SF	Collaborative Research: Volatiles (H_2O and CO_2) in Mariana and Izu Arc Magmas	
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A fundamental goal of the MARGINS Subduction Factory Initiative is to understand the cycling of volatile compounds through the subduction zone. Water in particular affects not only the physics of subduction and convection, but also is a dominant driving force for mantle melting beneath arc volcanoes and material recycling from the downgoing plate. This project combines direct measurements of magmatic water contents, as recorded in olivine-hosted melt inclusions from the Marianas island arc, with high pressure, water-bearing experiments on Mariana composition. Our first major results focus on quantifying the effect of water on mantle melting beneath the Mariana arc and back-arc.

- Mariana Trough lavas record a well-known linear relationship between the amount of water and the extent of melting in the mantle. We show here for the first time such a relationship for an arc.
- We have extended these observations to published data worldwide to reveal the contributions of potential temperature and decompression to the mantle melting process at subduction zones.

Figures and Captions

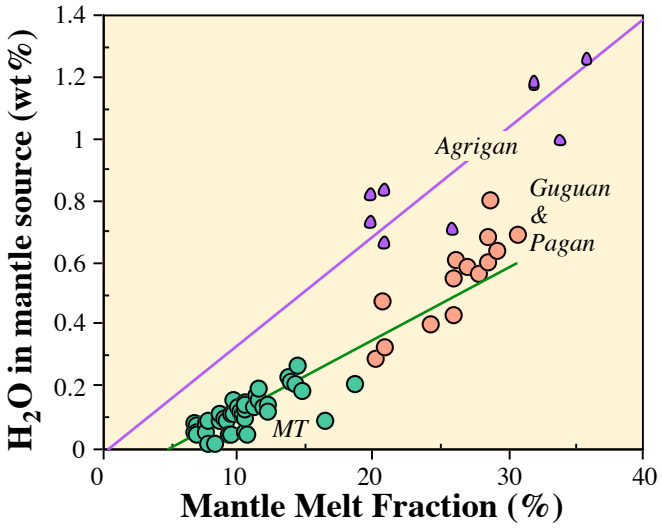

Figure 1: Relationship between water content and extent of mantle melting beneath Mariana Arc (Agrigan, Pagan & Guguan Islands) and Mariana back-arc Trough (MT). Melt fraction calculated from Ti concentration in lavas (MT) and melt inclusions (arc). MT data from Stolper & Newman (1994), Newman *et al*. (2000) and Gribble *et al*. (1996); Mariana arc data are from this study. Note arc basalts are derived by greater extents of melting of a wetter mantle than back-arc lavas. Guguan & Pagan magmas plot on extension of back-arc array, suggesting upwelling of mantle of similar potential temperature beneath the arc and back-arc. Agrigan volcano, on the other hand, defines a steeper slope with little to no intercept, indicating that it taps a cooler mantle with little decompression melting.

Publications and Presentations

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Kelley, K.A., Plank, T., Newman, S., Stolper, E., Grove, T.L., Parman, S., and Hauri, E. Mantle melting as a function of water content beneath the Mariana arc and other arc volcanoes. In prep. For EPSL

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