



From marine to terrestrial ecosystems: Oxygen isotope geochemistry of phosphate as a tool to study P dynamics

F. Tamburini (1), S. Bernasconi (2) and E. Frossard (1)

(1) Plant Nutrition Institute, D-AGRL, ETH Zurich, Lindau, Switzerland, (2) Geological Institute, ERDW, ETH Zurich, Zurich, Switzerland (federica.tamburini@ipw.agrl.ethz.ch)

Phosphorus is the nutrient that most commonly determines the trophic status of the environment, therefore the understanding of the dynamics of its geochemical cycle is of fundamental relevance. Because of its importance as nutrient, almost all steps of phosphorus geochemical cycle are carried out by biota and are mostly catalyzed by enzymatic processes. Recent studies have shown that oxygen present in the phosphate group exchanges with ambient water only as the result of biological activity, and that enzymatic processes are responsible for oxygen isotope fractionation in phosphate (Blake et al., 2005). The temperature dependence of O-isotopes of phosphate is also extensively used in paleoclimatic studies (see Longinelli and Nutti, 1973; Kohn and Dettman, 2007).

Among the methods that have been used to analyze O-isotopes of phosphate (Venne-mann et al., 2002), TC-EA mass spectrometry is the one chosen because it is fast and requires little samples (down to 300 micrograms of silver phosphate as analyte). One of the challenges of this technique, especially when dealing with natural samples, is the procedure to be applied to get pure silver phosphate. We are using a method developed for marine sediments and soil material (McLaughlin et al., 2004) to efficiently extract and prepare phosphate for mass spectrometry analyses. We are studying both natural and synthetic fertilizers, soils of different maturity and nutrient status, and water samples, influenced by agricultural practices. Our results indicate that this technique, once optimized for soils, can provide important insights on the dynamics of the

biogeochemical processes that rule phosphorus cycle in the terrestrial environment.

Blake et al. (2005) PNAS, 98(5), 2148-2153. Kohn and Dettmann (2007) Reviews in Min. Geochem., 66, 119-154. Longinelli and Nutti (1973) EPSL, 20(3), 337-340. McLaughlin et al. (2004), Limnol. Oceanog. Methods 2, 202-212. Vennemann et al. (2002), Chem. Geol., 185, 321-336.