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Hypothesis-driven field monitoring by using numerical experiments

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In order to understand biogeochemical responses and these temporal changes under the changing environment with global / regional scale, effectively combining field monitoring and numerical experiment using comprehensive process-based model is needed. Rapid improvement of computational power in the last decade allows us more effective monitoring research based on logical inference deduced by hypothesis-driven numerical experiments. We will report an under-going case study under the framework of ”hypothesis-driven field monitoring”.

We are focusing on temporal change of nitrate concentration in a headwater. We obtained two years discharge and water quality data (T-N, T-P, and NO3-) of two adjacent watersheds that is different in vegetation: one is coniferous forest, and the other is deciduous forest. Two watersheds show clear difference both in discharge and water quality. Especially for nitrate concentration, coniferous forest has larger concentration than that in deciduous forest. Before proceeding to execute more detail filed monitoring to clarify mechanisms of this difference, we tried to find possible hypothesis by using numerical experiments. TANKMODEL and TOPMODEL were applied to simulate discharge, and PnET model was used to simulate biogeochemical processes. By considering uncertainties inherent in each parameter by using Monte-Carlo simulations, we tried to narrow down possible dominant processes and to find important processes that are not considered in models.

Keywords: coniferous forest, deciduous forest, nitrate, numerical modeling