Marianas Arc - Backarc Magma Generation and Interaction

Award: 03-05292 (July 2003)

J. Conder[1,2]

[1]Washington University; [2]Southern Illinois University

The Mariana subduction system exhibits marked changes along strike, including robustness and morphology of the arc and back arc spreading center. Near Pagan, arc output is fairly robust and the spreading center appears much like a typical slow-spreading center. Towards Guam, the arc-spreading center spacing decreases and the character of both arc and spreading center change dramatically. The arc becomes less pronounced and the spreading center petrology becomes arc-influenced, possibly to the point of pirating much of the magma generated at the arc (Becker et al., 2001*). In this study (Conder, 2007), I use geodynamic models to explore the arc-backarc magma production system. A system more like Pagan, with faster ridge spreading and a larger amount of ridge migration, is shown in the first panel of the figure, and a system patterned after Guam, with slower spreading and a smaller spacing between arc and backarc spreading center is shown in the second panel. Of importance, the predicted eruption curve for Pagan shows two clear peaks at the spreading center and arc, but the peaks are not completely distinct from each other. Although there are distinct loci of ridge and arc melt production, it is likely that the two melt regimes are linked at depth. For the Guam case, the distinction is more ambiguous, suggesting a higher degree of interaction between the arc and ridge melts. Because the ridge is migrating, Guam will likely develop to a system much like Pagan with progressively more discrete, but still communicative regions of melt production.

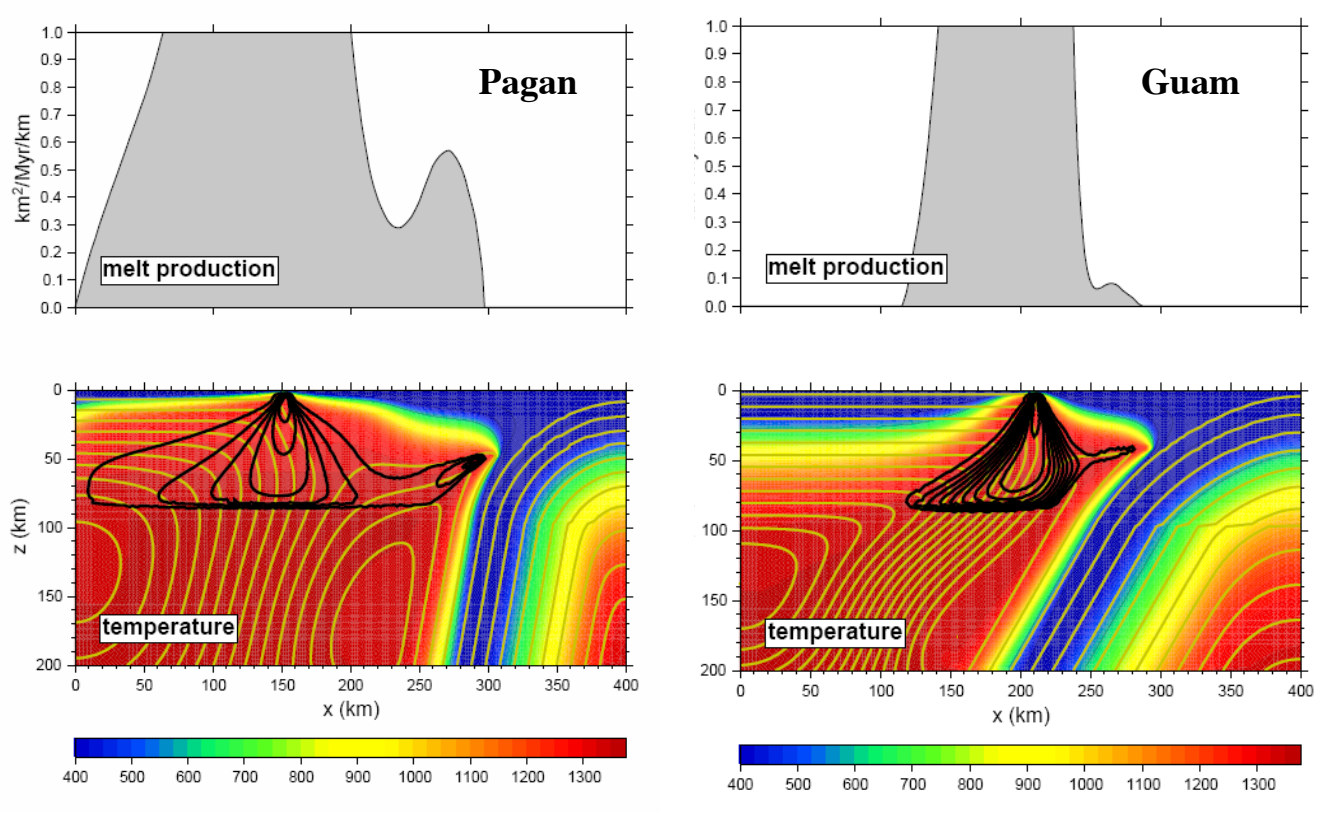

Figure: Colors denote mantle potential temperatures, yellow lines denote instantaneous streamlines, and thick, black contours show melt production. The top gray curves show the predicted eruption curve if all the generated melt migrated vertically to the surface.

Conder, J. A., Thermal Structure of the Mariana Subduction Zone, MARGINS workshop on Mariana subduction factory, Honolulu, HI, 2007

*References listed in appendix A.