$\boldsymbol{u}^{\scriptscriptstyle b}$

Institute of Geological Sciences Kolloquium Seminar

⁶ UNIVERSITÄT BERN Monday, 5th May 2025 at 16:15 Studer Auditorium, 2 OG

Melanie J. Sieber University of Potsdam

"Formation and Stability of Carbonates along Subduction Zones"

Listvenites (carbonate+quartz) and soapstones (carbonate+talc) form by metasomatic transformation of variably serpentinized peridotites in the forearc mantle due to extensive reaction with CO₂-bearing aqueous fluids released from the subducting slab ^[1]. This transformation sequesters large amounts of carbon since soapstones and listvenites commonly contain >20 wt% and >30 wt% CO₂, respectively. Although volumetrically rare rock types, they occur in many ophiolites throughout much of the geological record, with preserved examples from the Archean to the present^[1]. Listvenites and soapstones are highly interesting because they modulate deep carbon cycling and are natural analogues for engineered carbon sequestration by mineral carbonation. In this presentation, I will elucidate the formation of listvenites and soapstones within the forearc as a relevant sink for CO_2 . Further, the stability of carbonates within the subducting slab and more generally within the upper mantle will be considered from recent experimental results on the Ca-Mg-carbonate system. At 6 and 9 GPa, Ca-Mgcarbonates undergo incongruent melting producing dolomitic melt and periclase for temperatures above ~1250 $^{\circ}C^{[2,3]}$. At such high pressures, magnesite is expected to be the predominant carbonate phase. Even in the presence of hydrous fluid and even for hot subduction geotherms, magnesite will not melt^[4].

Menzel M., Sieber M.J., Godard M. (2024) Earth-Science Reviews <u>https://doi.org/10.1016/j.earscirev.2024.104828</u>
Sieber M.J., Wilke F., Koch-Müller M. (2020) American Mineralogist <u>https://doi.org/10.2138/am-2020-7098</u>

[3] Sieber M.J., Wilke M., Appelt O., Oelze M., Koch-Müller M. (2022) European Journal of Mineralogy https://doi.org/10.5194/ejm-34-411-2022

[4] Sieber M.J., Reichmann H-J, Farla R., Koch-Müller M. (2024) American Mineralogist <u>https://doi.org/10.2138/am-2023-8982</u>