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Failed eruption of Iwate volcano in 1998: temporal changes of seismicity and magma ascent

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Significant volcanic activity including earthquake swarms, M6.1 earthquake, and volcano inflation occurred at Iwate volcano from the beginning of 1998. Fumarolic area appeared was newly formed on the ridge in the western part of the volcano in the spring of 1999, blighting wild plants around it. However, magmatic eruptions did not occur at all. We reconcile the spatio-temporal distributions of volcanic pressure sources determined by previously reported studies (Miura et al., 2000; Sato and Hamaguchi, 2006) and measure the magma supply rates from their results. We further calculate the occurrence rates of the volcanic earthquakes. Comparison of these results shows that the magma supply rates are almost constant or even decrease with time while the earthquake occurrence rate increases with time. We interpret this contrast observed in their temporal changes as a result of stress accumulation in the volcanic edifice caused by constant magma supply and no effusion of magma to the surface. We further show that the temporal changes of the strain data slightly accelerate with time. These temporal changes are explained better by magma ascent with a constant velocity. This suggests that the magma seems not to get new additional buoyancy caused from gas bubble growth, which supports the observed results that the magma stayed at 2 km depth and horizontally migrated. These findings in the relation between magma supply rate and seismicity and the magma ascent process are clues to understand the reasons why the magmatic eruption did not occur at Iwate volcano in 1998.

Keywords: Iwate volcano, magma ascent, failed eruption