Time Dependent Model of Magma Intrusion in and around Miyake and Kozu Islands, Central Japan in June-August, 2000

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A time-dependent model of magma intrusion is presented for the Miyake-Kozu Island area in central Japan based on global positioning system (GPS) measurements at 28 sites recorded between June 27 and August 27, 2000. A model derived from a precise hypocenter distribution map indicates the presence of three dikes between Miyake and Kozu Islands. Other dike intrusion models, including a dike with aseismic creep and a dike associated with a deep deflation source are also discussed. The optimal parameters for each model are estimated using a genetic algorithm (GA) approach. Using Akaike's information criteria (AIC), the three-dike model is shown to provide the best solution for the observed deformation. Volume changes in spherical inflation and deflation sources, as well as three dikes, are calculated for seven discretized periods after GA optimization of the dike geometry. The optimization suggests a concentration of dike expansion near Miyake Island in the period from June 27 to July 1 associated with large deflation at a depth of about 7 km below Miyake volcano, indicating magma supply from depth below Miyake Island. In the period from July 9 to August 10, a huge dike intrusion near Kozu Island is inferred, accompanied by expansion of the lower parts of a central dike, suggesting magma supply from depth in the region between Miyake and Kozu Islands.