Geophysical Research Abstracts
Vol. 15, EGU2013-13101, 2013
EGU General Assembly 2013

Testing models of drainage stability in East Asia: a source-to-sink study of the Neogene-recent Amur River and its delta in the North Sakhalin Basin

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Throughout the Neogene the North Sakhalin Basin in the Russian Far East was supplied with clastic sediment by the Amur River, one of the ten largest rivers on Earth, with a catchment area of more than 1.8M km2, and a trunk stream more than 4,500 km long. This river drains a complex collage of tectonic terranes which make up the eastern part of the Central Asian Orogenic Belt, as well as adjacent cratons. We use an extensive dataset from more than 200 sandstone samples, together with seismically-derived sediment budget calculations, to provide a comprehensive source-to-sink analysis for the Amur River and to test models of Neogene drainage capture.

The majority of sand-sized sediment in the Amur River and its delta comes from upstream of the Lesser Khingan Ridge, shown by the composition of the deltaic sediments the lower 1700 km of the river. Stable mineral ratios, U-Pb age spectra and garnet geochemistry show little stratigraphic provenance-specific variation in the Neogene delta, and the grain assemblages indicate that much of the sediment was derived from the upper catchment of the Amur throughout the Neogene. This renders Miocene-Pliocene drainage capture models unlikely. Sediment budget calculations show significant temporal variations in Neogene sediment flux, which we attribute to climatic processes and uplift and recycling of deltaic sediment in the North Sakhalin Basin.