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Impact of millennial climate changes on dust cycle in Europe during MIS3

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In glacial times, large areas were subject to strong dust deflation in Europe, especially in the eolian corridor formed between the British and Fennoscandian ice sheets to the north and the relatively high midlatitude European relief to the south. Consequently, important dust deposits have formed. For the Marine Isotope Stage 3 ($\sim$60 - 25 kyr BP), data from the loess belt located at about 50°N latitude show periods of strong dust accumulation alternating with episodes of reduced sedimentation, favoring soil development. These loess sedimentation variations appear to have been related to the North Atlantic rapid climate changes known as Dansgaard-Oeschger (DO) events.
In two previous modeling studies we have shown that European dust emissions between 48°N-53°N were considerably smaller during the warm North-Atlantic episodes ("Greenland interstadials") associated with DO events, than during the cold phases ("Greenland stadials"). Assuming that variations in emissions would be an important cause for variations in deposition, we interpreted this result as qualitatively consistent with loess data.
As a follow-up of these studies, here we address the full dust cycle (emissions, transport, deposition) for the same area and climate period. We use the "LMDZORINCA" configuration of the IPSL climate model, including the LMDZ model for atmosphere, ORCHIDEE for land surface and vegetation, and INCA for dust. The "zoom" capacity of our models allows for an increased spatial resolution (1.25°lat. x 0.63° lon.) over our area of study compared to the rest of the globe. A "Greenland stadial" and a "Greenland interstadial" simulation are run for the 35kyr BP time slice. The ice-sheet configuration and sea surface temperatures used as boundary conditions are more realistic for the investigated period than in our previous studies, which were conceived as sensitivity experiments with respect to SST anomalies in the North-Atlantic only. We study the mechanisms linking the North Atlantic millennial climate changes and the dust cycle variations in Europe, and attempt a more direct comparison between modeling results and loess data.