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Authigenic $^{10}Be/^{9}Be$ ratio signature of the Brunhes/Matuyama transition in the Montalbano Jonico marine succession

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The cosmogenic nuclide Beryllium-10 (^{10}Be) is produced in the atmosphere through spallation reactions induced by highly energetic galactic primary and secondary cosmic particles interacting with nitrogen and oxygen atoms. Its production rate is mainly related to the Earth magnetic field variability by a non-linear inverse relationship [1]. Hence, the reconstruction of atmospheric ^{10}Be production rates from natural archives such as marine sedimentary sequences or ice cores constitutes a complementary approach, independent from paleomagnetism, to decipher past geomagnetic dipole moment variations. This is particularly important since the Montalbano Jonico section is candidate to host the Global Boundary Stratotype Section and Point (GSSP) of the Middle Pleistocene Subseries [2] but misses an absolute identification of the last geomagnetic field reversal – i.e., the Brunhes/Matuyama (B/M) transition – from paleomagnetic measurements [3]. We present (1) authigenic ^{10}Be cosmogenic nuclide and stable ^{9}Be isotope results through the Marine Isotope Stage (MIS) 20-18 interval, and (2) a new high-resolution benthic/planktonic oxygen isotope record within MIS 19. The new isotope stratigraphy (200 years resolution) has been tuned to an astronomical time-scale and refined using independent tephra markers providing a robust chronological framework for MIS 19. The beryllium results yield an unambiguous signature for the B/M transition with a twofold increase in the authigenic $^{10}Be/^{9}Be$ ratio. This major atmospheric ^{10}Be-production rate enhancement is due to the geomagnetic dipole collapse during the B/M transition as already demonstrated in marine and ice records [4, 5, 6]. Furthermore, the high-resolution of the Montalbano Jonico section together with its detailed chronostratigraphy enables discussion of the structure and timing of the ^{10}Be-production changes, and thus geomagnetic variations, at the B/M boundary with an unmatched accuracy for a marine archive. These new elements provide the only missing constraint that enables the correlation of this section at a global-scale.

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