Possible Role Of Grain Coatings In The Trace Element Geochemistry Of Kaveri River Sediments, Southern India

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The river Kaveri in Southern India, a small monsoon fed river, flows west to east from the Western Ghat mountains to the Bay of Bengal building extensive floodplains and a huge delta. The latter provide excellent farmland for grain production. The river has several major tributaries such as Hemavati, Kaveri, Kabini, Bhavani and Amravati; the former three flow thru the Archean Dharwar Craton and the latter thru southern granulite terranes. In order to understand the formation of this fertile sediment of the farmland and sustenance of grain production for the past several millennia we have been studying weathering of various lithologies in the catchment, with a strong rainfall gradient (> 5000 to < 1000 mm rainfall), and denudational processes. Here we discuss the geochemical characteristics of sediments deposited by the Hemavati River in its catchment, which consists predominantly of amphibolite-grade granodioritic gneisses, minor intrusive granites and supracrustal belts of amphibolites and high-grade pelitic schists. The studied samples were collected from floodplains and channel for about 100 km downstream with decreasing relief and rainfall.

Sediments are largely very fine sand to fine sand (ϕ = 1-3) with unimodal and bimodal size distributions and are poorly sorted. The bulk mineralogy of the sediments includes quartz, feldspar, biotite, pyroxene, muscovite, kaolinite and heavy minerals. The difference between floodplain and channel in terms of texture and mineralogy is very small except in their SiO_2 content. Major and trace element concentrations of sediments show a large variation, even in samples collected for a distance of ~ 100 km, with a decreasing CIA values downstream. Predominantly low-K_2O granodioritic source with decreasing chemical weathering intensity, in response to rainfall gradient and relief, is indicated in the A-CN-K plot. We observe a good positive correlation among Fe, Ti, Cr and Ni among the samples. Interestingly, the REE patterns are remarkably uniform with LREE enriched, fractionated patterns and with negative Eu anomaly in all the samples. The abundance, however, varies nearly by a factor of three. Although fine-grained samples have higher abundance, it is not correlatable with SiO_2 content to infer a quartz and feldspar dilution. Total REE, LREE and HREE all show a good degree of coherence with Ti content of the samples. This and other compositional parameters seem to suggest that REE chemistry of these alluvial sediments is controlled by Fe-oxide coalings on clastic grains. The overall uniform REE patterns of sediments mimicking the source lithology are likely controlled by metamorphic titanite in the rocks and its weathered products in the sediments derived therefrom.