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Stepwise Tarim Sea Retreat (West China): Eustatic VS. Tectonic Control and Links with Asian Aridification

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Climate modeling studies suggest the retreat of the shallow epicontinental sea that extended across Eurasia from the Mediterranean Tethys to the Tarim Basin may have been as important as the Tibetan Plateau uplift in forcing Asian aridification and monsoons due to the redistribution of the land-sea thermal contrast (e.g. Ramstein et al., 1997; Zhang et al., 2012). However, testing of this hypothesis is hindered by poor constraints on the timing and paleogeography of this sea retreat. Our previous litho- and biostratigraphic analyses of marine-continental Paleogene successions of the southwest Tarim Basin along the West Kunlun Shan in western China showed that they formed the easternmost margin of this shallow marine epicontinental sea extending across Eurasia, which was well-connected to the western Tethys (Bosboom et al., 2011). Here we present an improved and precisely dated integrated bio-and magnetostratigraphic framework of these successions, allowing us to better constrain cause and impact of this sea retreat. The marine-continental transition is assigned a late Lutetian-early Bartonian age (~41 Ma; correlation of the last marine sediments to calcareous nannofossil Zone CP14 and correlation of the first continental red beds to the base of magnetochron C18r). Higher in the continental deposits, a major hiatus in our magnetostratigraphic record coincides with the timing of the large global sea level drop associated with the 34 Ma Eocene-Oligocene Transition (e.g. Katz et al., 2008). The long term retreat suggest a tectonic control associated with the Eocene onset of the Indo-Asia collision (e.g. Dupont-Nivet et al., 2010). Shorter term fluctuations linked to global eustatic control indicate the Tarim Basin remained hydrologically connected to the Tethyan Realm until at least the Eocene-Oligocene transition. The stepwise westward sea retreat from ~41 Ma to the Eocene-Oligocene Transition is time-equivalent with reported Asian aridification steps and monsoon intensifications (Abels et al., 2011; Dupont-Nivet et al., 2007; Hoorn et al., 2012; Quan et al., 2011; Xiao et al., 2010) suggesting the sea acted as an important moisture source for the Asian continental interior.

Key words: Asia; Tarim Basin; Climate change, Paleoenvironment, Eocene-Oligocene Transition; Monsoons; Magnetostratigraphy; Biostratigraphy

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