Chemical and isotopic constraints on sedimentary input into the Northern Cascades Arc system

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To understand processes occuring during formation of new crust in subduction zone, the composition of the subducted material needs to be known. This is not the case for the Northern Cascades Arc system and here, we focus our work on the incoming sedimentary pile as sampled at ODP Sites 888 (Vancouver Island off-shore) and 1027 (east flank of the Juan de Fuca ridge).

We conducted a geochemical study (major & trace elements and Sr-Nd-Hf-Pb isotopic compositions) of 68 sediments with ages ranging from Pleistocene to Quaternary. Sediments range from Al_2O_3-rich hemipelagic mud to SiO_2-rich sands with the presence of few carbonate-rich intervals (CaO ≈ 28 to 45 wt%). The trace element patterns are nearly parallel to upper continental crust, and concentration changes reflect dilution by carbonate or detrital silica. Fine-grained sediments display negative Zr-Hf anomalies, while sands exhibit excess Zr-Hf that we attribute to the 'zircon effect [1]'. Both sites have variable isotopic compositions with $^{87}Sr/^{86}Sr$ ratios at 0.7048 to 0.7108, ε_{Nd} between -13.4 and +2.6, ε_{Hf} between -23.5 and +8.6 and $^{206}Pb/^{204}Pb$ ranging from 18.9 to 19.7. When compared to the Astorian fan sediments located further South and analyzed by Prytulak *et al*. [2], our data extend the field of subducted sediments to more radiogenic Nd and Hf isotopes. In addition, our sediments define a field displaced to higher $^{206}Pb/^{204}Pb$ ratios relative to the Astorian fan sediments.

In Nd-Hf isotopic space, the Al-rich fine silts and mud lie between the terrestrial and seawater arrays. In contrast, Si-rich sands are shifted below the terrestrial array. The vertical deviation of these sediments from the terrestrial array defines a strong negative correlation with SiO_2/Al_2O_3 and Zr/Al_2O_3 ratios suggesting that zircons present in the coarse sands control the Zr and Hf excess and the position of the Hf-Nd isotopic compositions of the sands below the terrestrial array.

Our study of the sediments soon-to-be subducted under the Cascade volcanic arc demonstrates that variability along the trench is large. This can be used to constrain the nature and amount of recycled sediments in the arc lavas.

[1] Patchett *et al*. (1984) EPSL **69**, 365–378. [2] Prytulak *et al*. (2006) *Chem Geol* **233**, 276–292.

Microbial communities and carbon cycling within deep sea marine sediments off Eastern Antarctica

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Carbohydrates and amino acids in shallow marine sediments have previously been identified as labile organic substrates that are selectively metabolized by bacteria and archaea. However, few studies exist of the microbial cycling of these nutrients in deep marine environments. During the recent Integrated Ocean Drilling Program Expedition 318 off Eastern Antarctica, cores for microbiological and geochemical analysis were collected from two contrasting deep water sites: U1357 and U1359 located in a deep continental shelf basin and continental rise, respectively. Site U1357 has a particularly high sedimentation rate of ~2cm per year, due to high diatom productivity in the surface waters and benthic sediment focusing. In contrast, the sedimentation rate of silts and clays at site U1359 is much lower (~20m/Myr). High resolution studies of the upper 20 m of the two contrasting sties will include biomass estimates via microscopic cell counting, structural and $\delta^{13}C$ analysis of bacterial and archaeal phospholipids, 16s rRNA sequencing, porewater chemistry and characterization of the labile carbon substrates. From these measurements we will characterize the microbial community composition and their role in degrading labile organic carbon in these two different depositional environments.