# Fluid-Rock Interactions in Deeply Subducted and Underplated Oceanic Sediments: Scales of Fluid Infiltration and Carbon Mobilization

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We have assessed the extent to which deeply subducted (50-80 km) carbonate-bearing oceanic sediment sections in the Schistes Lustrés (SL; Italian and French Alps) have experienced fluid-rock interaction involving fluids mobilized at varying scales and the related degree and scales of mobilization of C. The SL suite bears a resemblance to the sediment section presently subducting into the E. Sunda margin (Indonesia) and drilled at DSDP/ODP Sites 261/765.

In this study, we combined C and O isotope data for carbonates in the SL presented in previous studies (n≈300; [1,2]) with new analyses (n≈80) that greatly expand the geographic coverage and allow a more thorough test of a regional model for fluid mobility discussed by Cook-Kollars et al. [1]. The overall $\delta^{18}O_{VSMOW}$ variation in the SL (18-25‰) can be explained by varying degrees of: (1) closed-system re-equilibration of silicate and carbonate fractions, and (2) infiltration of marbles and calc-schists by $H_2O$-rich fluids generated by devolatilization in intercalated metapelites, resulting in appreciable decarbonation in some bulk compositions particularly at the higher-grade units [1]. Enhanced deformation along more highly sheared, carbonate-vein-rich subduction interfaces, and other larger-scale fluid conduits, afforded infiltration by fluids seemingly generated in underlying dehydrating metabasalt and/or serpentinite and leading to greater lowering of $\delta^{18}O$ to values of 11-15‰ [2].

There is ample evidence, within the SL, for relatively local-scale carbonate dissolution (e.g., pressure solution, cleavage formation). However, at larger scales, carbonate veining and pervasive carbonation near larger-scale faults argue for net deposition from fluids flowing toward the surface along the interface. The existence of these very large expanses of carbonate-rich rock, and this more localized evidence of C mobility, is indicative of the preservation of the bulk of the C in carbonate as dictated by varying access to parts of the section by farther-travelled infiltrating fluids mobilizing dissolved carbonate.

[1] Cook-Kollars et al. (2014) Chem. Geol. **386**, 31-48.
[2] Jaeckel et al. (in press) Geosphere.