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Placing late Oligocene paleoclimate estimates for southern China into a modern climate framework

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Paleoclimate records of Asian monsoons under times of elevated CO_2 may help to predict future trends under anthropogenic climate change. Today, two monsoon systems influence the climate of southern China: the Indian monsoon (IM) and the East Asian monsoon (EAM). Whereas the IM is characterized by intense summer rainfall driven by the northward migration of the Inter-Tropical Convergence Zone (ITCZ) and intensified by the rain-shadow effect from the Tibetan Plateau (TP), the EAM is driven by uneven heating of the TP, with pressure reversals that advect moisture into the continental interior. Previous research suggests a pre-Miocene establishment of the IM; however, disagreements exist as to the presence of the EAM by this time. In this study, we place late Oligocene paleoclimate estimates from southern China into a modern climate framework to test for signatures of the IM vs. EAM in the Paleogene. We used the following paleoclimate estimates: 1) seasonal (6-month) rainfall from a proxy based on intra-ring $\delta^{13}C$ variations in fossil evergreen wood from Nanning, China; 2) a range of mean annual precipitation (MAP) centered on 20th century values; 3) mean annual temperature (MAT) values from late Oligocene fossil floras in Nanning and Ningming. The estimated summer to winter precipitation ratio (P_s/P_w) from fossil wood is 5.3 (68% confidence interval of 2.5 to 11.1) consistent with a strong summer monsoon. Late Oligocene paleoclimate values were compared with records from 169 weather stations using the Euclidean distance formula and ranked to determine possible modern analogs for paleo-Nanning. Preliminary results suggest that paleo-Nanning had a climate similar to modern southern China, but cannot differentiate between the IM, EAM, or both systems. Future work will involve further sampling of fossil growth rings to better constrain paleo-P_s/P_w ratios and quantifying the sensitivity of paleo-MAT estimates on modern analog placement.