Modelling the Eurasian Ice Sheet

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Elucidating the system linkages and amplification mechanisms that govern Arctic glaciation and its transition from icehouse to greenhouse states is key to reconciling the long-term stability of contemporary ice sheets and their respective future contributions to SLR. This talk will highlight two avenues, spanning very different timescales, where recent progress in modelling from the Eurasian domain can yield critical insights: i) the impact of glacial erosion on Arctic geosystems, and ii) the mechanisms driving the rapid collapse of marine-based sectors.

The glacial-driven transformations of the Arctic landscape resulting from erosion over >1E5 year timescales have global implications, impacting patterns of ocean circulation and palaeoclimate, as well as having the potential to mobilize substantial volumes of ancient carbon. Empirically constrained modelling outputs presented will show a new time-transgressive reconstruction of the spatiotemporal patterns and rates of glacial erosion of the Barents Shelf across geological timescales, and highlight the importance of robust chronostratigraphic constraints for guiding modelling insights.

How marine-based sectors of the glaciated Arctic rapidly collapsed during the last deglaciation, potentially within 500 years and accounting for up to half of Meltwater Pulse 1A, is still unresolved within modelling and empiricist communities alike. A new perspective on the dynamic breakup and collapse of the last shelf-wide ice sheet in the Eurasian Arctic highlights the importance of accounting for lacustrine boundary conditions in palaeo ice-sheet modelling experiments. Their potential to induce strong dynamical effects and mass-balance feedbacks that impact deglaciation trajectories presents a significant opportunity to further unravel the highly nonlinear and asynchronous behaviour of the Eurasian ice-sheet system.