Paleomagnetic dating of *in situ* weathering profiles of Belgium and northern France: paleogeographic implications around the Paleocene-Eocene boundary

Caroline Ricordel-Prognon[1], Christian Dupuis[2], François Barbier[3], Jean-Yves Storme[3], Florence Quesnel[1]

[1] BRGM, GEO/G2R, BP 36009, 45060 Orléans cedex 2, France
[2] UMONS, Géol. Fond. & Appl., Rue de Houdain 9, 7000 Mons, Belgium
[3] FUNDP, UCL-Namur, Rue de Bruxelles, 61, 5000 Namur, Belgium

The geological archives record «hyperthermic» crises, along with their consequences on the biota and physical environment. Among these, the PETM (Paleocene-Eocene Thermal Maximum) is often considered as the closest analogue to the current climate crisis due to its global character and the speeds at which the CO_2 rate and average temperatures increased. The shallow to deep marine environments from various paleolatitudes have been studied intensively (e.g. Aubry et al, 2007), but apart notable paleontological studies, the PETM impact on the terrestrial realm at a regional scale has probably not been studied and integrated enough (Zachos *et al,.* 2008). Moreover very few studies aimed at checking if the drastic rises of greenhouse gases and temperature had a real impact on the weathering profiles development during the PETM. Such a regional study is proposed in the “Sparnacian” terrestrial and lagoonal units of the Paris Basin, which offers rich and diversified interconnected paleoenvironments, and on its emerged interfluves and borders.

The paleoweathering profiles here considered belong to the so-called “Landenian” quartzites, or “Sparnacian” silcretes, and are locally well correlated to the first terrestrial units of the Tienen and Mortemer Fm, between the Upper Thanetian and Lower Ypresian marine units. However some silcretes and ferruginous sandstones are sometimes dated no better than Early Paleogene. To improve the error bar from 25 Ma to 5 Ma would mark a significant progress. Paleomagnetism is one of the methods useful to improve the uncertainty being often the status of those geological objects. Goethite and hematite, main iron oxides formed in weathering profiles, acquire a chemical remanent magnetization (CRM) in the direction of the ambient geomagnetic field. Consequently paleomagnetism is often considered as the most suitable method for dating weathering profiles (e.g. Idnurm & Senior, 1978; Ricordel-Prognon et al, 2010). The fossil geomagnetic direction enables one to calculate the virtual magnetic pole (VMP) of the site where magnetic minerals were precipitated. Dating the minerals is then possible by comparing their recorded paleomagnetic poles (VGP) with the apparent polar wander path (APWP) of the continent in which the site is located.

In situ weathering profile formed upon the Upper Thanetian glauconitic sands from the Grandglise section (Belgium) have been sampled in details and various analyses have been performed: granulometry, XRD and magnetic mineralogy, petrography, paleomagnetism. Haematite is the main magnetization carrier, directions are well clustered, with a low MAD (maximum angular deviation). However the dating obtained around the Paleocene-Eocene boundary is consistent with the stratigraphic position of the Grandglise paleosol and gives evidence of a fossil weathering, instead of a recent one related to a Neogene to Quaternary re-exposure often invoked for such red and variegated sandstones. Our results and others recently obtained in the neighboring Avesnois help to decipher the correlation between the Grandglise paleosol and surroundings silcretes and to precise the terrestrial paleogeographic evolution on the emerged areas during this critical interval.