Magmatism in the southern New Hebrides arc-Coriolis backarc

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The formation and evolution of island arcs and the magmatic processes involved remain a matter of active debate. The southern New Hebrides island arc and the Coriolis Troughs backarc provide the opportunity to address important questions related to magmatism and hydrothermal activity in relatively young island arcs. The Coriolis Troughs consist of three extensional basins (Vate, Erromango and Futuna from north to south) each between 10-30 km wide and about 75 km long that opened during the past 6 Ma as a result of the clockwise rotation of the arc. The three basins are bordered by shallow but magmatically active and complex ridges.

Here, we present new glass and whole rock major and trace element data from the Epi caldera in the arc front and three localities in the Coriolis Troughs from expedition RV Sonne SO-229. Major and volatile elements of fresh volcanic glasses were measured by electron microprobe and trace elements will be measured by solution ICP-MS. The northernmost samples from Epi caldera are exclusively evolved with SiO_2 contents > 60 wt.% and MgO contents < 2 wt.%. Mafic streaks in pumice from Epi caldera suggests that mafic melts were injected into rhyolitic magma chambers triggering eruptions. Samples from Nifonea ridge, situated in Vate Trough, range from tholeiitic to alkaline basalts to trachybasalts. ROV sampling at Nifonea ridge also revealed active hydrothermal activity and the largest compositional range is observed at the active hydrothermal vent site in a large caldera. Contrastingly, samples from the northernmost Futuna Trough display a bimodal distribution with one group of samples situated at 60 wt.% and several basaltic samples at around 50 wt.% SiO_2. The major elements and on-board petrography reveal extensive fractionation of olivine, clinopyroxene and plagioclase. Fractionation corrected $(Na_2O)_8$ contents of the basaltic samples from Nifonea and Futuna indicate that the degrees of partial melting are slightly lower at Futuna compared to Nifonea, which is in agreement with a slightly deeper initiation of melting underneath Nifonea compared to Futuna. We will use the trace elements to quantify the dynamics of melting to better constrain the melting and mantle source processes underneath this rifted island arc.