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Using Peatlands as Archives of Dust Deposition: A Preliminary Record from Southern Sweden

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Our understanding of the complex role that mineral dust and its feedbacks play in the Earth's climate system is limited by its highly variable nature in space and time and a lack of data reflecting this variability. Paleorecords of dust provide a means by which we can examine the response of dust over time under very different climatic conditions. These records also supply the data (dust deposition rates, grain size, mineralogy and provenance) necessary to validate models of the dust cycle. Ombrotrophic peat is hydrologically isolated and therefore, like ice, records atmospheric deposition alone. Peatlands have a wide distribution globally, particularly in formerly glaciated regions, and are established environmental archives which provide continuous, high-resolution, datable records of atmospheric deposition and climate change. The use of peat for reconstructing dust deposition has been demonstrated, but as yet, not systematically examined. Their use as an archive of dust deposition must be further tested before they can be used to improve on the relatively poor spatial coverage of current terrestrial dust records (e.g., loess, lake sediments, dune building records).

We present here a first focussed effort to reconstruct past changes in dust deposition through loss on ignition (LOI), bulk density, humification and inorganic geochemistry data using a peat sequence from Store Mosse in southern Sweden. This deposit has been studied previously and reveals a record that extends back some 5000 years. LOI data, in combination with elemental chemistry of the samples, aids in identifying those depths where the observed signal is atmospheric in source only. Humification analyses and bulk density are used as a proxy for surface wetness and allows for the linking of broader climatic changes (precipitation, evaporation, temperature) with fluctuations in dust deposition rates and changes in grain character (grain size, surface roughness). The inorganic geochemistry provides a means to quantify dust deposition as well as make a first attempt at source tracing of the deposited materials; this is important in terms of reconstructing changes in paleo wind regimes.

Past variations in aeolian activity in Scandinavia are relatively unknown. Dune building records from Denmark and elsewhere around Europe show several periods of inland sand invasion and dune building during the Holocene. These are linked to cooler and stormier climates caused by shifts in the North Atlantic Oscillation and/or movement of the polar front. We compare the dust deposition record from Store Mosse with available dune building records and records of storminess from the region in order to make a preliminary assessment of the use of peatlands as paleo records of dust deposition.