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Zn and Fe isotopes in the Cerro del Almirez ultramafic massif (Spain): new constraints on serpentinite breakdown during subduction

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The Almirez ultramafic massif offers a unique opportunity to unravel fluid transfer processes in subduction zones, as the outcrop grants access to a key subduction-related dehydration reaction: the breakdown of antigorite (atg) to prograde olivine at high pressure [1]. The massif is composed of atg-serpentinites and prograde chlorite (chl)-harzburgite separated by a clear dehydration front. In this study, we used zinc and iron isotope compositions, two tracers of the fluids released during serpentine minerals breakdown in subduction zones [2,3]. We show that the Almirez samples record a significant Zn isotope fractionation occurring during atg-serpentinite dehydration, with average Zn isotope compositions values (noted δ^{66}Zn, in ‰) increasing from +0.23±0.18‰ (2 s.d.) in atg-serpentinites to +0.38±0.16‰ in chl-harzburgites. These means are statistically distinguishable (Student's t-test, two-tailed, 95% C.I.). This fractionation in consistent with interaction, during dehydration, of Almirez chl-harzburgites with slab-derived fluids enriched in heavy isotopes. The lack of correlation between δ^{66}Zn and tracers (Th-U-Nb-Ta-Pb-Sr) of surrounding subducted crustal lithologies [4,5] suggest that the δ^{66}Zn in chl-harzburgites carry the signature of the fluid released during antigorite breakdown under oxidizing conditions [2].

[1] Padrón-Navarta *et al.* (2019) *EPSL* **297** [2] Pons *et al.* (2016) *Nat. Commun.* **7**. [3] Debret *et al.* (2016) *Geology* **44**. [4] Garrido et al. (2005) *G³* **6**. [5] Marchesi et al. (2013) Lithos **178**.