Intermittency in dust deposition rates around the world: the story of hiatuses affecting rates

Noah Fraser

Abstract

Deposition rates for intermittent processes tend to depend on temporal measurement interval. This age interval bias can be used as a tool in evaluating the intermittency of dust deposition. Dust deposition is an intermittent process controlled by dust creation (erosion) and transport (dry winds). During glacial periods it is more likely that cold, dry winds will transport dust regionally and sometimes globally than during the warmer, wetter interglacial periods As deposition rates are estimated in loess cores over longer and longer time spans, it is more likely that large non-depositional or erosional periods may be incorporated into the average rate. Since loess cores are sampled by depth and material profile, the reported analysis rarely have equally space time intervals which causes age interval bias. 50 loess core profiles from Central Asia, New Zealand, North America, and Europe show the presence of power-law distributed hiatuses within the dust deposition record. Regional and global analysis of these 50 loess cores showed that dust deposition rates are equally affected by age interval bias no matter the scale. The rate versus age bias is used to scale away the hiatuses and recalculate average instantaneous dust deposition rates from loess cores. We find that over the last 3 million years, worldwide dust deposition rates varied from 0.004-5 cm/year.