Glacial source-to-sink systems on the formerly glaciated North Atlantic margin

Benjamin Bellwald[a], Heather Stewart[b], Gareth Carter[b], Cathinka Forsberg[a], Sébastien Castelltort[c], Scott A. Smith[a], Maarten Vanneste[a], and Carl F. Forsberg[a]

[a]Norwegian Geological Institute (NGI), Oslo, Norway, benjamin.bellwald@ngi.no; [b]British Geological Survey (BGS), Edinburgh, UK; [c]Section of Earth and Environmental Sciences, University of Geneva, Geneva, Switzerland

The common understanding of source-to-sink systems is dominated by terrestrial processes with glaciated catchments, supported by a vast body of evidence (Castelltort and Van Den Driessche, 2003; Tofelde et al., 2021). However, there remain significant knowledge gaps regarding completely glaciated source-to-sink systems, for example those dominated by extensive ice-sheets (Sejrup et al., 1996; Jaeger and Koppes, 2016). The aim of this contribution is to summarize glacial source-to-sink systems along the formerly glaciated European margin, with a focus on depositional environments (Bellwald et al., 2023). We integrate new extensive and detailed geological, geophysical and geotechnical evidence collected to support the rapidly growing offshore renewable industry.

We show deposits and processes representative of a complete glacial cycle on emerged continental shelves during sea-level lowstands: i) subsurface weathering before the glacial onset in the periglacial environment, ii) accumulation of glacial till, glacio-tectonic deformation, and erosion of channels in the subglacial environment, iii) glacio-lacustrine deposition and outwash sedimentation in the proglacial environment, and iv) fluvial incision, lacustrine deposition, and sediment reworking in the ice-free environment.

We compare the types of sedimentary environments with processes active in Southern Iceland and Svalbard, which act as modern analogues for the European margin (Evans, 2017). Our study highlights that there are strong links between the Quaternary ice-sheet driven source-to-sink systems and their classical counterparts that cover longer time periods, and that there is much to learn from data integration between glacial geologist and sedimentologists.

References

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