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The dispersal of Pearl River sediments on the northwest South China Sea Shelf, constrained by mineral chemistry and elemental geochemistry

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About 15-19×10^9 tons of river-derived sediments are delivered to the coasts and Oceans per year and the continental shelf is one important sink of fluvial sediments to the sea. The flux and the dispersal of fluvial sediments to the sea play an important role in controlling the physical and biogeochemical features of the continental shelf. The Pearl River is the largest river to the northwest South China Sea (SCS) Shelf. Annual sediment flux of the Pearl River is about 87 million tons which is about 25 times more than the total flux of other rivers. A study of elemental geochemistry and mineral chemistry was conducted to examine the transport and sink of the Pearl River sediments on the northwest SCS shelf. In order to decrease the effects of grain-size and heavy-mineral sorting, the ratios of immobile elemental pairs were picked out to analyze the shelf sediment provenance. The two elemental ratios of Ti/Nb and Zr/Hf indicated the Pearl River sediments were characterized by a higher proportion of weathered materials from granitic rocks and were mostly distributed on the eastern shelf. Mineral chemistry of tourmaline and amphibole almost supplied a consistent implication for the sources of shelf sediments. Tourmaline and amphibole are mostly of igneous or granitic origin in the Pearl River sediments but are mainly of metamorphic origin in other small rivers in the west. Results of single-mineral provenance study demonstrated that the Pearl River sediments were only dominant on the eastern shelf but contributed little to the western shelf. The western shelf sediments were mainly sourced from other small rivers. This provenance study has two implications about the shelf sedimentation in the northwest SCS: 1) the dispersal area of the Pearl River sediments is not proportionate with its modern sediment flux; 2) surface sediments on the northwest SCS shelf contained abundant recycled deposits.