A 13000-year, high-resolution multi-proxy record of climate variability with episodes of enhanced atmospheric dust in Western Asia: Evidence from Neor peat complex in NW Iran

Orash Sharifi¹; A. Pourmand¹, E.A. Canuel² and L.C. Peterson¹

1. Division of Marine Geology and Geophysics, University of Miami, Rosenstiel School of Marine and Atmospheric Science, Miami, FL, USA.
2- Virginia Institute of Marine Science, College of William & Mary, P.O. Box 1346, Gloucester Point, VA, USA.

The regional climate over West Asia, extending between Iran and the Arabian Peninsula to the eastern Mediterranean Sea, is governed by interactions between three major synoptic systems; mid-latitude Westerlies, the Siberian Anticyclone and the Indian Ocean Summer Monsoon. In recent years, a number of paleoclimate studies have drawn potential links between episodes of abrupt climate change during the Holocene, and the rise and fall of human civilizations across the “Fertile Crescent” of West Asia. High-resolution archives of climate variability from this region, however, are scarce, and at times contradicting. For example, while pollen and planktonic data from lakes in Turkey and Iran suggest that dry, continental conditions prevailed during the early-middle Holocene, oxygen isotope records indicate that relatively wet conditions dominated during this interval over West Asia. We present interannual to decadal multi-proxy records of climate variability from a peat complex in NW Iran to reconstruct changes in moisture and atmospheric dust content during the last 13000 years. Radiocarbon dating on 20 samples from a 775-cm peat core show a nearly constant rate of accumulation (1.7 mm yr⁻¹, R²=0.99) since 13356 ± 116 cal yr B.P. Down-core X-ray fluorescence measurements of conservative lithogenic elements (e.g., Al, Zr, Ti) as well as redox-sensitive elements (e.g., Fe, K, Rb, Zn, Cu, and Co) at 2 mm intervals reveal several periods of elevated dust input to this region since the early Holocene. Down-core variations of total organic carbon and total nitrogen co-vary closely and are inversely correlated with conservative lithogenic elements (Al, Si, Ti), indicating a potential link between climate change and accumulation of organic carbon in the Neor peat mire. Major episodes of enhanced dust deposition (13000-12000, 11700-11200, 9200-8800, 7000-6000, 4200-3200, 2800-2200 and 1500-600 cal yr B.P) are in good agreement with other proxy records that document more arid climate in Asia and eastern Mediterranean Sea during these intervals. The relationship between periods of elevated dust input and the response of civilizations in the region, such as the Akkadian and Persian Empires, can also be inferred from variation of conservative lithogenic elements since 4200 cal yr B.P. Intensive dust deposition during 4200-3200 cal yr BP, for example, coincides with similar dry conditions documented by oxygen isotope and geochemical data from Lake Van and Tecer of Turkey, the geochemical data from the Gulf of Oman and oxygen isotope records from Soreq Cave in Israel. Several significant periodicities (e.g. 750, 900, 1550 and 3000 yr) observed from wavelet analysis of refractory elements correspond with the timing of internal climate feedbacks and/or solar variability as potential modulating mechanisms for abrupt climate change in West Asia during the Holocene.