

Development of the northern European ice sheets enforced by a systematic change in polar-directed moisture transfer

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The glacial extents of western Eurasian ice sheets is rather well established for the past 450 ka or so, essentially reflecting 3 major glaciations classified in continental Europe as Elsterian (MIS 12), Saalian (MIS 6), and Weichselian (MIS 2-5). This is because the western-southern geographical expansion of each glaciation became progressively less from the oldest to the next youngest glaciation. A very similar temporal pattern is also recorded in the amount of iceberg-rafted debris (IRD) in polar-subpolar marine sediment cores from all along the western European margin. As the glacial IRD input also decreased over time a direct relationship between the volume of iceberg discharge into the ocean and ice-sheet size over the adjacent continent may be inferred. By contrast, along its northern periphery, the North Eurasian shelf edge of the Barents-Kara seas, ice sheet activity there remained rather inactive before Saalian times. This latter finding is contrary to field evidence from southern and eastern Russia where the existence of several major glaciations predate both the Weichselian and the Saalian. We explain this temporal/spatial asymmetry in terrestrial glacial evolution between the Arctic and the regions farther south to have been caused by enhanced oceanic heat available in the mid-latitudes which eventually enabled significant amounts of moisture to be transported via atmospheric circulation into the European high Arctic only as late as the Saalian time.