Dust-cycle response to Arizona's Holocene climate change

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Dust archive was retrieved from Montezuma Well core in Central Arizona, a region associated with high amounts of dust storms damaging public health and safety. The core was dated to last 12 ka [1], a time interval were climate changed from a relatively humid Pleistocene/Holocene transition (12-8 ka) to a drought at the middle Holocene (8-4.2 ka), with the current relatively humid climate established in the late Holocene (<4.2 ka) [2]. Although dust is a major feature in the region, the current and paleo-dust cycles in Arizona were rarely studied, especially under such contrasting climate regimes. The core sediments may assist in identifying past and current potential regional and geomorphic dust sources and identify climate control on dust flux. Elemental concentrations and sedimentological analyses of the core and of potential dust sources were conducted. Major elements reveal that Montezuma Well sediments were deposited from two distinct end-members: local bedrock and Arizona dust sources. Unusual high concentrations of heavy rare-earth elements (HREE) were documented in the core, although no dust source in the entire region presents such concentrations. This result contradicts the pattern of the major elements, which fits well Arizona dust sources. We hypothesise that the high HREE concentrations is related to diatoms' presences in the core, which could have scavenged HREE [3]. Concentrations of Al in Arizona dust sources are richer compared to the local bedrock. Therefore, an Al-based dust flux was calculated, emphasizing dust endmember. Dust flux was high during the wetter phases of the Holocene; during drought intervals dust fluxes are minimal. Field surveys of potential dust sources in Arizona indicate that the sources are mostly supply limited in active fluvial systems. To conclude, dust input is strongly connected to climate shift as an increase in dust occurred during humid intervals, were fluvial systems boosts sediments supply towards dust sources, which later can be sheared and transported.

[1] Davis&Shafer (1992) *P3* , **92**, 107–119.
[2] Hermann et al. (2018) *JQS,* **33**, 421-434.
[3] Akagi et al. (2011) *GCA*, **75**, 4857–4876.