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The Liverpool Geomagnetic Polarity Reversal : New evidences for a complex magnetic field behavior during reversals.

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We carried out a detailed and continuous paleomagnetic re-sampling of the reversed-to-normal Eocene -36 Ma- geomagnetic transition recorded in the Liverpool (NSW, Australia) volcanic range [Hoffman, 1986]. Our main objective was to obtain a precise description of the variation in the paleofield vector (direction and absolute intensity) as the geomagnetic field reverses. With more than 30 transitional directions documented, the Liverpool reversal is, along with the Miocene record -16.2 Ma- of the Steens Mountain (Oregon, USA) [Mankinen et al., 1985] and the Matuyama-Brunhes -780 Ka- record of Hawaii [Coe et al, 2004], among the best example of a transition record from a volcanic sequence. The Liverpool polarity reversal shows a complex path of the Virtual Geomagnetic poles between the initial (reverse) and final (normal) polarities. Two loops in the trajectory of VGPs before the actual polarity switch are documented [Hoffman, 1986]. Such swings preceding the reversal seems to be a common characteristic of reversal since similar features are described on the Steens Mountain [Jarboe et al., 2007] and a long period of instability, estimated to 18 ka, is now well established prior to the Matuyama-Brunhes reversal [Singer et al., 2005]. In the present study, we found an additional swing through the reversed polarity yielding a complex R-T-R-T-R-T-R-T-N path for VGPs to achieve the reversal process. During the sampling campaign, we did not find evidence for significant hiatus in the eruptive activity such as soil horizons or sediments. We do not believe either that some part of the volcanic sequence be duplicate by the presence of tectonic faults. Hence, we think that the three excursions and the actual reversal belong to a single phenomenon. In order to strengthen this conclusion, precise Ar/ Ar will be performed.
Twelve flows (5 of transitional and 7 of reversed polarity, respectively) all located in the lower half part of the Liverpool record, yielded paleointensity estimates with very good technical quality. The results are unexpected: we did not observe a significant decrease in the field intensity during the transition as commonly observed in other reversal records. Indeed, the weighted mean paleointensity by flow are close to 40 microT, which is the expected value for the stable field.