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Holocene to contemporary fluvial sediment budgets in small glacier-fed valley-fjord systems (ESF-NRF SedyMONT - Norway Project, SedyMONT, TOPO-EUROPE)

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A sediment budget study contains analysis and quantification of the processes of sediment production, storage and transfer. For constructing a sediment budget at a small-catchment scale (50-100 km2) it is necessary to integrate the temporal and spatial variations of supply of material from sediment sources, sediment transport and storage and to identify how far the different system components are coupled to each other. The analysis of sedimentary fluxes and budgets as well as their controls at different timescales (Holocene to contemporary) is a basis for the assessment of complex landscape responses to Holocene to recent changes in temperature, precipitation and runoff.

This PhD project is part of the NFR funded Norwegian Individual Project within the ESF SedyMONT (Timescales of sediment dynamics, climate and topographic change in mountain landscapes) TOPO-EUROPE Programme. Two neighbouring glacier-fed valley-fjord systems (Erdalen & Bødalen) with a different topographic inheritance from Pleistocene glaciations are compared. It is of special interest how the different valley morphometries have influenced Holocene to contemporary sediment fluxes and budgets. Different approaches for sediment budget studies are used to interpret and understand the spatial and temporal sediment flux variability during the Holocene with the main focus on i) the quantification and analysis of storage element volumes for estimation of Holocene sedimentation rates and sediment yields, ii) the analysis of the spatial and temporal sediment flux variability, iii) the analysis of the linkages between sediment transfer and storage, iv) the analysis of controlling factors for postglacial, subrecent and contemporary sediment fluxes and v) the construction of Holocene to contemporary sediment budgets for Erdalen and Bødalen.

Both valleys are instrumented with a year-round monitoring system (runoff, suspended and solute transport) for analysing fluvial sediment fluxes. The results enable to link sediment transport and runoff (events) and the spatial and temporal variability of sediment transport processes. In addition, several channel test stretches in the two catchments are defined. Channel surveys include seasonally repeated channel morphometry studies and pepple counts for bedload transport and storage estimations. Sediment traps are deployed to indentify different sediment sources using grain size and SEM analysis. Lake sediment investigations are focused on i) quantifying post-Little Ice Age to contemporary sedimentation rates, ii) the temporal variability of process rates and iii) the detection and analysis of sediment sources. Sediment cores are retrieved in defined lakes within Erdalen and Bødalen. Geophysical methods (Georadar, Geoseismic) are applied for calculation of the total valley infills and for interpretation of the stratigraphic architecture, with the goal to define the controlling factors for the postglacial sediment storage within the two glacially eroded valleys.
This research contributes to the understanding of controls of Holocene to contemporary sedimentary processes and budgets in formerly glaciated steep mountain environments.
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