



Downwind changes in grain size of aeolian dust; examples from marine and terrestrial archives

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Aeolian dust in the atmosphere may have a cooling effect when small particles in the high atmosphere block incoming solar energy (e.g., Claquin et al., 2003) but it may also act as a 'greenhouse gas' when larger particles in the lower atmosphere trap energy that was reflected from the Earth's surface (e.g., Otto et al., 2007). Therefore, it is of vital importance to have a good understanding of the particle-size distribution of aeolian dust in space and time.

As wind is a very size-selective transport mechanism, the sediments it carries typically have a very-well sorted grain-size distribution, which gradually fines from proximal to distal deposition sites. This fact has been used in numerous paleo-environmental studies to both determine source-to-sink changes in the particle size of aeolian dust (e.g., Weltje and Prins, 2003; Holz et al., 2004; Prins and Vriend, 2007) and to quantify mass-accumulation rates of aeolian dust (e.g., Prins and Weltje 1999; Stuut et al., 2002; Prins et al., 2007; Prins and Vriend, 2007; Stuut et al., 2007; Tjallingii et al., 2008; Prins et al., 2009).

Studies on modern wind-blown particles have demonstrated that particle size of dust not only is a function of lateral but also vertical transport distance (e.g., Torres-Padron et al., 2002; Stuut et al., 2005). Nonetheless, there are still many unresolved questions related to the physical properties of wind-blown particles like e.g., the case of "giant" quartz particles found on Hawaii (Betzer et al., 1988) that can only originate from Asia but have a too large size for the distance they travelled through the atmosphere.

Here, we present examples of dust particle-size distributions from terrestrial (loess) as well as marine (deep-sea sediments) sedimentary archives and their spatial and temporal changes. With this contribution we hope to provide quantitative data for the modelling community in order to get a better grip on the role of wind-blown particles in the climate system.

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