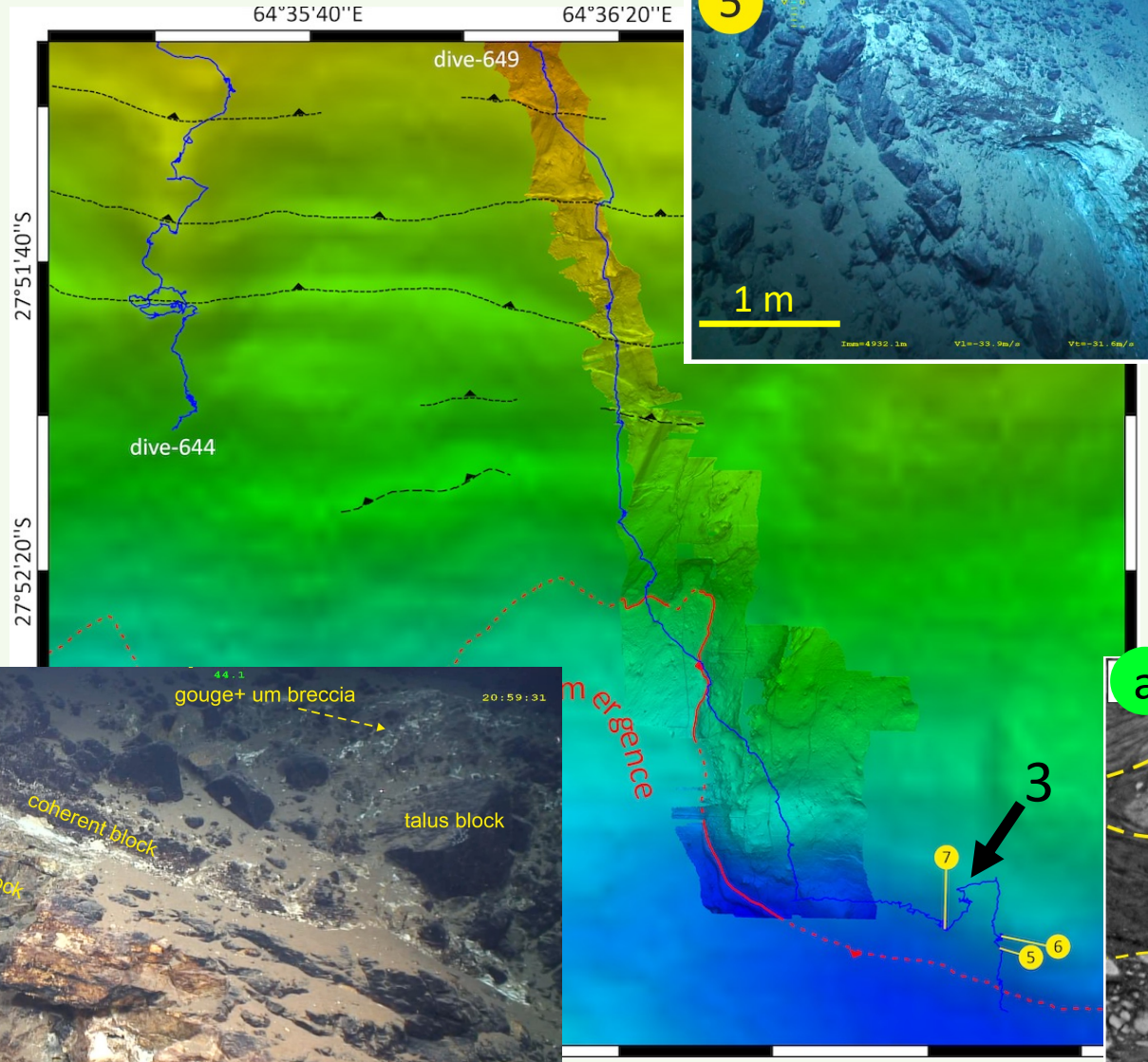


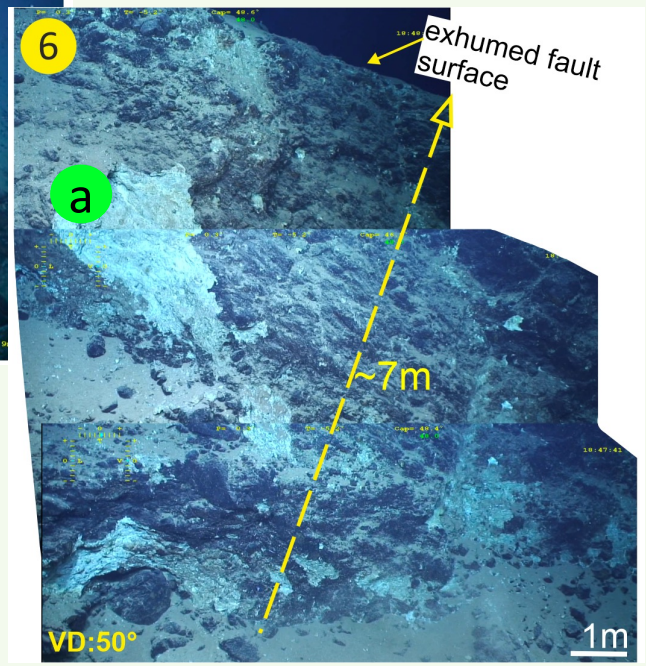


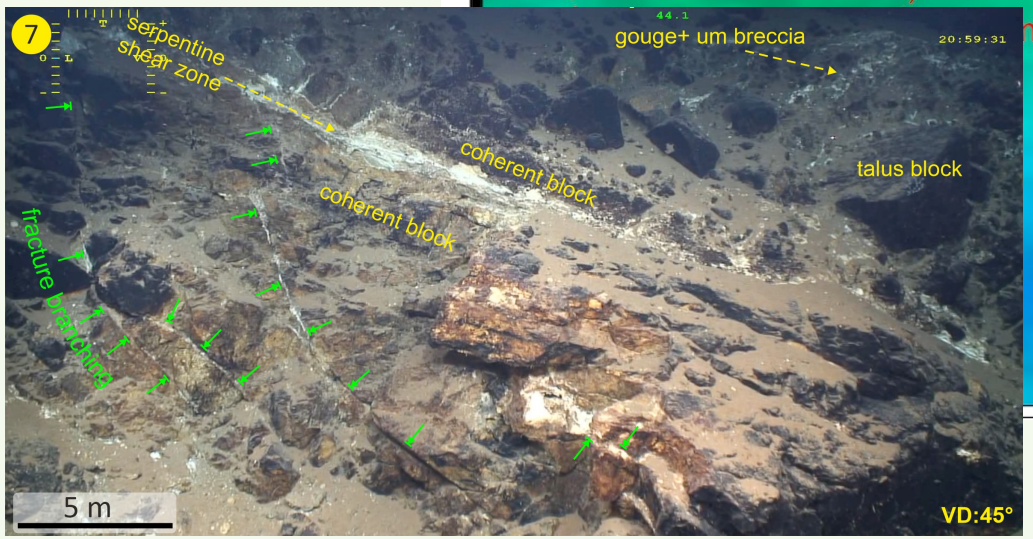
THE LOWER SLOPES

3- localized deformation in exhumed detachmentnt fault

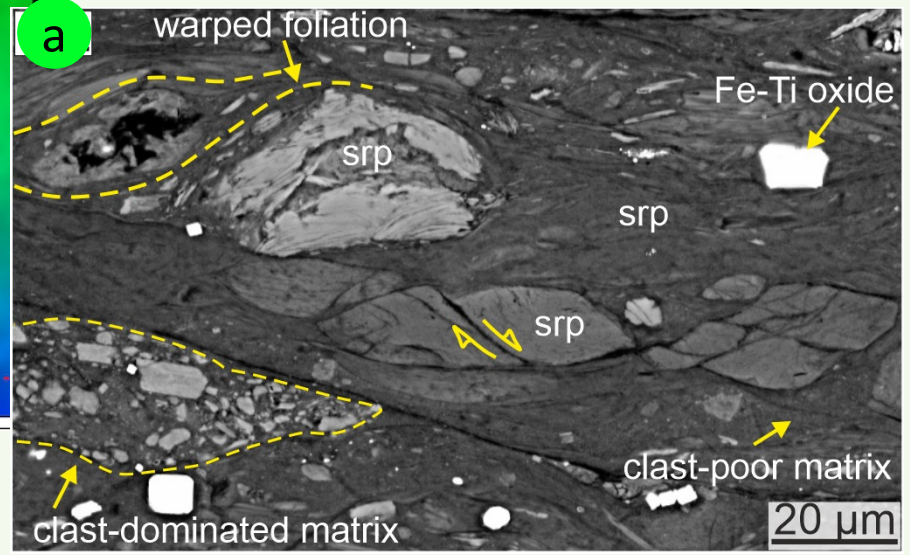
- formation of gouge bearing microbreccia is triggered by hydrous fluid circulation in brittle cracks





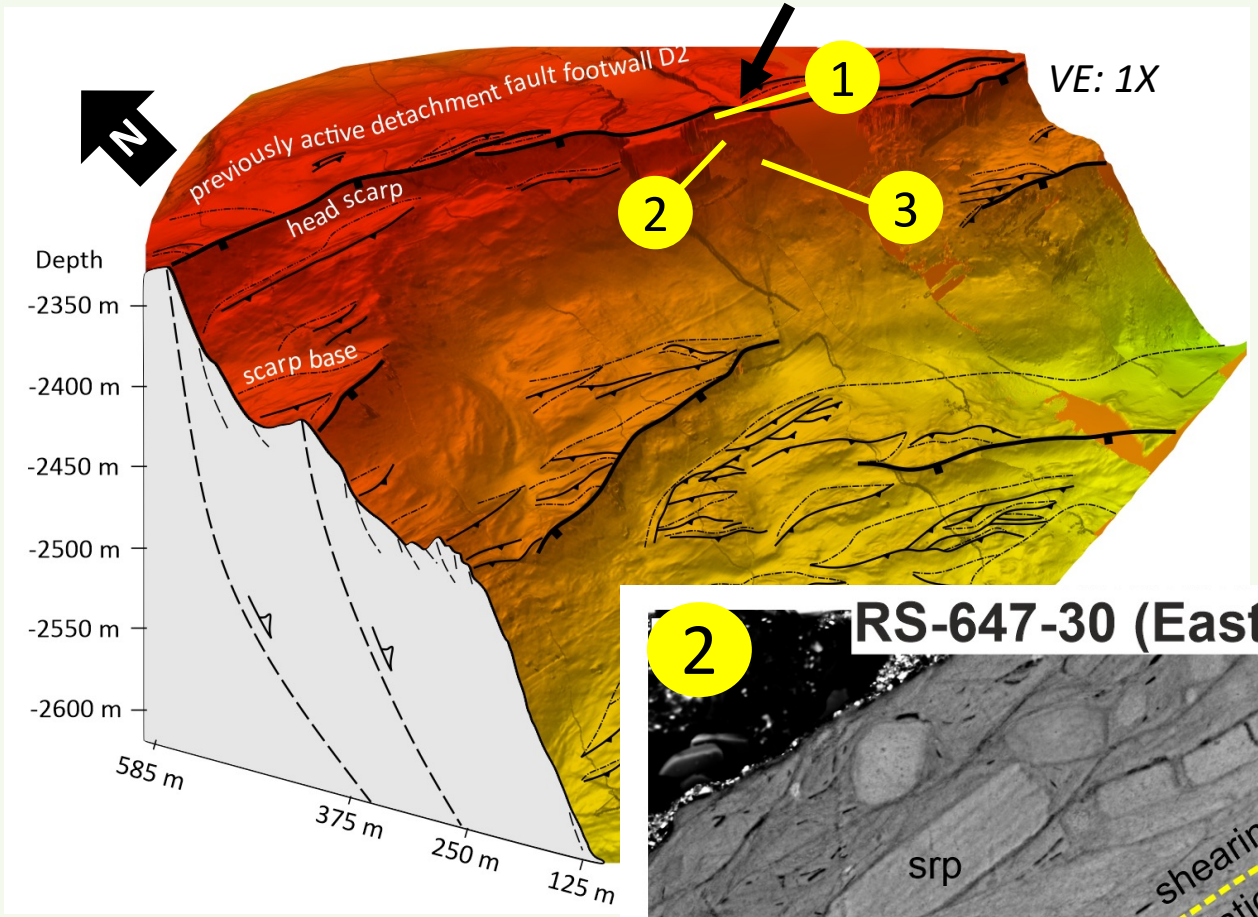


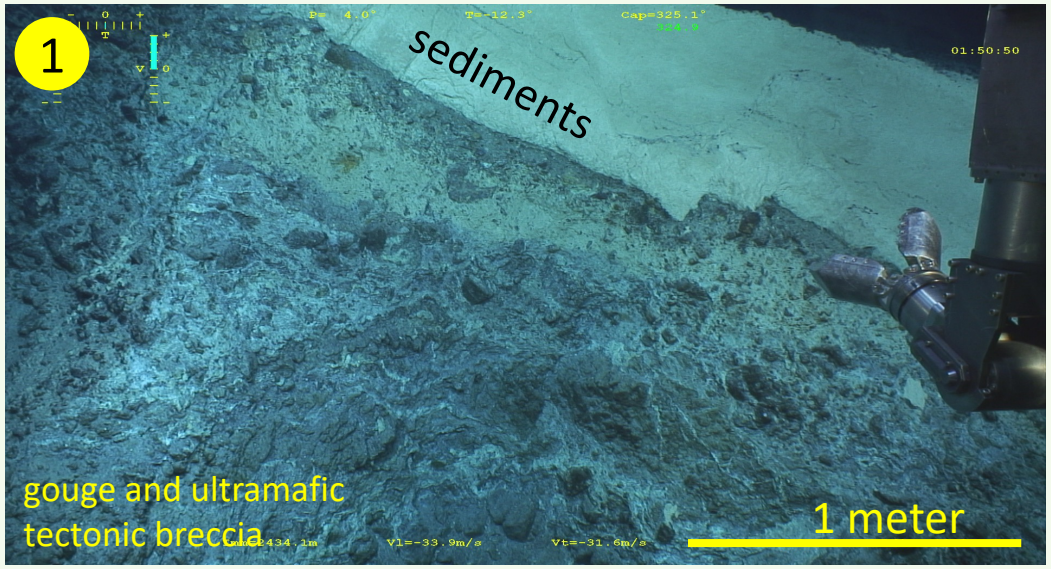
viscous deformation of the recryst. serpentine matrix.

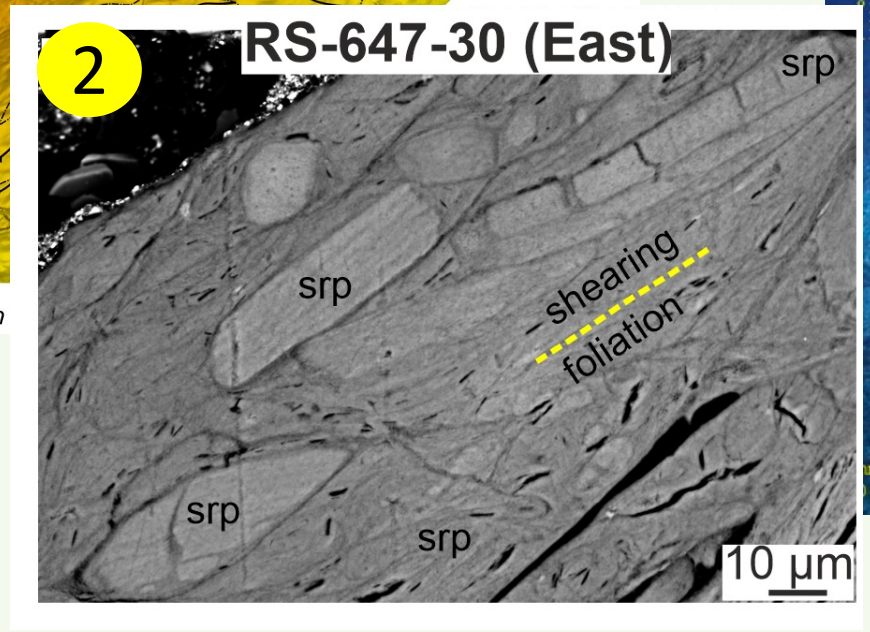


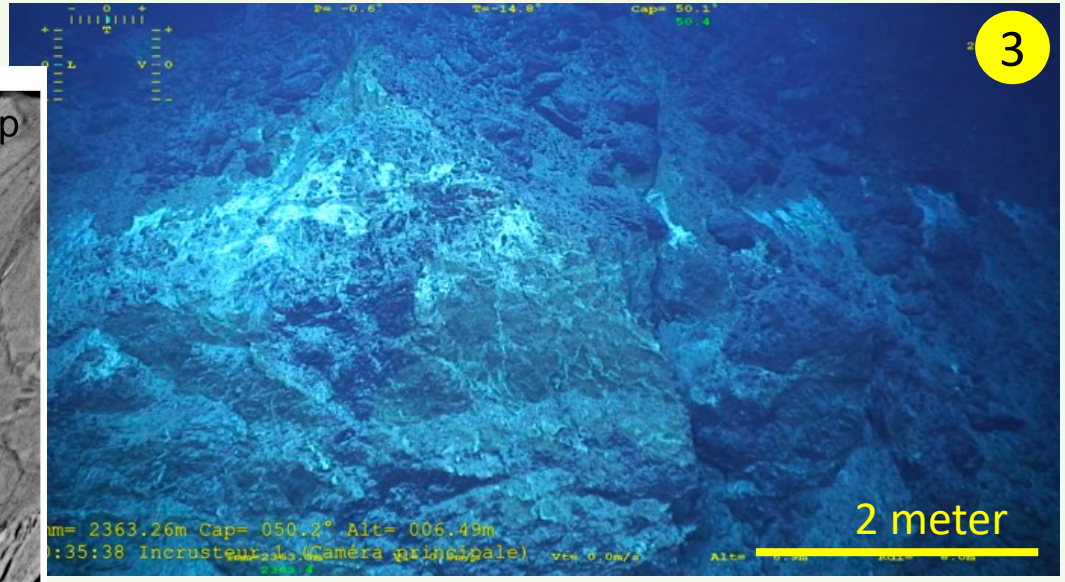
THE UPPER SLOPES

4- internal deformation associated with previously active north-facing detachment fault









*At **63-meter depth** from the top of of the fault surface*

- strain localization mechanisms similar to those at presently active detachment

key points:

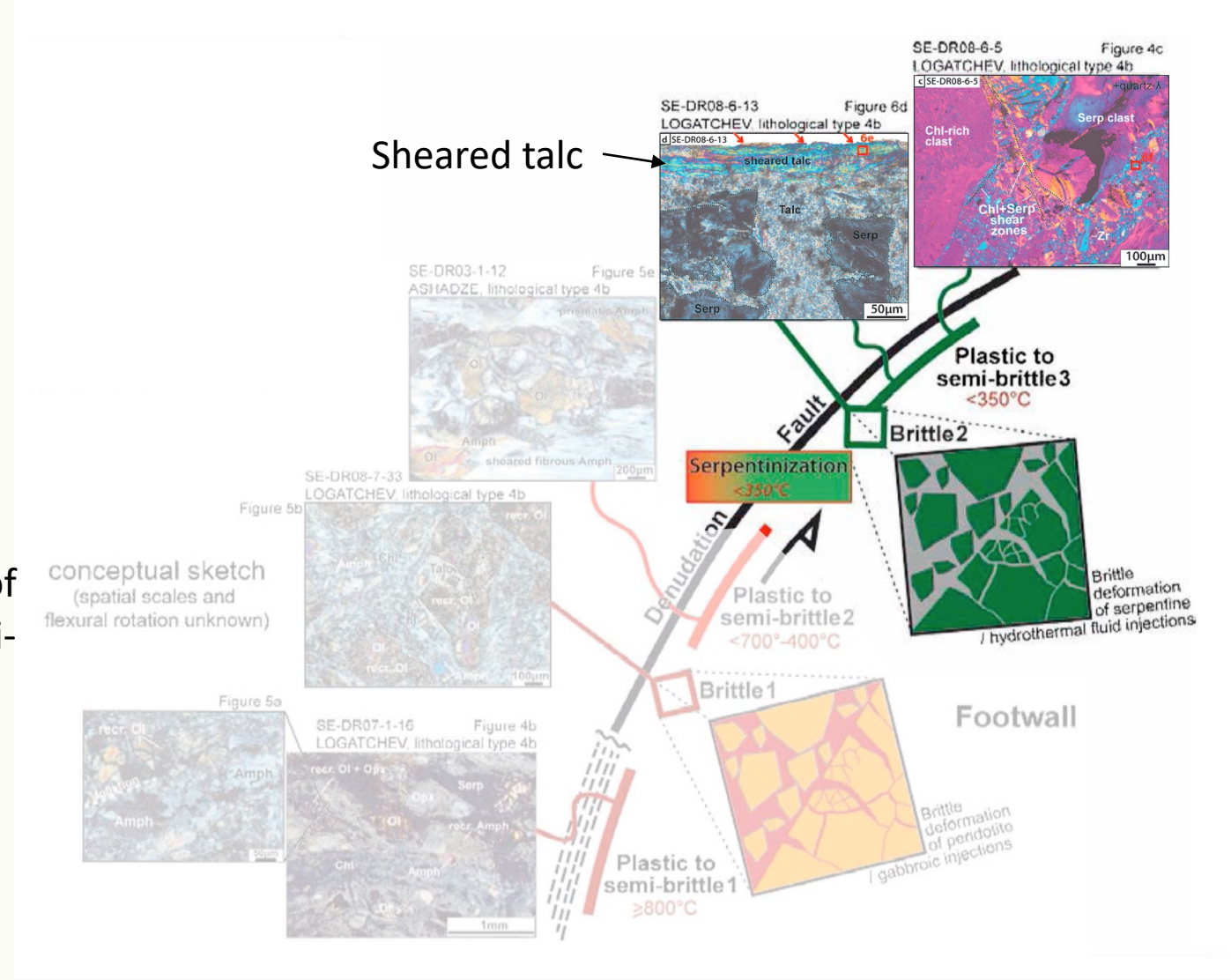
- dominant deformation mechanism is brittle type deformation of already serpentinized peridotite
- syn-tectonic hydrous fluid infiltrations in brittle cracks promote syn-tectonic recrystallization of serpentine in microbreccia horizons, enhancing strain localization
- the deformation structures and strain localization mechanisms are similar for the active detachment fault and for the previously active north-facing detachment fault

- These are to be contrasted with deformation structures documented from magmatic Mid-Atlantic detachment faults, based on similar studies

The strain localization is associated with minerals such as talc, chlorite, and/or amphibole

Which are the product of hydrous alteration of gabbro-peridotite mixtures, or alteration by Si-rich metasomatic fluid (Picazo et al; 2012; Boschi et al; 2006)

Thank you!



[Picazo et al., 2012] 13°N Mid-Atlantic Ridge