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Paleomagnetic age constrains and magneto-mineralogic implications for the Triassic paleosurface in Europe

Christine Franke (1), Medard Thiry (1), David Gomez-Gras (2), Maria Jelenska (3), Magdalena Kadzialko-Hofmokl (3), France Lagroix (4), David Parcerisa (5), Simo Spassov (6), Adam Szuszkiewicz (7), and Krzysztof Turniak (7)

(1) Mines ParisTech, Centre des Géosciences, Fontainebleau Cedex, France (christine.franke@mines-paristech.fr), (2) Universitat Autònoma de Barcelona, Dpt. de Geologia, Campus UAB, 08193 Bellaterra, Espagne, (3) Institute of Geophysics, Polish Academy of Sciences, ul. Ks. Janusza 64, 01-452 Warsaw, Poland, (4) Institut de Physique du Globe de Paris, Equipe de Paléomagnétisme, 4 place Jussieu, 75252 Paris Cedex 05, France, (5) Universitat Politècnica de Catalunya, Dpt. d'Enginyeria Minera i Recursos Naturals, Av. Bases de Manresa 61-73, 08242 Manresa, Espagne, (6) Centre de Physique du Globe de l'Institut Royal Météorologique de Belgique, Dourbes (Viroinval) B-5670, Belgium., (7) University of Wroclaw, Mineralogical Museum, Institute of Geological Sciences, ul. Cybulskiego 30, 50-205 Wrocław, Poland

The reconstruction of paleosurfaces represents a unique tool to access the evolution of ancient continents. Paleosurfaces contribute to the study of global changes through paleoweathering features/profiles and record uplift and subsidence of the ancient continents driven by crustal geodynamics and plate tectonics. However, age constraints for basement paleosurfaces are often difficult to obtain since the geological record of ancient land surfaces is usually limited, fragmented by unconformities and scrambled by successive superimposed evolutions, leaving a patchwork of relict landforms and weathering products, discontinuous over time and space.

The crystalline basement of European Paleozoic massifs, consisting of igneous and metamorphic rocks, often show Permo-Triassic overprints resulting in underestimated age determinations. These remagnetisations are ubiquitous [e.g. Edel & Schneider, 1995], affecting many emerged Paleozoic rocks in Europe. The rejuvenated age estimations are attributed to an alteration of the primary paleomagnetic signal and carried by secondary hematite [Ricordel et al., 2007; Preeden et al., 2009; Preeden, 2009]. Moreover, published paleomagnetic ages [Ricordel et al., 2007] showed a strong relationship between the remagnetization and the development of pinkish-red crystalline facies associated to the albitized underlying rocks of the Morvan Massif (France). Parcerisa et al. [2009] performed further field and petrographic analyses and proposed that the albitization was linked to the precipitation of secondary haematite.

Since hematite forms under oxidising conditions one may deduce that the remagnetization occurring in the Paleozoic crystalline rocks formed during the exposure of these rocks at the Permo-Triassic (paleo)surface. The extent of the altered zone ($\sim$200 m in depth) points to a sodium enriched groundwater environment [Thiry et al., 2009].

Demonstrating that the albitized facies are of supergenic origin and bound to the Triassic paleosurface deeply renews the ideas about the evolution of basement areas. The recognition of the Triassic paleosurface on widespread basements in Europe will provide spatio-temporal benchmarks to constrain the ablation of these massifs since the Triassic. This will be a major contribution to the geodynamic modelling of continental evolution of Europe.

To deepen our understanding of this paleoalteration phenomenon on a supra-regional scale and to obtain a reasonable distribution of paleomagnetic age determinations, we aim to acquire more tie points for this Permo-Triassic surface, which was preserved in the crystalline basement of Europe throughout the Mesozoic and Cenozoic epochs. We will present results from paleomagnetic investigations as well as magneto-mineralogic analyses of the profiles through albitized granite and porphyry from the Sudetes in SW-Poland and the Catalonian

Mountains in NE-Spain, for which preliminary age estimations have been carried out. Further European Paleozoic sample sites are in process.
Depending on the depth situation of the sampled facies compared to the weathering profile, the Triassic paleomagnetic ages show dispersion towards rather older ages at the top and younger ages at the bottom of the sequence. This seems to correlate with the results from magneto-mineralogical analyses which show a decreasing hematite concentration with depth. The oldest ages are carried by a single component, identified as single-domain secondary hematite inclusions in the secondary albite crystals. With increasing depth the samples are rather characterized by a two-component signal, still showing (younger) Triassic ages for both components. These were identified as secondary hematite and maghemite. The latter is most probably a product of either low-temperature magnetite oxidation or precipitates during the albitization of the primary rock. These processes are both linked to less oxidising conditions than at the top of the weathering profile.

A systematic interpretation of the paleomagnetic ages and the identification of the magnetic carrier assemblage for all European sites will provide valuable insights into (a) the geodynamic evolution of the crystalline complexes, by estimation of erosion/stability rates and (b) an advanced mineralogical understanding of the specific conditions linked to this Triassic paleoweathering event.

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