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European contribution to the last glacial dust cycle: how loess sequences were built

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When studying the past variations of the dust climate cycle, an important source of uncertainty are the emissions from sources which were active in glacial times (due to lower sea level, dryer and windier climate, reduced vegetation etc), but are not anymore in present day. A better agreement between results from numerical simulations and the available data for the Last Glacial Maximum has recently been obtained by taking into account the contribution of glaciogenic dust sources (i.e. areas following the continental ice-sheet margins, rich in easily deflatable material produced by glacier-related processes). The extent and relative contribution of the different types of dust sources (desert, glaciogenic) have varied during the past glacial cycles, and their relative impact on deposition also varied from one deposition area to another. Thus, when attempting to interpret dust deposition records in terms of climate change, the corresponding dust sources need to be well identified. Here we address the North Atlantic abrupt climate changes ("Greenland stadial-interstadial cycles"), which have largely impacted Europe especially during marine isotope stage (MIS) 3 and 2, from the perspective of European loess deposits. Using geochemical data analyses on loess sequences located along the 50°N latitude, and numerical dust emision simulations at an appropriately high spatial resolution, we identify the main emission sources relevant for the different deposition areas, and mechanisms contributing to the sedimentation rate variations in the European MIS 3 and 2 loess sequences.