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A new ^{10}Be record recovered from an Antarctic ice core: validity and limitations to record the solar activity

Mélanie Baroni (1), Edouard Bard (1), and Aster Team (2)

(1) CEREGE, Aix-Marseille University/CNRS/IRD/College de France, Technopôle de l'Arbois, 13545 Aix-en-Provence cedex 4, France, (2) M. Arnold, G. Aumaître, D. Bourlès, K. Keddadouche, CEREGE, Aix-Marseille University/CNRS/IRD/College de France, Technopôle de l'Arbois, 13545 Aix-en-Provence cedex 4, France

Cosmogenic nuclides provide the only possibility to document solar activity over millennia. Carbon-14 (^{14}C) and beryllium-10 (^{10}Be) records are retrieved from tree rings and ice cores, respectively. Recently, ^{14}C records have also proven to be reliable to detect two large Solar Proton Events (SPE) (Miyake et al., *Nature*, 2012, Miyake et al., *Nat. Commun.*, 2013) that occurred in 774-775 A.D. and in 993-994 A.D.. The origin of these events is still under debate but it opens new perspectives for the interpretation of ^{10}Be ice core records.

We present a new ^{10}Be record from an ice core from Dome C (Antarctica) covering the last millennium. The chronology of this new ice core has been established by matching volcanic events on the WAIS Divide ice core (WDC06A) that is the best dated record in Antarctica over the Holocene (Sigl et al., *JGR*, 2013, Sigl et al., *Nat. Clim. Change*, 2014).

The five minima of solar activity (Oort, Wolf, Spörer, Maunder and Dalton) are detected and characterized by a ^{10}Be concentration increase of ca. 20% above average in agreement with previous studies of ice cores drilled at South Pole and Dome Fuji in Antarctica (Bard et al., *EPSL*, 1997; Horiuchi et al., *Quat. Geochrono.*, 2008) and at NGRIP and Dye3 in Greenland (Berggren et al., *GRL*, 2009). The high resolution, on the order of a year, allows the detection of the 11-year solar cycle.

Sulfate concentration, a proxy for volcanic eruptions, has also been measured in the very same samples, allowing a precise comparison of both ^{10}Be and sulfate profiles. We confirm the systematic relationship between stratospheric eruptions and ^{10}Be concentration increases, first evidenced by observations of the stratospheric volcanic eruptions of Agung in 1963 and Pinatubo in 1991 (Baroni et al., *GCA*, 2011). This relationship is due to an increase in ^{10}Be deposition linked to the role played by the sedimentation of volcanic aerosols.

In the light of these new elements, we will discuss the limitations and possibilities of using a ^{10}Be ice core record to detect SPE and the variations of past solar activity.