Nutrient dynamics along the land-to-river-to-ocean continuum and its potential impacts on coastal primary production

*Tomoya Iwata[1]

1. Faculty of Life and Environmental Sciences, University of Yamanashi

Riverine transport of biogeochemical elements from watersheds can be an important flux that supports the downstream and coastal food webs. Watershed properties (e.g., land cover types and watershed geology) often influence the fluvial export of macronutrients and trace elements, thereby affecting the primary production in their receiving coastal ecosystems. For example, the Pacific Rim (known as the Ring of Fire), to which the Japanese Archipelago belongs, is known to be the most highly active region of chemical weathering in the world, reflecting direct and indirect effects of tectonic and volcanic activity on riverine biogeochemical flux. Moreover, recent studies have identified that stream and river ecosystems uptake and/or mineralize the large amount of river-borne material leaking from terrestrial ecosystems, resulting in the decrease of material transport from land to the ocean. Our research group has also identified the importance of in-stream processing of nitrogen and phosphorus in the entire area of a river network from headwater streams to downstream rivers in their export to coastal ecosystems.

I will present our recent empirical studies conducted in three Japanese watersheds (Fuji River, Iwaki River, and Kanogawa River), which show that landuse development, volcanic-rock lithology and in-stream processing are major factors controlling the flux of river-borne nutrients during the base flow period. Our study also shows the functional relationship between fluvial geomorphology (e.g., channel size and river network structure) and the riverine biogeochemical flux. I emphasize that physical modifications of river network structure may affect the delivery of nutrients to coastal areas, resulting in change of the strength of land-ocean linkages. Moreover, river-borne nutrients interact with rainfall runoff events to influence the growth of coastal primary producers. On the basis of the obtained results, I present empirical and theoretical considerations on the effects of riverine solute dynamics on the coastal food webs.

