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Towards untangling the changing tectonic and climatic influence on deposition on the Surveyor Fan, Gulf of Alaska: A single grain geochemical and geochronological study

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The Surveyor Fan depositional system, Gulf of Alaska, serves as a recorder of onshore processes in the evolving St. Elias orogen, the highest coastal mountain range on earth. Here, the relative contribution of tectonics and climate to clast production and denudation are controversial and need to be determined in detail. Absence of major onshore sediment traps allows fast transport of orogenic sediment to the ocean, minimising modifications of the sediment during transport. Exhumation and climatically controlled variations in glacier type and extent influence denudation rates and the characteristics of the sediments. We apply diverse tools of single grain geochemical provenance analysis to Neogene sediments from IODP 341 expedition sites U1417 (distal Surveyor Fan), U1418 (proximal Surveyor Fan), U1419 (continental slope) and U1420 (continental shelf). This will allow for deriving information about the relative contributions of tectonics and climate on rates and locations of exhumation and denudation as well as their temporal and spatial interplay in the evolving St. Elias orogen.

Target of the sampling were sands and silts, covering the Miocene to Pleistocene stratigraphy of the four sites. We apply microprobe analysis for main element geochemistry on different heavy minerals; cathodoluminescence imaging, U/Pb dating and REE and trace element measuring on zircons as well as $^{40}Ar/^{39}Ar$ dating of hornblende and mica.

First analyses point towards dominant sediment sources in the area of the Chugach Metamorphic Complex (CMC). U/Pb dating of zircons of samples in different stratigraphic positions from sites U1417 and U1418 shows peaks in age spectra between ca. 50 and 60 Ma, the youngest being 25.3 Ma $\pm$ 0.6 Ma, the oldest 1305.8 $\pm$ 38.1 Ma of age. Additional analyses of REE and trace elements from the same zircons imply granitoid sources, mainly granodiorites and tonalites, for most zircons measured. REE and trace element spectra of the 50 to 60 Ma zircons strongly resemble published REE patterns of zircons from the Sanak-Baranof plutonic belt in the CMC. Microprobe analyses of 450 hornblende grains of the same samples and additional analyses of samples from sites U1419 and U1420 show an overall dominance of magnesiohornblende and varying amounts of actinolite, kaersutite and tschermakite. Similar hornblende compositions have been published for a belt of metamafic rocks in the CMC. Microprobe data of garnets from these samples indicate derivation from granites or gneisses and amphibolites of metamorphic conditions transitional between amphibolite and granulite facies. This also matches with published information about lithologies in the area of the CMC.

The Chugach Metamorphic Complex, via the Bering glacier, seems to be one of the main long time sources of the Surveyor Fan sediments. Shipboard clast and other data indicate input also from the eastward lying Seward glacier and longshore transfer into the Surveyor Fan system. Changing amphibole compositions with time of deposition and zircons with ages older than ca. 50 Ma point to changes in source terranes which will be constrained by future analysis.