REE minerals evolution and U-Th-Pb dating in the northern Lepontine domain, Central Alps

*Janots Emilie, *Engi Martin, *Berger Alfons, **Rubatto Daniela & **Gregory Courtney

*Institute of Geological Sciences, University of Bern, Switzerland, ejanots@geo.unibe.ch
**Research School of Earth Sciences, The Australian National University, Canberra, Australia

In the Lepontine domain (Central Alps), U-Pb ages show that thermal peaks are diachronous from the southern to the central parts (28 and 26-21 Ma, respectively). At the northern margin of the dome, the age pattern remains controversial. Geochronological data reported range from 13 to 350 Ma, with discrepancies resulting from the difficulty to obtain and properly interpret ages at low metamorphic conditions. In order to find potentially well resolved U-Th-Pb geochronometers, we have addressed the REE-mineralogy in suitable samples from the northern Lepontine domain, along a transect recording conditions from diagenetic to amphibolite facies. Our strategy has been to characterize texturally and chemically the REE-minerals, document their assemblages, and deduce mineral reactions, which occurred with increasing metamorphism. The most promising samples with newly formed REE-minerals have been then selected for U-Th-Pb isotopic measurements with SHRIMP and LA-ICPMS. In diagenetic to low-grade metamorphic rocks, LREE are contained in roundish Variscan and/or minute newly formed monazite (Chemical U-Th-Pb dating). With the appearance of chloritoid, monazite vanishes, and LREE are taken up in idiomorphic homogeneous allanite grains. With the appearance of biotite, allanite acquires a first rim of epidote, rich in HREE, and a second one, with low REE content, grows contemporaneously with garnet. At the “chloritoid-out” zone boundary, allanite is replaced by monazite associated with plagioclase, biotite and/or staurolite. In our samples, the evolution of the REE-phases thus appears to be correlated with the succession of major silicate assemblages. SHRIMP and LA-ICPMS ages of allanite, epidote and monazite should therefore yield U-Th-Pb ages which can be related to the P-T conditions of their formation. In particular, the presence of all of the REE minerals in one and the same sample offers the unique possibility of dating the prograde evolution and peak metamorphism using different chronometers. Isotopic measurements, currently in progress, promise to add new clues to interpret the age discrepancies at the northern margin of the Lepontine domain.