Multi-isotopic dating of West Eifel xenoliths

M. M. THIEMENS[1*] AND P. SPRUNG[1]

[1]Inst. für Geologie und Mineralogie, Universität zu Köln, Germany (*m.thiemens@uni-koeln.de)

Analysis of mantle xenoliths from continental intraplate volcanic fields such as the Quaternary West Eifel can provide valuable insights into the composition and evolution of regional continental lithospheric mantle. The Dreiser Weiher (DW) locality of the West Eifel volcanic field hosts a variety of peridotite nodules, including hydrous and anhydrous lherzolites. Neodymium model ages of anhydrous lherzolite. nodules record a Palaeoproterozoic depletion age.

A second partial melting event in the early Cambrian was inferred from linear arrays on Rb-Sr and Sm-Nd isochron diagrams obtained for anhydrous lherzolite nodules. Correlating isotopic signatures of xenoliths with signatures within the European lower crust, a Variscan episode of fluid metasomatism was inferred. Textural and Sr-Nd isotopic observations in DW xenoliths further mark two episodes of melt infiltration: one likely of early Cretaceous age and a second vein-producing event probably related to the quarternary volcanism in the West Eifel.

We present the first internal mineral isochron study for Eifel xenoliths using the Rb-Sr, Sm-Nd, and Lu-Hf systems in a study of an anhydrous lherzolite from the DW locality. Hand-picked mineral separates were digested at low pressure and purified for analysis on a Neptune MC-ICP-MS. Preliminary Lu-Hf data imply resetting of Lu-Hf systematics after 200 Ma. This Lu-Hf age constraint coincides with the two youngest metasomatic episodes inferred and may date to the older of the two, having been obtained from a vein-free lherzolite.

We discuss the age data obtained from our Rb-Sr, Sm-Nd, and Lu-Hf isochrons and possible implications for the lithospheric mantle modifying events, as well as potentially distinct responses of the different dating tools to these events.