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^{222}Rn in magmatic gases brings new constraints on degassing dynamics under an active volcano

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Spatiotemporal scales of magma degassing at active volcanoes are still poorly constrained and require further investigation to establish realistic plumbing system models for the interpretation of gas data recorded at surface. Among the few methods that can give insights into the dynamic nature of degassing, radioactive disequilibrium in the gas phase between the last three daughters of ^{238}U, namely ^{210}Pb-^{210}Bi-^{210}Po, has been studied for more than 40 years. However, little attention has been paid to the precursor of ^{210}Pb in the decay chain, namely the noble gas ^{222}Rn. Due to its presumed high volatility, ^{222}Rn is likely to be enriched in the magmatic gas phase and can provide complementary information to ^{210}Pb-^{210}Bi-^{210}Po systematics, as already suggested by a theoretical study. In this contribution, we will present a physical model accounting for very high radon volatility in basalt and new measurements of ^{222}Rn in the gas plume of Mt. Etna volcano (Sicily). We will also show that joint observation of ^{222}Rn and its daughters brings new constraints on the degassing reservoir, especially with respect to the residence time and volume of magma in the chamber.