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Holocene to contemporary source-to-sink fluxes in a valley-fjord system in western Norway: Erdalen and Bødalen site project (SedyMONT - IP Norway)

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The focus of this Norwegian Research Council (NFR) funded Norwegian Individual Project (IP) (http://www.ngu.no/sedymont) within the European Science Foundation (ESF) SedyMONT (http://www.sedymont.eu) (EUROCORES TOPO-EUROPE) Programme (http://www.esf.org/topoeurope) is on Holocene, subrecent and contemporary sedimentary fluxes and budgets in the Erdalen and Bødalen valley systems in Nordfjord, western Norway. The innovative approach of this international research project is the integrated quantitative study of longer-term (Holocene), subrecent and contemporary source-to-sink fluxes and geomorphic process rates in selected representative valley-fjord systems using a novel combination of advanced methods and techniques.

With respect to the main aims and objectives of ESF SedyMONT, the following main aims of the Erdalen and Bødalen site project can be stressed:

- Analyse how the inheritance of the landscape due to the influence of the Last Glacial Maximum (LGM) has affected process rates over time (paraglacial system),
- Document changes in process rates over different timescales by combining quantitative knowledge on Holocene process rates with newly generated data on subrecent and contemporary process rates.

High-resolution monitoring of denudative surface processes in Erdalen and Bødalen, in combination with repeated analyses of surface water chemistry, atmospheric solute inputs and granulometric as well as shape analyses of suspended sediments provide high-resolution data to analyse and quantify present-day sedimentary and solute fluxes as well as sediment sources, denudation rates, and meteorological and topographical / landscape morphometric controls of denudative processes. In addition to standard methods for monitoring bedload transport, innovative techniques like horizontally installed impact sensors and biofilm analysis are applied in combination with advanced flume experiments (for calibration of field data) to analyse channel stability / mobility and to estimate bedload transport rates in both valleys.
The volume and composition of lake sediments are studied using echo-sounder, georadar and different coring techniques. Investigations on volumes and architecture of storage elements (talus cones, valley infills, deltas) using different geophysical methods like georadar and seismic refraction surveys are carried out to improve the quantitative knowledge on Holocene process rates and sediment budgets. Detailled geomorphological mapping is performed and interpreted in combination with digital elevation models and data.

The U-shaped valley morphometry is the main control of Holocene denudative processes in both Erdalen and Bødalen. In Erdalen the more clearly defined stepped longitudinal valley profile results in a larger storage (larger volume of Holocene valley infill) and an altogether lower level of slope-channel coupling as compared to Bødalen. Different periods within the Holocene with varying intensity of denudative processes can be identified. Under the present-day environmental conditions mechanical denudation dominates over chemical denudation. Process rates are altogether moderate to low, and the valley systems are altogether supply-limited.

The process and denudation rates from Erdalen and Bødalen are compared with rates from the other SedyMONT test sites (Alps) (http://www.sedymont.eu), and with denudative process rates in other cold environment catchment systems worldwide through the SEDIBUD Programme (http://www.geomorph.org/wg/wgsb.html).