# Degassing of intrusive bodies on early Earth

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The buildup, density and composition of early Earth atmosphere are still only sparsely established. While some work has already been done on modeling the outgassing rates of extrusive volcanism, the influence of intrusive degassing to early Earth´s atmosphere is typically not considered. However, it is suggested that intrusive degassing rates are significantly higher compared to extrusive rates. Thus, they should play an important role regarding the amount and composition of the volatiles released to the atmosphere. Especially as pressure (and therefore the depth of the intrusion) considerably influences the gas speciation. Hence, we focus on the contribution of intrusive degassing of a magma body emplaced in the lithosphere at distinct depths.

To degas such an intrusion either decompression or fractional crystallization is required. The latter results in the concentration of the volatiles in residual melt and therefore in an oversaturation. This initiates the formation of a magmatic gas phase as well as a subsequent degassing when a critical volume is reached.

In our model, we investigate the change in $CO_2$ and $H_2O$ solubility and therefore the possible degassing rates at different pressure, temperature and magma composition, particularly with a varying water content. Since it is assumed that in the Hadean and Archean the mantle was too hot for plate tectonics to take place as it does today, we start our model with parameters for a stagnant lid Earth and compare the resulting data to mobile lid conditions.