ORBITAL CYCLE VARIABILITY AS CHRONOLOGICAL TOOL FOR CONSTRAINING THE MIDDLE PLEISTOCENE TRANSITION: NEW INSIGHTS FROM THE NW PACIFIC OCEAN

LA VARIABILITA' DEI CICLI ORBITALI COME STRUMENTO CRONOLOGICO PER DEFINIRE LA MIDDLE PLEISTOCENE TRANSITION: NUOVE EVIDENZE DALL'OCEANO PACIFICO

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The orbital cycles recorded within the time series have been used as chronostratigraphical tool for astronomically tuning the sedimentary sequences of the last 15 Myr (Hilgen et al., 1997). Within the Pleistocene, the Middle Pleistocene Transition (MPT; 1.25-0.6 Myr, Clark et al., 2006) represents a significant time window when the climate-forcing signal changed from the dominant 41-kyr cyclicity of obliquity to the 100-kyr cyclicity of eccentricity. After 950 kyr, the global climate gradually changed, leading to lower global temperatures, increased global ice volume and lower sea-surface temperature and more intense glaciations. Defining the periodical cycles of the MPT can provide a powerful geochronological tool and can better constrain the age models for studies in this peculiar time interval. Furthermore, by studying the response of marine biota to this climate revolution we can provide new insights on the timing and dynamics driving the MPT. We present here a high-resolution study of calcareous nannofossil assemblages and stable oxygen isotope ($\delta^{18}O$) derived from planktonic foraminiferal shells at Ocean Drilling Program (ODP) Site 1209 and International Ocean Discovery Program (IODP) Site U1437, respectively, located in the NW Pacific Ocean. The samples span the entire MPT (from 1.56 to 0.5 Myr). So far, the Milankovitch cycles recorded into marine sediments have been mainly investigated at high-latitudes in Southern (Marino et al., 2009) and North (Ruddiman et al., 1986) Atlantic Ocean. The study of mid-latitudes opens new and challenging perspectives on the MPT, as they are far from the direct influence of polar ice sheets expansion and contraction. Our data on calcareous nannofossil assemblages show that the main recorded periodicity is the precessional one (19-21 kyr), while the 41-kyr typical of the MPT is recorded only by the nannofossil dissolution index and the group of *Reticulofenestra* spp. On the other hand, the $\delta^{18}O$ signal at Site 1437 records the 100-kyr cycle all along the sequence, while the 41-kyr cycle is evident between 500-1000 kyr. A similar dominance of the precessional cyclicity is also documented on speleothems from Borneo (Carolin et al., 2013) and on precipitation proxies from Mindanao and northern Papua New Guinea (Tachikawa et al., 2011). Thus, this signal represents a direct response to subtropical insolation and to intensity's variability of the subtropical gyre circulation characterizing the NW Pacific region, determined primarily by wind-stress curl (e.g., Qiu, 2002) and sea surface height at subtropical latitudes (Imawaki et al., 2001). On the other hand, the lack of a 41-kyr signal can be related to a weak influence of meridional changes in the surface water masses or in the position of the northern subtropical gyre, as also documented by Venti and Billups (2013).

Keywords: Calcareous nannofossils, Middle Pleistocene Transition, orbital cycles, Pacific Ocean

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