Applications and improvements in hydrological structure of an existent biogeochemical model in forested catchments

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We applied an existent biogeochemical model (PnET-CN) in forested catchments to determine the effects of Asian Monsoon climate conditions on the estimations of streamwater chemistry. The simulations and observations were conducted at two sites; a cold temperate forest in Hokkaido and a humid temperate forest in Shiga prefecture. In the cold temperate forest, the PnET-CN model well simulated the observed NO3- concentrations in streamwater, particularly at high concentrations during snowmelt; however, the model could not simulate small increases in NO3- during the summer. By considering hydrological processes within the catchment and combining the model with a rainfall-runoff model, HYCYMODEL, the seasonality of streamwater NO3- concentrations was better simulated. In the humid temperate forest, the PnET-CN model less simulated the observed NO3- concentrations in streamwater; the simulated seasonal variations were large and showed high concentrations in winter and low concentrations in summer. However, the observed seasonal variations were opposite; small and showed high concentrations in summer and low concentrations in winter. The improved model relatively well simulated these seasonal variabilities. These results suggest that the hydrological properties, some of which are ascribed by the climate properties in Japan, should be correctly included in the biogeochemical modeling.