

# Timescales of magma transfer, degassing and crustal assimilation at Merapi volcano, Indonesia

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The October-November 2010 eruption was the first VEI 4 eruption of Merapi since 1872. It was the first time that a larger than ‘normal’ eruption at Merapi was well-monitored, with seismic, ground deformation and gas emission data all available to enhance the interpretation of petrological and geochemical data. Here, we present short-lived U-series isotope data from various lithologies erupted from Merapi in 2010 to place constraints on the timescales of pre-eruptive magma ascent and degassing in an attempt to link the complex subsurface processes to the volcano monitoring signals recorded in the build-up of the eruption. The results are complemented by preliminary U-series isotope data from calc-silicate xenoliths that are used to assess the timing of crustal assimilation at Merapi.

Basaltic andesite scoriae from the initial explosions on 26 October 2010 show the lowest  $(^{210}\text{Pb}/^{226}\text{Ra})_0$ , i.e. they represent the magma most degassed of  $^{222}\text{Rn}$ . Near-equilibrium  $(^{210}\text{Pb}/^{226}\text{Ra})_0$  in the basaltic andesite lava dome, which extruded between 29 October and the peak of the eruption on 5 November, and its conspicuous light grey basaltic andesite inclusions may suggest no or only recent  $^{222}\text{Rn}$  degassing at timescales  $< 2$  years. The lava dome samples are characterised by  $(^{210}\text{Po}/^{210}\text{Pb})_0 \ll 1$ , indicating that Po is almost entirely degassed from the dome lava. By contrast, the inclusions have higher  $(^{210}\text{Po})_0$  and  $(^{210}\text{Po}/^{210}\text{Pb})_0$  than the dome lava.  $^{210}\text{Po}$ - $^{210}\text{Pb}$  disequilibrium in these inclusions indicates Po degassing on a timescale that correlates with the beginning of seismic unrest in early September 2010. We associate this unrest with the intrusion of magma at shallow depth within the volcanic edifice, forming a degassed and crystalline plug. This plug was later disrupted by the magma feeding the initial explosions on 26 October and the subsequent, rapidly extruding lava dome.