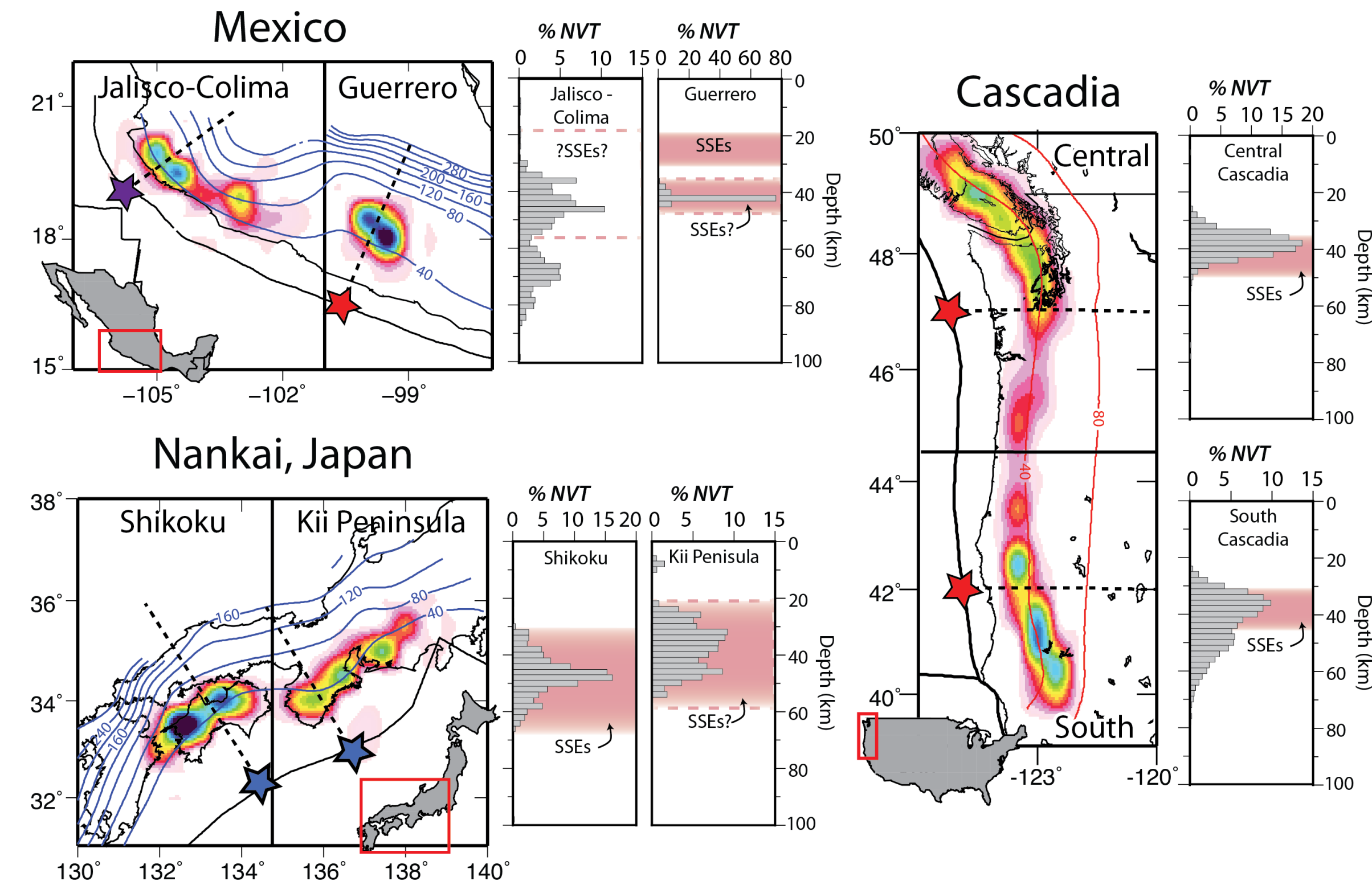


1. Metamorphic dehydration + ETS in Subduction Zones

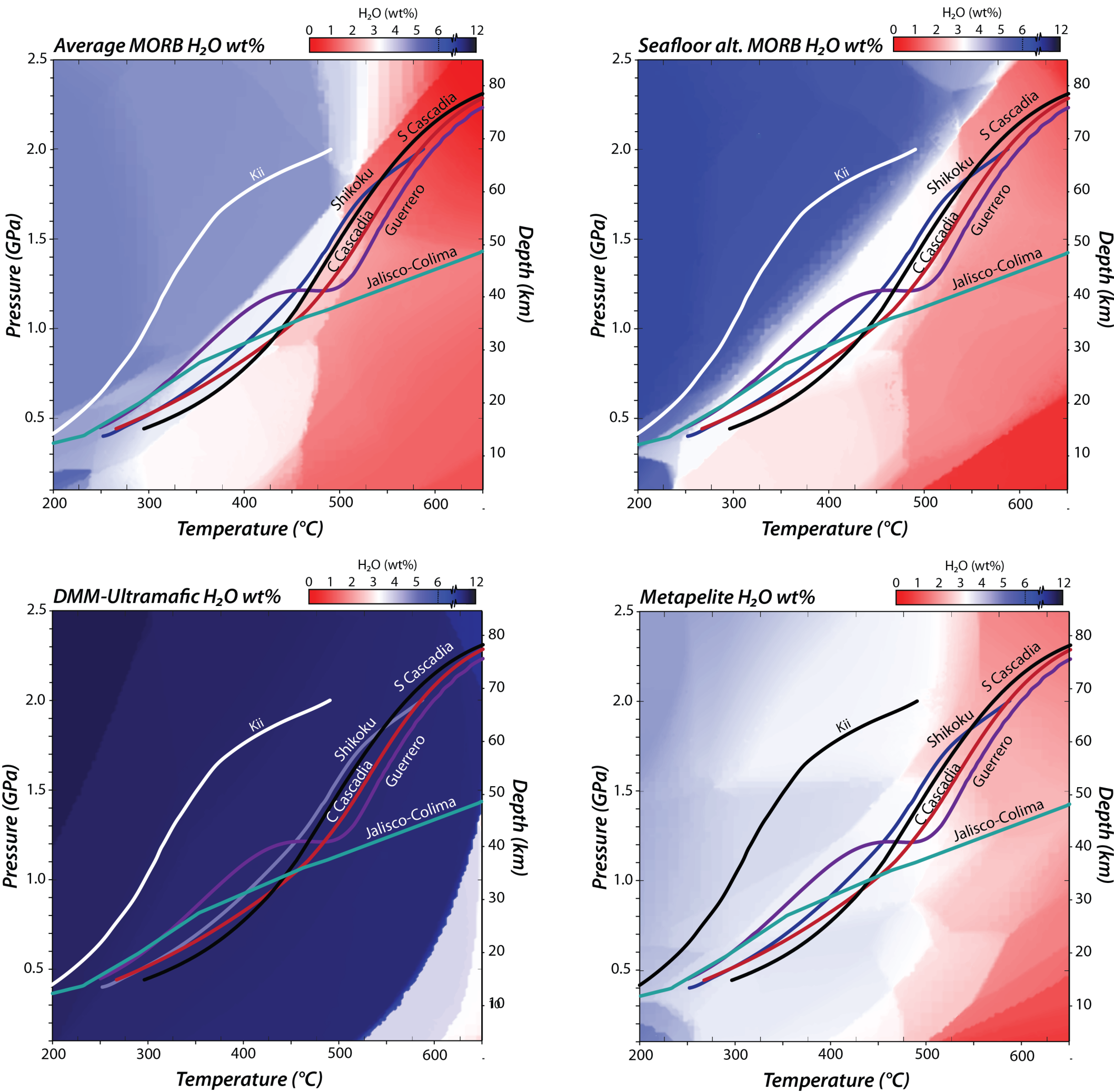
Condit et al., 2020, EPSL

TL;DR: Breakdown of Chl ± Lws in mafic rocks releases 1-2.5 wt% H₂O at the depths of SSEs and NVT in warm subduction zones, providing fluid source for geophysically + geologically inferred high Pf that may lead to mechanisms of ETS .

1. Assess depths of NVT and SSEs for subduction segments with well constrained thermal structures (Fig. 1.1)
2. Model metamorphic dehydration in PerpleX for MORB, Altered MORB, metapelite (Fig. 1.2)
3. Extract mineral-bound H₂O along predicted P-T path from thermal models for each subduction segment.
4. Compare depths of mineral-bound H₂O los (ie metamorphic dehydration) to ETS (Fig. 1.3).



↑ Fig. 1.1 Mineral bound water in subduction lithologies and slab-top P-T paths



↑ Fig. 1.2 Loci of fluid production vs NVT ± SSEs in warm subduction zones.

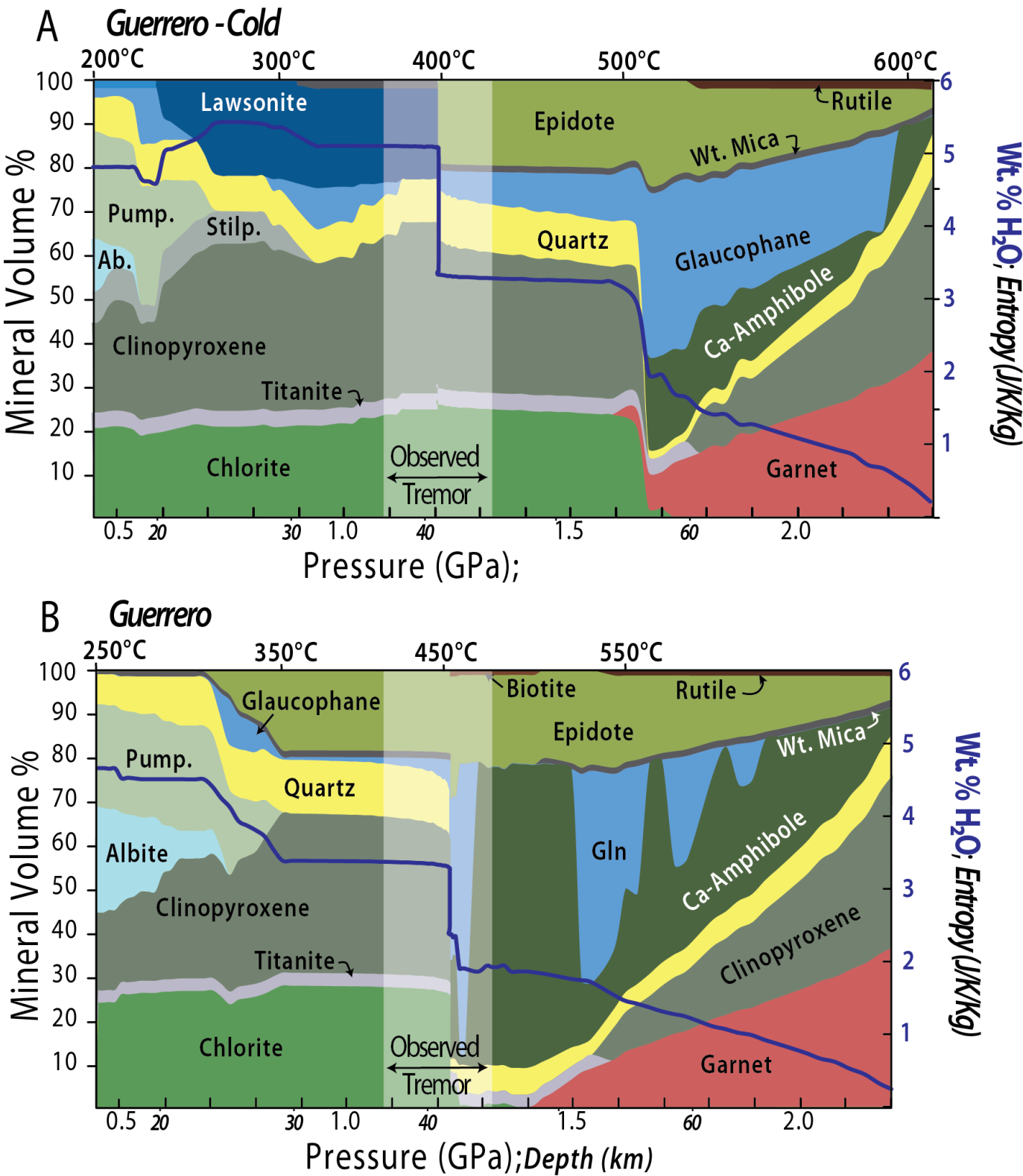
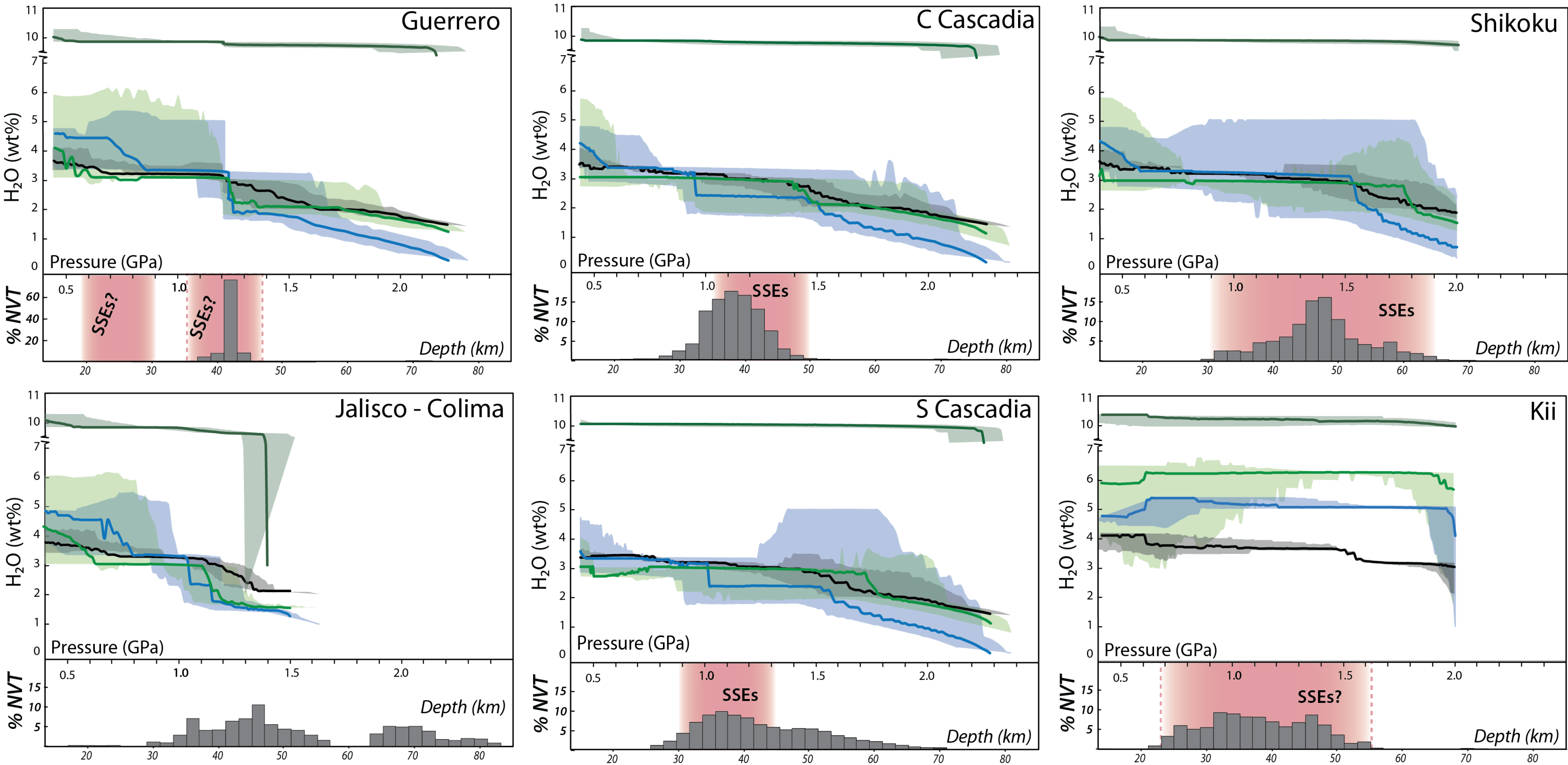
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Condit et al., 2020, EPSL

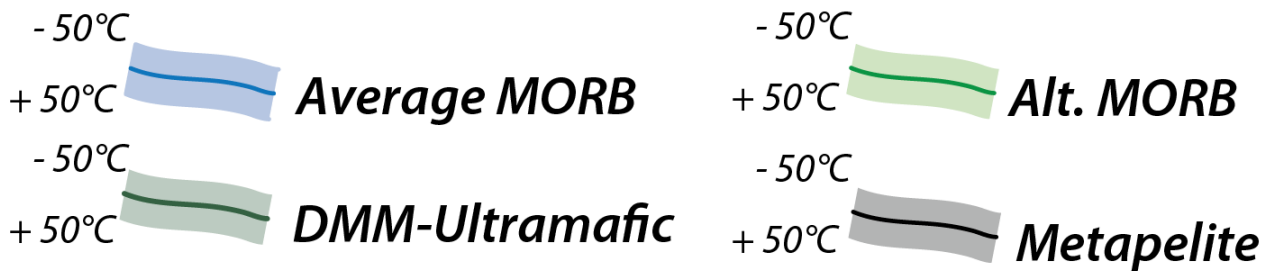
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Breakdown of Chlorite ± Lawsonite Growth of Epidote, Amphibole, Garnet



↑Fig. 1.4 Metamorphic reactions leading to fluid production in MORB



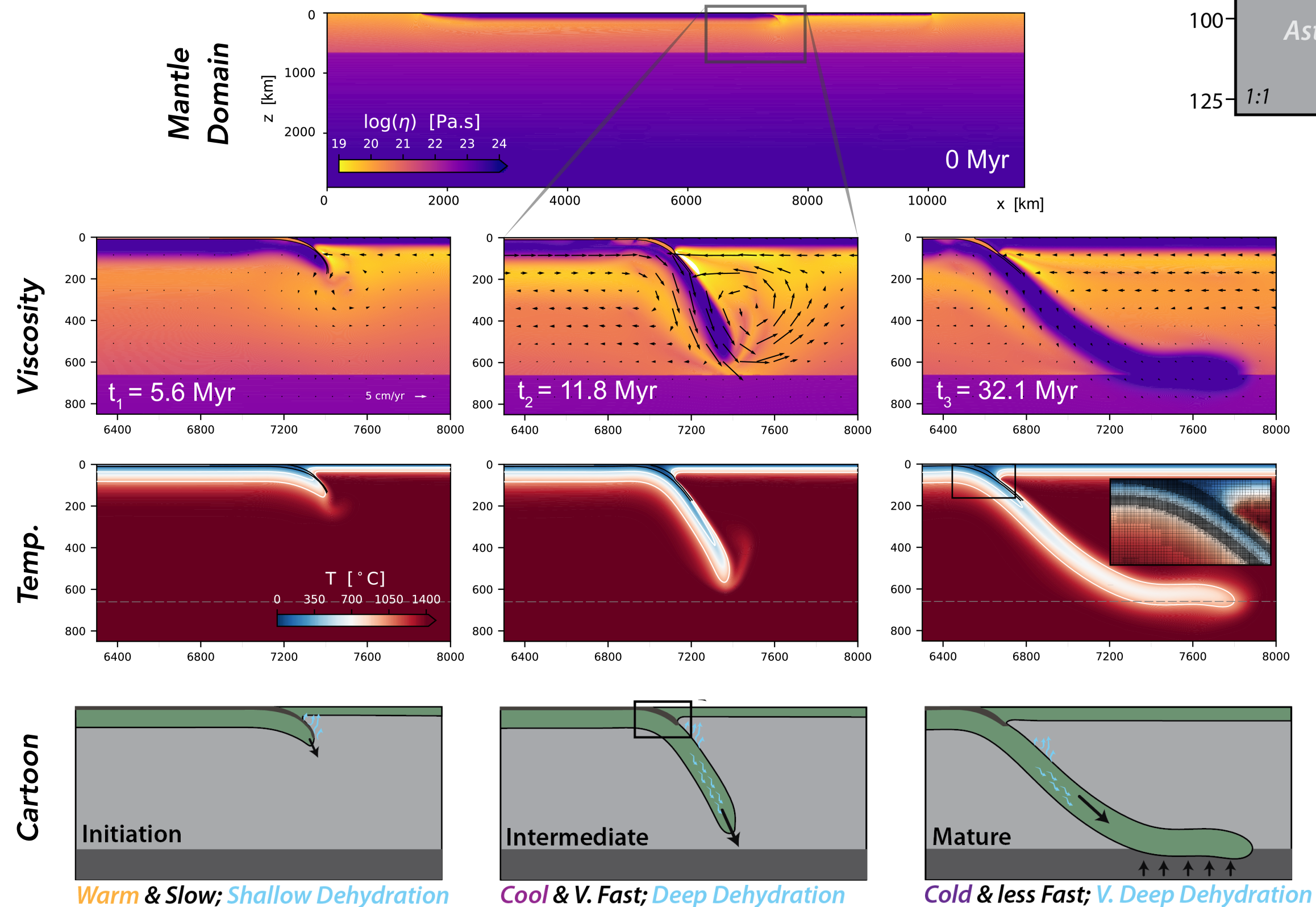
←Fig. 1.3 Loci of fluid production vs NVT ± SSEs in warm subduction zones.

2. Thermal evolution over the lifetime of a subduction zone: dehydration and rheology

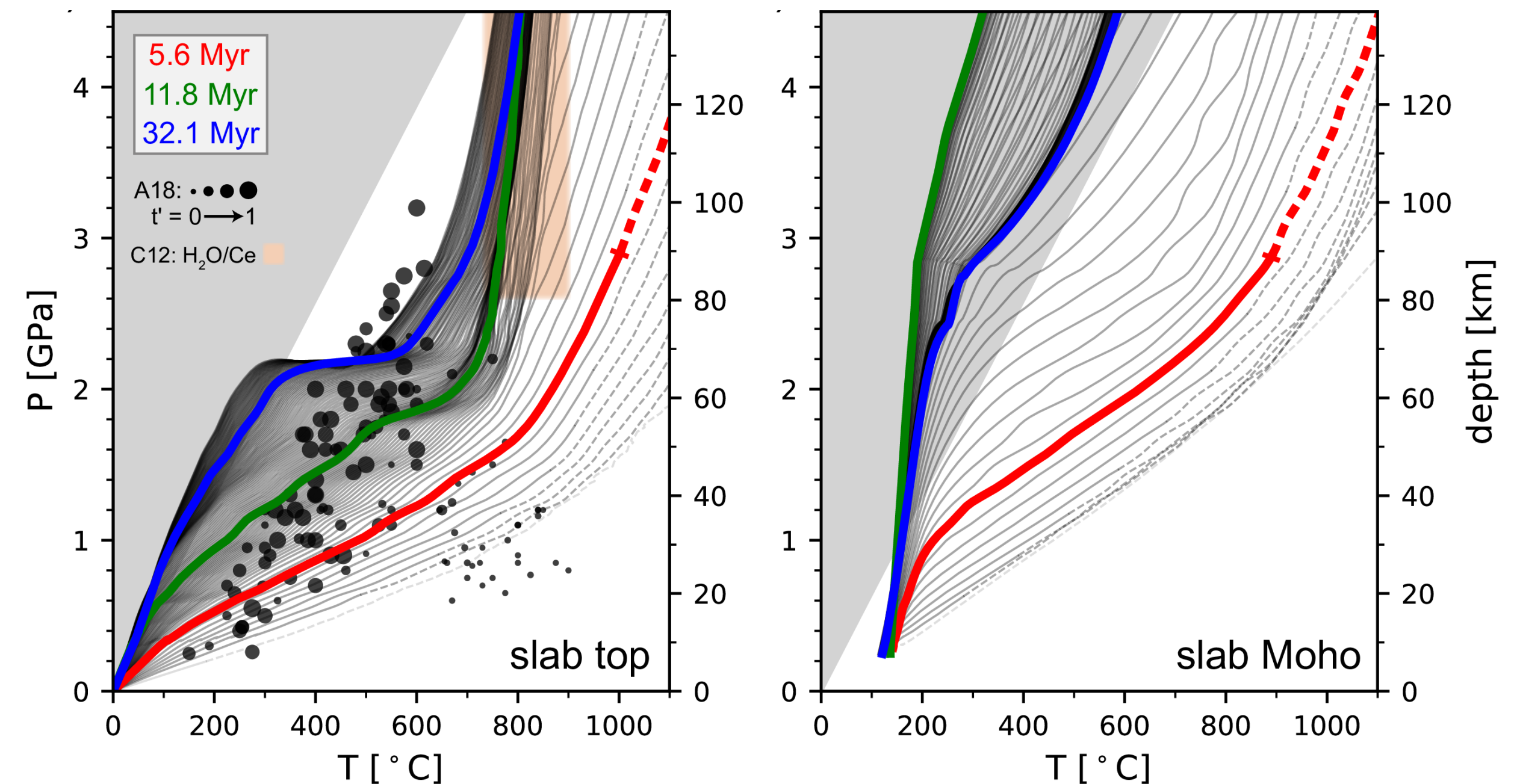
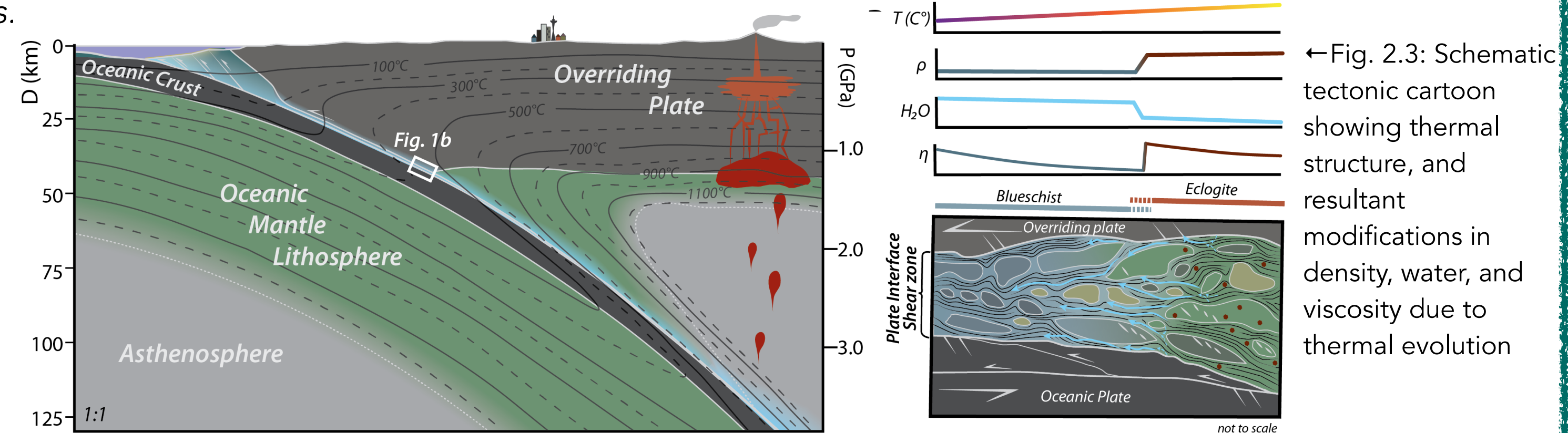
Rheology & metamorphism both thermally mediated processes. Strongly related to evolving thermal structure of subduction zones.

1. Time evolving, dynamically consistent geodynamic models (Fig. 2.1)
2. Extract evolving thermal profiles over lifetime of sub. zone (Fig. 2.2)
3. Link to co-evolving dehydration, rheology, density (Fig. 2.3)

Holt & Condit, In Revision, G-Cubed



↑ Fig. 2.1: Subduction model set up and results



↑ Fig. 2.2: P-T paths over 40 Myr compared to rock record and subarc temps.