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Sediment loading processes in a tectonic and forested catchment

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1. Introduction: Exploring fluvial sedimentary processes on catchment scale is useful for studies on the forest management, material cycle and ecosystem of short time scale and topographic evolution of long time scale. The fluvial transportation of sediment is also related to sedimentation, material cycle and ecosystem in coastal regions. A considerable portion of suspended sediment discharging into a coastal lagoon, the Oikamanai Lagoon, Tokachi, Hokkaido, Japan (**Fig. 1**) annually is contributed by the forested (ca. 90% area) Oikamani River catchment with many tectonic faults. It is important to find out the sediment source in such forested catchments. Here, we have tried to find out how sediment load occurs by rainfall and snowmelt runoffs in the tectonic and forested catchment.

2. Methodology: Grain size and mineralogy of catchment soil and stream sediment, survey techniques, and turbidimeters provide the information that allows us to understand fluvial sedimentary processes and the sediment source and its availability. Here, a semi-distributed model, ArcSWAT2012, is applied to time series of discharge and sediment load, which were obtained in 2011 to 2013. In 2013, we set two gauging stations, site R1 and site R3, to get discharge and suspended sediment concentration time series (**Fig. 1**). In ArcSWAT2012, the total basin area (62.47 km^2) was divided into 3 sub-basins, as subbasins into hydrological response unit (HRU) based on soil type, land use and slope classes that allow a high level of spatial detail simulation. In this study we have used the data of discharge, Q (m^3/s), suspended sediment concentration (SSC; C, mg/L) and sediment load, L (kg/s) of April 2011 to November 2013 on non-frozen period of these three years, weather data of 2008 to 2013, and soil data.

3. Results and Discussions: The semi-distributed SWAT model is applied to model discharge and spatially distributed soil erosion/sedimentation processes at daily time step. A reasonable agreement is obtained between the model discharges predictions and measured discharge at the basin outlet (**Fig. 2**). The simulations of sediment load time series indicate that most of the sediment input is coming from sub-basin 2 (**Fig. 3**). Most of the time sediment load at R3 greater than at R1 (**Fig. 4**) indicates that the sediment is deposited between R1 and R3. At present, the interpretation of the quantitative results is not yet satisfactory, because of lack of model parameterization at a local scale in the SWAT model. This results from the fact that the information on hydrological structures of soil and bedrock is not sufficient. Thus, a comparison with the other modelling is essential to understand the sediment loading processes on catchment scale.

Fig. 1. Observation sites in the Oikamanai river basin.

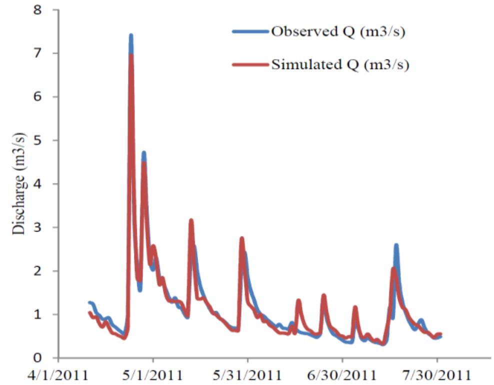

Fig. 2. Discharge Simulation.

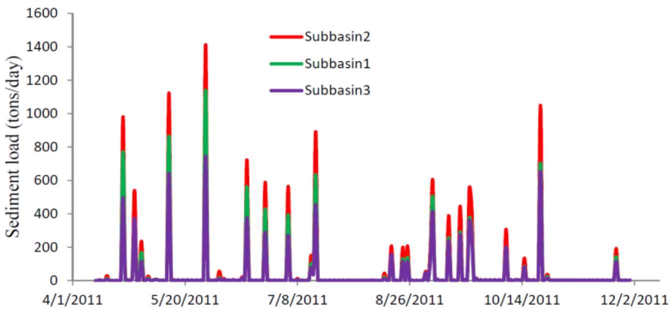

Fig. 3. Sediment load at Subbasins 1, 2 & 3.

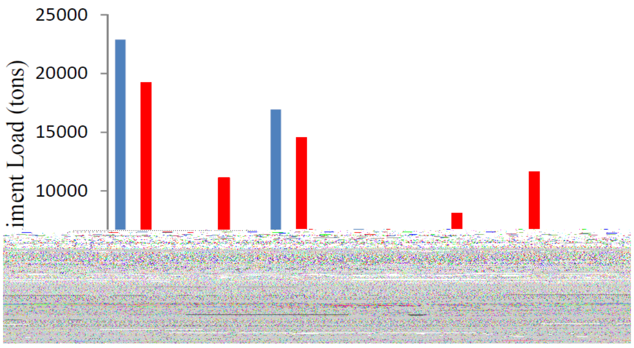

Fig. 4. Sediment load at sites R1 and R3.