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Towards an astrochronological tuned age model for the upper Pliocene–lower Pleistocene Western Foreland Basin of Taiwan

Romain Vaucher^{1,2}, Christian Zeeden³, Amy Hsieh^{2,4}, Stefanie Kaboth-Bahr⁵, Andrew T. Lin⁶, Chorng-Shern Horng⁷, and Shahin E. Dashtgard²

¹Institute of Earth Sciences (ISTE), University of Lausanne, Geopolis, Lausanne, Switzerland (romain.vaucher@unil.ch)

²Applied Research in Ichology and Sedimentology (ARISE) Group, Department of Earth Sciences, Simon Fraser University, Burnaby, Canada

³LIAG – Leibniz Institute for Applied Geophysics, Geozentrum Hannover, Hannover, Germany

⁴Department of Geosciences, National Taiwan University, Taipei, Taiwan

⁵Institute of Geosciences, University of Potsdam, Potsdam-Golm, Germany

⁶Department of Earth Sciences, National Central University, Taiwan

⁷Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan

The stratigraphic records of shallow-marine environments are not commonly regarded as excellent climate archives because of their presumed temporal incompleteness. However, a recent study of lower Pleistocene strata in the Western Foreland Basin, Taiwan, reveals high-resolution records of past climate oscillations preserved within shallow-marine strata. Deriving such narratives is made possible because of the high accommodation and sedimentation rates in the basin, which enhanced the completeness of the stratigraphic record.

Here, we astrochronologically tune the Chinshui Shale and the lower part of the Cholan Formation of the Western Foreland Basin from approximately 3.5 to 2 Ma. These strata are calibrated to global deep-sea stable oxygen isotope ($\delta^{18}\text{O}$) records with established time scales detailing global climate change during the studied time period. The Chinshui Shale is mudstone-dominated and was deposited mostly in offshore settings, while the Cholan Formation comprises mainly heterolithic strata deposited in shallower settings (i.e., offshore transition, nearshore) of the paleo-Taiwan Strait. The data used herein are two borehole gamma-ray profiles through the Chinshui Shale and the Cholan Formation that have a proximal-distal relation to Taiwan. High gamma-ray values reflect clay-rich intervals and correlate to lower values of $\delta^{18}\text{O}$ in the global reference records. Low gamma-ray values point to sand-rich packages and correlate with higher values of $\delta^{18}\text{O}$.

Preliminary results show that the alternating clay-rich to sand-rich deposits during the late Pliocene to early Pleistocene are orbitally paced. The results allow us to i) tune the upper Pliocene–lower Pleistocene Chinshui Shale and lower part of the Cholan Formation, ii) refine the magneto-biostratigraphic framework established for this time interval in the Western Foreland Basin of Taiwan, and iii) lay the groundwork for connecting climatic changes in Taiwan during this time period to the wider frame of global climate change.

