Geophysical Research Abstracts
Vol. 13, EGU2011-13648, 2011
EGU General Assembly 2011

Snowmelt driven spring discharge: measuring and modeling results for a small catchment in Norway

Jannes Stolte (1), Geoffrie Kramer (2), and Helen French (3)

(1) Bioforsk Soil and Environment, Ås, Norway (jannes.stolte@bioforsk.no), (2) University of Minnesota, Minnesot, USA (kram0268@umn.edu), (3) Norwegian University of Life Sciences, Ås, Norway (helen.french@umb.no)

Climate changes will increase the frequency of extreme precipitation events, floods and snow melt periods. The anticipated climate change effects suggest that the potential for an increase in extreme runoff events will exist disproportionately during periods of soil frost and snow cover. Several factors combine during cold periods to increase the potential for large runoff events, including reduced infiltration capacity due to frozen soils and increased water stored on the landscape in the form of snow. Increasing runoff in spring period also might increase the losses of sediment and nutrients. The capability for accurately modeling catchment-scale hydrological processes during periods of snowpack creation and ablation is currently limited. Research into appropriate snowpack and snowmelt modeling tools is integral to gaining an understanding of the hydrologic processes which occur within a catchment during cold seasons. Combining this snowmelt modeling with catchment scale discharge and soil erosion modeling is done for the 2009 and 2010 melt period for a small catchment in Norway. For this, the Utah Energy Balance model is used for the snowmelt calculations. Initially, the UEB model is calibrated on measured snow dynamics. The LISEM model is used to calculate catchment discharge, and is calibrated on a summer event in 2010. Afterwards, output of the UEB model is used in the LISEM model for surface discharge estimates and results are compared with measured discharge for the 2009 and 2010 melt period. Good results were found for both timing and magnitude of peak discharge, were infiltration capacity is used for calibration purposes. The coupling of the UEB and LISEM models provides valuable insight into the hydrological processes and responses occurring during winter periods. However, more work is needed to improve our understanding and quantification of soil-water interactions during cold periods, which can cause great deviations from hydrologic processes observed during warmer periods.