Chemical weathering and sediment source-to-sink processes within the Changjiang (Yangtze River) and mountainous river basins (Taiwan)

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The Changjiang is the largest river originating from the Himalayan-Tibetan Plateau and bridges the Eurasian continent and west Pacific Ocean. In comparison, the small-sized mountainous rivers in Taiwan have increasingly attracted research attentions in recent years owing to the unique geologic setting and huge sediment fluxes. Both river systems deliver huge amount of terrigenous matter into East Asian marginal seas, which exerts a great control on marine sedimentation and biogeochemical cycle. Nevertheless, the sediment source-to-sink (S2S) processes are significantly different within these two kinds of river systems.

In this contribution, we attempt to compare the weathering intensity and sediment S2S processes within the Changjiang catchment and Taiwan river basins by using various geochemical proxies. Source rock compositions and chemical weathering intensities in the catchments account for the compositional variations of the fluvial sediments. The CIA, bulk Sr-Nd isotopic compositions and age spectrum of zircon provide good constraints on sediment recycling and evolution of weathered upper continental crust under different tectonic settings. Geochemical composition of the sediment into the sea is complicated by hydrodynamic sorting and changing sediment suppliers in relation to variability of monsoon-induced precipitation in the river basin. Overall, the mountainous Taiwan rivers and the mega-river like Changjiang represent two kinds of typical river systems that shape the earth surface and drive material cycle.

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Boron isotopic fractionation during magmatic differentiation: A case study of tourmalines from the Nyalam leucogranite-pegmatite system, South Tibetan Himalaya

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The Miocene Nyalam leucogranite-pegmatite system from South Tibetan Himalaya consists of two mica leucogranite (2mg), tourmaline leucogranite (Tg) and pegmatite dykes which were extracted from two mica leucogranite magma. Tourmaline is an important constituent of the Nyalam leucogranite-pegmatite system. Tourmaline in the two mica leucogranite and tourmaline leucogranite occurs mostly as nodular tourmaline–quartz segregations. Tourmaline in the pegmatite consists of isolated, millimeter sized, euhedral crystals. In situ analyses by electron microprobe and LA-MC-ICP-MS reveal a large variation of chemical and boron isotopic compositions of tourmaline from the Nyalam leucogranite-pegmatite system. Most of these tourmalines have high Fe/(Fe+Mg) and Na/(Na+Ca) ratios, and can be considered as a typical magmatic product.

Tourmalines from the Nyalam two mica leucogranite have the $\delta^{11}B$ values between −15.8 and −12.3‰, whereas tourmalines from the tourmaline leucogranite are between −13.1 and −11.4‰. The tourmalines from one pegmatite dyke have $\delta^{11}B$ values of −13.1 to −11.5‰. But, tourmalines from another pegmatite dyke have a wide range of $\delta^{11}B$ values between −13.5 and −7.7‰. We consider that the source rock control was important for the boron isotope compositions in the granites. The two mica leucogranite was produced by biotite dehydration melting in biotite-rich metapelites, whereas the tourmaline leucogranite was produced by muscovite dehydration melting in muscovite-rich metapelites. The boron isotope variation from granite to pegmatite indicates that boron isotopic fractionation factually occurred during the magmatic differentiation process in Nyalam leucogranite-pegmatite system. The pegmatitic magma with high primary water concentration is more prone to trigonal $B(OH)_3$ complexes and therefore ^{11}B is preferentially partitioned into the extracted pegmatitic magma.

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