



## **Cosmogenic $^{10}\text{Be}$ records of past geomagnetic instabilities: a tool for global synchronization of Plio-Quaternary records**

Quentin Simon (1), Didier L. Bourlès (1), Nicolas Thouveny (1), Franck Bassinot (2), and Jean-Pierre Valet (3)

(1) CEREGE UM34, Aix Marseille Univ, CNRS, IRD, Coll France, Aix en Provence, France (simon@cerege.fr), (2) LSCE, UMR8212, LSCE/IPSL, CEA-CNRS-UVSQ and Université Paris-Saclay, Gif-Sur-Yvette, France, (3) Institut de Physique du Globe de Paris, Sorbonne Paris-Cité, Université Paris Diderot, UMR 7154 CNRS, Paris, France

Chronological uncertainties often hinder accurate synchronizations of paleoclimatic series between marine and ice records. The use of a robust and independent chronostratigraphic tool capable of correlating these series is therefore essential in order to understand their inter-variability and teleconnections. Although potentially suffering from biases associated with paleomagnetic lock-in depths, one such tool, the variations of the Earth magnetic field, has been successfully used in marine sedimentary sequences, but cannot be retrieved in ice records. An alternative approach to decipher past variations of the geomagnetic dipole moment (GDM) is through the use of cosmogenic nuclide beryllium-10 ( $^{10}\text{Be}$ ) since its atmospheric production rate depends primarily on the magnetospheric shielding at millennial time scales. Moreover, it has been demonstrated that the episodic collapses of the geodynamo accompanying all polarity reversals and excursions have systematically triggered large  $^{10}\text{Be}$  overproduction episodes over the last 2 Ma (Simon et al., 2016, 2018), providing robust and synchronous stratigraphic markers that can be retrieved in both ice and marine records. Such  $^{10}\text{Be}$  production time series can thus be synchronized at the global scale and be correlated to radiometrically and/or astrochronologically dated Geomagnetic Instability and Polarity time scales. We present a compilation of several authigenic  $^{10}\text{Be}/^9\text{Be}$  ratio (proxy of atmospheric  $^{10}\text{Be}$  production) records obtained from Plio-Quaternary marine archives. It permits to introduce and discuss improvements of orbitally tuned magnetic and oxygen isotope stratigraphies that are sometimes affected by biases or unconformities intrinsic to the recording processes. It will also improve the synchronization of long paleoclimatic series from Antarctica and Greenland ice records with marine sequences worldwide.

Simon, Q., Thouveny, N., Bourlès, D.L., Bassinot, F., Valet, J-P., Ménabréaz, L., Guillou, V., Choy, S., Beaufort, L., 2016. Authigenic  $^{10}\text{Be}/^9\text{Be}$  ratio signatures of the cosmogenic nuclide production linked to geomagnetic dipole moment variation since the Brunhes/Matuyama boundary. *Journal of Geophysical Research: Solid Earth*, 121(11), 7716–7741.

Simon, Q., Bourlès, D.L., Thouveny, N., Horng, J., Valet, J-P., Bassinot, F., Choy, S., 2018. Cosmogenic signature of geomagnetic reversals and excursions from the Reunion event to the Matuyama-Brunhes transition (0.7 - 2.14 Ma interval). *Earth and Planetary Science Letters*, 482, 510-524.