Understanding the regional submarine groundwater discharge and the associated nutrient inputs - an assessment from the southwest coast of India

Murugan Ramasamy, Suresh Babu, and Reji Srinivas
National Centre for Earth Science Studies, Coastal Processes Group, Thiruvananthapuram, India (muruganr82@gmail.com)

Submarine groundwater discharge (SGD) is a possible source for nutrients and anthropogenic pollutants that flow from the land to the ocean. The coastal zone of southwest (SW) India is capped with Tertiary sandstone-limestone-clay intercalations, Quaternary sediments, and laterites up to 600 m thickness above bedrock, which are considered as productive aquifer belts. The signatures of freshwater discharge to sea are not entirely vivid on the SW coast of India due to different constraints on investigation techniques and coastal dynamics. Hence, an onshore and offshore sampling and monitoring were carried out from Kanyakumari to Mangalore (∼640 km) along the SW coast of India to understand the groundwater discharge from the coastal aquifer system. The combined techniques used make it possible to identify groundwater outflows using satellite thermal infrared images to monitor physico-chemical anomalies in the sea (from 7 October – 5 November 2019 onboard the Sakar Kanya research vessel). Surface-to-bottom CTD (conductivity, temperature, depth) profiling and sampling of radium and nutrients were performed during fieldwork. The conventional water balance method and radium isotopic analyses were used to quantify the SGD. The findings of the water balance method show that the average of all fresh SGD is 790 m$^3$/y/m with a minimum of 72 m$^3$/y/m and a maximum of 2070 m$^3$/y/m exported by SW coast to the sea. Regional precipitation patterns and coastal drainage geometry control local variation in fresh SGD. Nutrient concentrations have apparently followed conservative and non-concentrative mixing between fresh, high nutrient groundwater and saline, low-nutrient seawater at coastal ocean sites. Further investigations are in progress for flux estimation using radium isotopes in offshore and deployment of seepage meters in specific known areas along the shore.