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Characterizing and tracing the dust sources of Lakes Sihailongwan and Huguangyan Maar in NE and SE China over the past 80 kyrs

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A major challenge in the field of quaternary paleoclimate lies in reconstructing and understanding changes in atmospheric circulation and its relation to global and regional climate patterns. In this study, we use mineralogical, chemical and isotopic signatures of fine size particles in lake sediments to trace the sources of dust, as a tool to understand the synoptic patterns in East Asia during the past ∼80 kyrs. The study focuses on sediments from two maar lakes: Sihailongwan and Huguangyan in NE and SE China, respectively. These two are ideal for our study; they are hydrologically confined and do not drain any rivers or streams that introduce additional particle sources other than the volcanic rims and windblown dust. Sediment cores from both lakes were obtained by the German-Chinese drilling project (Mingram et al. 2004). Both cores have been previously dated and their general composition had been characterized (Mingram et al. 2004, Zhu et al. 2013). To characterize the local signature we additionally collected sediments from the rim and the vicinity of the lakes. Because we are interested in windblown particles, we concentrate on fine sediment fraction ($<70\mu$m). The fine particles from Sihailongwan Maar show large variations in the chemical compositions (e.g. ∼0-9% and 2-8% for CaO and Fe_2O_3, respectively) and $^{87}Sr/^{86}Sr$ and εNd values of 0.711-0.715 and -2 to -13, respectively. In the εNd - $^{87}Sr/^{86}Sr$ diagram the samples lie between the values of: -3.5 and 0.71113, and 8.3 and 0.71543, suggesting changes in contributions from nearby northeast China and farther west China deserts, respectively. The fine particles of Huguangyan Maar resemble tropical soils dominated by Fe and Al oxides. A few abrupt variations in iron might reflect changes in rain/monsoon intensity or local changes in source material. Sr and Nd isotope ratios of materials from the lakes' rim and vicinity display large variations ($^{87}Sr/^{86}Sr$ and εNd values of 0.7042-0.7202 and 6.0 to -8.8 for, respectively) and form two distinct mixing lines between the local basalt and two different end members. Isotopic values of core samples fall between the two lines and likely represent shifts in the relative contribution of each source.