Examining the dust emissions from Kati Thanda-Lake Eyre (KT-LE): has dust deflation reshaped the bathymetry of Australia’s largest lake?

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# ABSTRACT

The Lake Eyre Basin, including Kati Thanda-Lake Eyre (KT-LE) is considered to represent the largest dust source in the Southern Hemisphere. Reconstruction of lake levels at KT-LE over the past glacial cycle reveals a complex history of filling and drying (Cohen et al., 2015). Periods of lake drying have been linked to major dust deflation events from the lake floor, resulting in possible reshaping of the bathymetry of KT-LE (Magee et al., 1995). Evidence for dramatic lake-floor lowering is provided by the exposure of lacustrine sediments in cliffs around the lake margins at elevations of up to 12 m above the modern playa floor, and by aeolian deposits around the lake margins. Downwind of Australia’s arid center, dust deposition records record marked variability in dust flux consistent with dramatic changes in source area conditions, and, potentially, net-dust deflation episodes. These lines of evidence do not, however, provide unequivocal proof of net dust deflation (surface lowering), with, for example, steady-state type dust deflation previously argued to be the main process driving long-range dust emissions as well as the formation of proximal aeolian deposits. We therefore propose that multiple lines of evidence are needed to support net dust deflation. This includes i) proximal *and* distal aeolian deposits, coeval with ii) low lake levels, and iii) unconformities in lake sedimentary records and/or preservation of lacustrine units above the modern lake floor. We explore these factors during the past glacial cycle, using updated sedimentary records from KT-LE (Cohen et al., 2022) and show that only the LGM displays convincing evidence for net dust deflation/lake floor lowering (Marx et al., 2022). Importantly, this finding has implications for our understanding of past hydro-climate conditions in central Australia, which is largely based on lake-level records from KT-LK.

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