

Tracking the migration and conversion of metamorphic H₂ and reduced carbonic fluids in orogenic belts

ALBERTO VITALE BROVARONE¹, ANTOINE BOUTIER², ORLANDO SÉBASTIEN OLIVIERI¹, FRANCESCO RESSICO¹, FRANCESCO GIUNTOLI¹, GUILLAUME SIRON³, ZEUDIA PASTORE^{1,4} AND VERONICA PEVERELLI¹

¹Alma Mater Studiorum Università di Bologna

²Università di Torino

³Università degli Studi di Bologna

⁴Norwegian university of science and technology (NTNU)

Presenting Author: alberto.vitaleb@unibo.it

The identification of natural H₂ formation, migration, and storage in the lithosphere is an emerging topic in the Earth and green energy Sciences. Surficial H₂ seeps provide direct evidence for the production and accumulation of H₂ in the shallow crust. In contrast, the production and migration of deeper H₂ fluids, down to the upper mantle, is less constrained and requires the identification of petrological and geochemical markers in the rock record. In this contribution, we present geological evidence for H₂ production, migration, and transformation in various orogenic belts. The coevolution of hydrogen and redox-sensitive carbonic fluids and minerals defines recurrent patterns of deep H₂ and carbon cycling observed in multiple case studied. These data provide important constraints on the formation and cycling of natural hydrogen in deep geological reservoirs for global natural H₂ inventories.

This work is part of project that has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (Grant agreement No. 864045).