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Sulfur scavenging potential of fractured permeable rhyolitic domes

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Hot volcanic gases can be removed from the atmosphere (i.e. gas scavenging), due to adsorption and subsequent crystal growth on glassy ash particles. This has been shown to be a feasible mechanism in hot volcanic plumes and in conduits above the fragmentation front. However, the possibility of scavenging occurring during outgassing through permeable volcanic domes has never received attention, despite the conditions being favorable for gas scavenging. Namely, volcanic domes can reside at high temperatures gas residence times can be high, providing ample opportunity for gas-glass interactions. We have conducted experiments to evaluate the potential for rhyolitic glass to scavenge SO_2 at high temperatures and then we have applied our results to an in-dome scenario (to the Chaitén volcano 2008 rhyolitic dome). We evaluated the effect of grain size distribution of glassy ash trapped in dome fractures, dome residence temperature, exposure time and water vapour content, on SO_2 scavenging. We hypothesize that, the ash-filled fracture networks through which hot volcanic gases pass, are indeed capable of scavenging considerable amounts of SO_2, HCl, and other gases. Our findings provide a mechanism for understanding SO_2 anomalies measured in plume gases during rhyolitic dome-forming eruptions.