



Hot spots of in-stream phosphorus in a coastal mountain region with marine sedimentary rocks, Akita, Japan

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Understanding of the mechanism of phosphorus (P) export to natural stream is key requirement for predictions of changes of future forest ecosystems and downstream aquatic ecosystems. Surface geology is the one of key factors to regulate P export in natural stream. We compared stream water qualities in headwater catchments consisting of a single surface geology between marine sedimentary rocks and igneous rocks and evaluated the factors resulting in higher concentrations of soluble reactive phosphorus (SRP). Stream water and streambed sediment were sampled at 66 sites of marine sedimentary rock catchments and at 55 sites of adjacent igneous rock catchments at the coastal mountain regions in Akita prefecture, Japan. The sampling was conducted at once in summer 2015. The sampled water was quickly filtered through 0.45 μm filter on each site. The streambed sediments were sampled through 2 mm mesh sieve on site. Anion (Cl^- , NO_2^- , NO_3^- , SO_4^{2-} , and DIC (dissolved inorganic carbon)) and cation (Na^+ , K^+ , Mg^{2+} , Ca^{2+}) in stream water were measured. The dried streambed sediments were shaken with NaCl and CaCl_2 solutions adjusted to a median value of ionic strength of stream water 0.0015, respectively and SRP concentration in the extraction was measured. SRP concentration in stream and sediment-extract water was analyzed by molybdenum blue method. SRP concentration in stream water was significantly higher in the marine sedimentary rock catchments (median 23 $\mu\text{g/L}$) than in the igneous rock catchments (median 8 $\mu\text{g/L}$) ($P < 0.001$). In addition, in-stream SRP concentration tended to be higher in the marine sedimentary rock catchments with younger geological ages. Trilinear diagram showed the stream water with higher SRP concentration was the NaCl water type, and in-stream SRP concentration correlated with Na^+ concentration significantly ($r = 0.408$, $P < 0.01$). SRP concentration in sediment extract was significantly higher by NaCl extraction than by CaCl_2 extraction in both rock types. These results indicated that marine sedimentary rocks at the coastal area in Akita prefecture were significant P source to stream water and the site-specific NaCl type water in coastal region would result in increasing the solubility of P in the solid phase in these catchments.