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Effects of changing precipitation pattern on stream water chemistry at a forested catchment in the Russian Far East

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Acidification of the environment is still an important problem in the Russian Far East. Since the number of studies related to acidification is limited, the monitoring at the Primorskaya, one of the EANET sites, is of interest. The Primorskaya site has a set of continuous monitoring data on air, precipitation, and stream water (SW). The site is located within the watershed of the Komarovka River.

While emissions of major acidifying agents have started decreasing in the Russia Far East and neighboring countries (e.g., China, Korean Peninsula, and Japan), the SW pH has been decreasing continuously alongside increases in concentrations of sulfate and nitrate for the observation period at the Komarovka River. Deposition trends also do not follow the major emission tendencies completely. To understand the mechanism of SW acidification, we tried to estimate the influences of meteorological variability and atmospheric-deposition seasonality on the SW discharge of the Komarovka River. The monitoring data for the period 2005 - 2020 is presented in the study.

Two major climatic seasons can be distinguished at the Komarovka river catchment: the cold season (from October to March) with low precipitation, and the warm season (from April to September) when the major amount of precipitation falls. Although concentrations of major acidifying agents, such as sulfate and nitrate, in precipitation are usually higher in the cold season, the deposition fluxes are higher in the warm season due to the difference in precipitation amounts. While the annual precipitation amount did not show a clear trend, the contribution of precipitation during the warm season was tended to be increased since the early 2010s. Accordingly, the deposition fluxes of sulfate and nitrate were tended to be increasing in the warm season. Similarly, the recent SW fluxes of sulfate and nitrate have become higher in the warm season. It is suggested that the change in precipitation pattern influenced atmospheric deposition and SW fluxes, resulting in SW acidification (Zhigacheva et al. submitted).

Besides the fluxes, SW concentrations in each sampling month showed specific trends, although the SW samples were taken only five times per year according to the hydrological regime: low

water in February and November, snow melting period in April, summer low water in June, and high flow in September. Moving weighted mean concentrations of nitrate show an increasing trend at every hydrological phase except for September. Sulfate and calcium concentrations are more stable. We will discuss the effects of hydrological and biological processes on the seasonality and trends of SW chemistry.