

Comparison of volatile releases by volcanic and hydrothermal activities

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Volcanic gases and hydrothermal fluids are the two major output of volatiles in magmas emplaced at shallow crust but have quite contrasting composition ranging from very acid S-rich ($Cl/S < 1$) volcanic gases to neutral Cl-rich hydrothermal fluids of $Cl/S \gg 10$. Magmas have intermediate but variable Cl/S ratio ranging from about one of basalt to >10 of rhyolite. Conditions to cause these contrasting volatile release and their budget are not yet well constrained. Source of volcanic gases are actively degassing magma. Flux and composition of volcanic gases are well constrained by recently advanced monitoring techniques. Fluxes of hydrothermal fluids are estimated based on volatile fluxes from hot and cold springs but are not yet well constrained because of their variable composition and diffuse emission. The neutral Cl-rich hydrothermal fluids could be formed either by neutralization of acid volcanic fluids with decreasing temperature, and/or direct release of neutral Cl fluids from a magma at high pressure. The former mechanism will cause deposition of a large amount of S-containing minerals as the alteration products, whereas the latter mechanism requires a S-poor magma, such as rhyolite, to release the Cl-rich fluids. We will discuss the genetic relation of the volcanic and hydrothermal fluids to constrain budget of volatiles within magmatic-hydrothermal system and during magmatic evolution.