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Erosion on Taiwan: Major, trace elements and (Sr, Pb, Zn) isotopic approach

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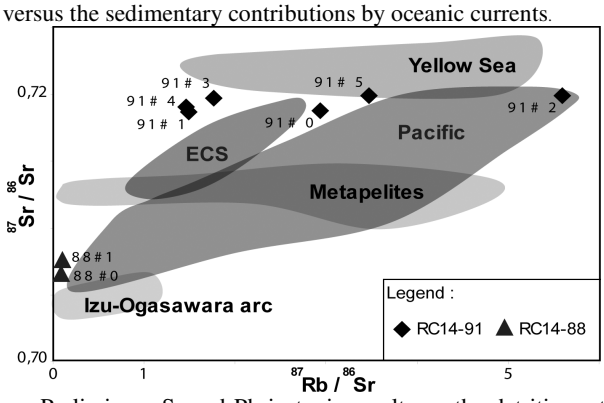
Taiwan, located at the collision boundary between the Philippine Sea Plate and the Asian Continental Plate, is one of the most active orogenic belts in the world. We report on a study of erosion processes in recent times (Pliocene to present) by tracing the sources of sediments deposited around this orogen, using major, trace elements and Pb, Sr, Zn isotopes. Indeed, the very high rate of erosion on Taiwan makes this orogen an important source of sediment added to the sedimentary contributions by the Yangtze and Yellow Rivers as well as the Kuroshio Current. A comparison between the detritic part of the marine sediments and the results obtained on samples from rivers should allow identifying the sedimentary contribution of Taiwan's orogen versus the sedimentary contributions by oceanic currents.



Preliminary Sr and Pb isotopic results on the detritic part from five marine cores offshore Taiwan evidence strong differences between them: one of them (RC14-91), located in Okinawa trough, shows the more radiogenic compositions, which can be assigned to mixture of Taiwan and Yellow Sea sediment contributions (sea figure). In contrast, cores sampled close to Luzon arc (RC14-88) present volcanic isotopic signature. Major and trace element data confirm the above findings.

We report the first Zn isotopic results on sediments around Taiwan measured on carbonate and silicate fractions. Differences are observed between the surface samples, the carbonate δ^{66}Zn ranging from 0.26 to 0.43 %. Data obtained on dated samples suggest an increase of δ^{66}Zn during the Last Glacial Maximum.

The long-term goal of this study aims to characterize the Taiwan sedimentary contributions during the last 3-4 Ma years, and to correlate the sedimentary geochemical data with the models of tectonic uplift.

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Export and sediment deposition on the East China Sea from a small Asian river with high suspended sediment

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Small asian rivers are one of the most important source of suspended particle exported to the ocean [1]. Suspended particle exported from rivers in Taiwan is one of the typical examples. Compounded with frequent earthquake and typhoon induced debris flow, the average annual rivers suspended sediment from Taiwan is 384 Mt/yr over a 30 years period [2] which is almost twice that of the Mississippi River. Despite its large size in exporting suspended particle to the ocean, little is known concerning the fate of these tremendously large amounts of river suspended particle from the asian rivers. The objectives of this study are to characterize and trace the sources of shelf sediments in order to evaluate the impact of these sediment from Taiwan on the East China Sea by analysing shelf surface sediments as well as river suspended sediments organic carbon, grain sizes, Al, Fe, Mn, Cu, Zn, Pb, Cd and carbonate contents.

Terrigenous sediments originated from a northern Taiwan river occupied a very small circular band shaped region with the majority areas characterized by relict and biogenic sediments. With the exception of this circular band region, the majority of shelf sediments were characterized by median to coarse-grained relict sediments with very low concentrations of metals and organic carbon. Sediments underneath the upwell Kuroshio branch current were characterized by coarse-grained calcium carbonate, up to 95%, with little organic carbon and high cadmium concentration. Sediments in the circular band region were characterized by high concentrations of Mn, Fe, Cu, Pb, resembling those in the river suspended sediments. River suspended sediments varied temporally and were characterized by fine-grained particles with high concentrations of metals. Though metals in circular band region sediments were similar to those found in the river suspended particles, little fine-grained sediments were found on shelf. The result demonstrated that most river derived fine-grained particles were not deposited on shelf and were transported further to the slope region.

References

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