

The source-sink characteristics of organic carbon, phosphorus and trace metals in the mountainous Gaoping river-sea system in southwestern Taiwan

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The study investigates the fluvial and marine burial fluxes of organic carbon, phosphorus and trace metals in the Gaoping (GP) river–Gaoping Submarine Canyon dispersal system. The river fluxes of total suspended matter (TSM), dissolved and particulate organic carbon (DOC & POC), total phosphorus (TP) and total trace metals (TTM) were much higher in the wet season than in the dry season, mainly because of extremely high river discharge and sediment yield associated with the May-yu (monsoon) and typhoons in summer. The river transported around 7.44 Gg C yr⁻¹ DOC, 226 Gg C yr⁻¹ POC (64% particulate carbon) and 3.3 Gg P yr⁻¹ (98.2%P as particulate phosphorus) into the Gaoping coastal sea. The export of dissolved phosphorus was elevated through the estuary as desorption occurred obviously in the estuary. Trace metals were mainly transported by suspended matter (>70%) by the river in the wet season. Although the export was relatively small, most metals were greatly enriched in the river and estuary in the dry season. The POC and TP yields are about one order of magnitude higher than those global averages. If integrated over an area of 3045 km² around the Gaoping Canyon, the mean burial fluxes of total organic carbon (TOC) and TP were 13.0 g C m⁻² yr⁻¹ and 1.39 g P m⁻² yr⁻¹, respectively. Despite difficulty in assessing the accumulation of TTM in the coastal sea, the burial efficiency of terrestrial TOC and TP was estimated to be only 10.9% and 20% of the riverine inputs, respectively. The low accumulation of terrestrial sediment, POC and TP suggests that most sediment, POC and TP that were derived from the Gaoping River may have been recycled and/or moved out of the study area. The active margin appears to act as an efficient conduit for the transfer of terrestrial sediment, POC and TP into the deep ocean.