

- Why?**
- The alpine dipping panel is in continuity with the European Lower Crust (LC) (Zhao et al. 2015).
 - Interpretation of tomography images limited by our knowledge of rocks seismic properties.
 - Direct method: predict the possible seismic properties of the LC from field analogues.**

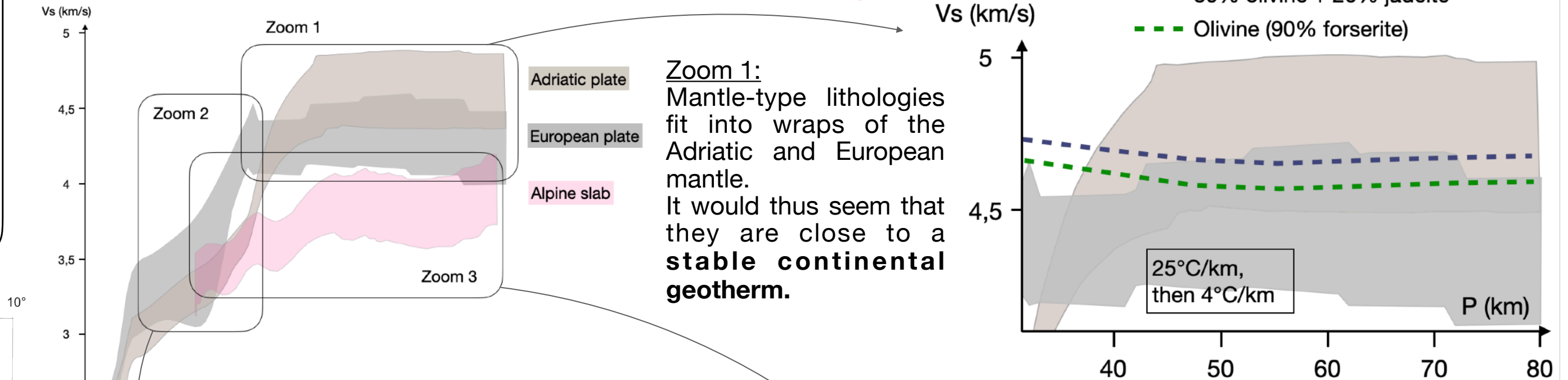
How?

- Bulk rock chemistries & thermo-dynamic modeling (Holland & Powell 1998).
- P-T velocity diagrams from seismic properties modeling (Abers & Hacker 2016).
- Testing the impact of different processes on the effective velocities of rocks along the slab.
- Comparison with effective seismic velocities along the Cifalps profile (Nouibat et al. in prep).

Assuming that:

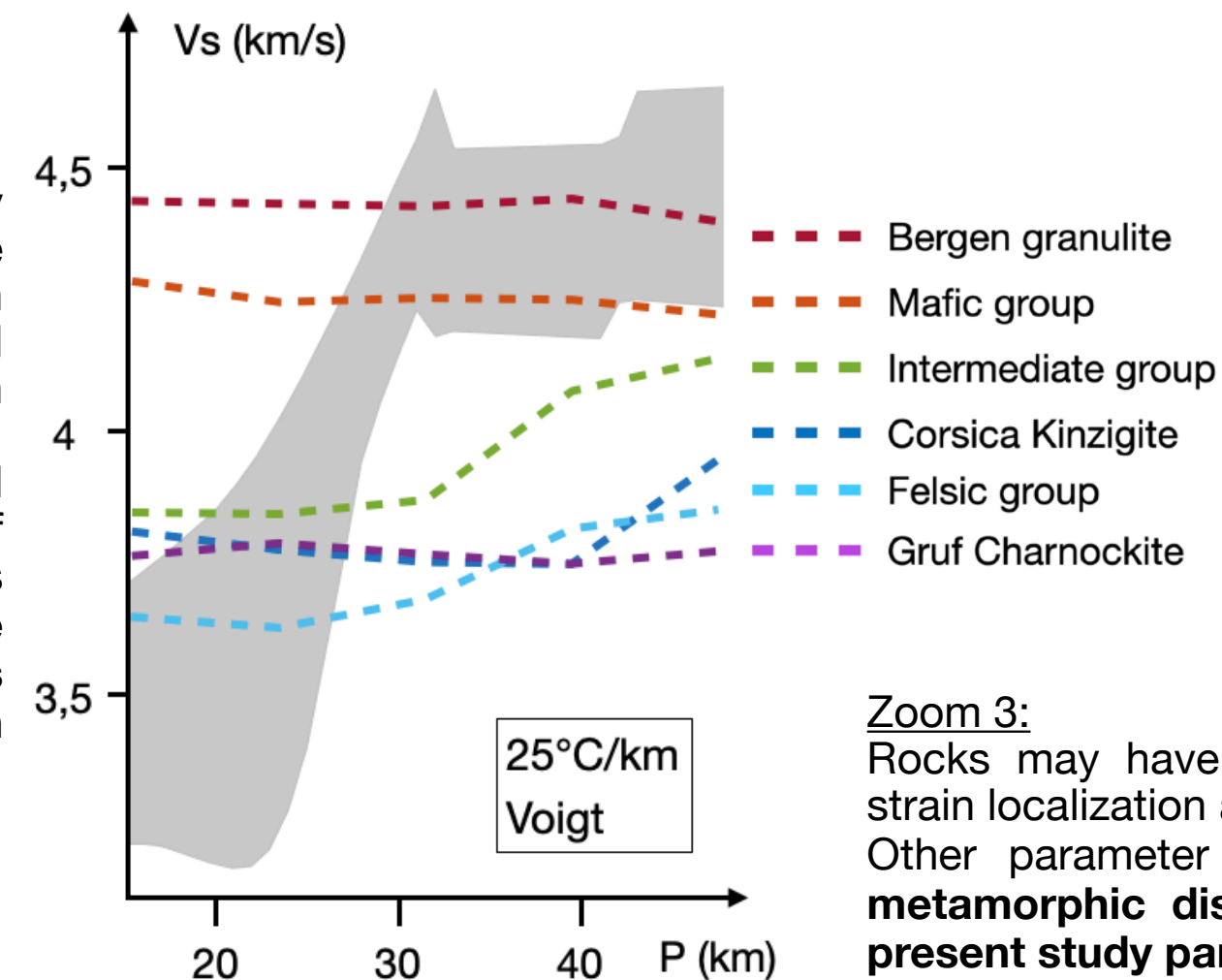
- The alpine lower crust forms the top of the lithospheric slab.
- Chemical composition of rocks is constant except for water (OH).
- The European and Adriatic lithospheres are thermally equilibrated away from the Alps.

I. Validation of the method out of the mountain range



II. One first parameter tested : the OH content of the paragenesis

Zoom 2: A single chemistry does not explain the increase in Vs drawn by the foreland envelope (European plate). For this, in a crustal model consisting of felsic and mafic rocks intercalations, **the share of mafic ones must increase with depth.**



Zoom 3: Rocks may have undergone hydration or dehydration during strain localization and metamorphism during burial and since. Other parameter such as **fabric orientation, layering and metamorphic disequilibrium** are also in the scope of the present study parameters.

- References:
- Abers, G.A., Hacker, B.R., 2016. Geochim. Geophys. Geosyst. 17, 616–624. <https://doi.org/10.1002/2015GC006171>
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 - Boundy, T.M., et al. 1992, J. metamorphic Geol. 10, 127-146.
 - Galli A., et al. 2011. Lithos 124, 17-45. doi:10.1016/j.lithos.2010.08.003.
 - Martin A.J., L., 2011. Lithos 125, 620–640. doi:10.1016/j.lithos.2011.03.015.
 - Nouibat et al., submitted to Geophysical Journal International.
 - Zhao, L., 2015. Geology 43, 815–818. <https://doi.org/10.1130/G36833.1>

- Discussion**
- The European LC must involve with depth from felsic to mafic lithologies with Gruf charnockite, Corsica kinzigite and felsic group being the best analogues for the middle crust and intercalated mafic restites for the lowermost levels.
 - The alpin slab shows velocities below the ones predicted for fully reacted analogues lithologies, hence processus lowering the apparente velocity must act at depth :
 - Reaction overstepping and delay.
 - Metamorphic texture and layering.
 - Post subduction thermal re-equilibration and subsequence re-equilibration.
 - Presence of free fluids not taken into account in our calculations.

Tested lithologies have been sampled in the External Crystalline Massifs. Other relevant lithologies are also borrowed from Boundy et al. 1992 (Bergen), Galli et al. 2011 (Gruf), and Martin et al. 2011 (Corsica) (see part 4).

