

EGU2020-19414

<https://doi.org/10.5194/egusphere-egu2020-19414>

EGU General Assembly 2020

© Author(s) 2020. This work is distributed under the Creative Commons Attribution 4.0 License.



Global rates of continental volcanism on Earth

Paolo Papale¹, Warner Marzocchi², and Deepak Garg¹

¹Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Pisa, Pisa, Italy (papale@pi.ingv.it)

²Università di Napoli Federico II, Napoli, Italy

Knowledge of the rates of Earth volcanism and their variability is critical in many fields involving global assessments, such as plate tectonics and associated rates of crustal formation and consumption, large-scale volcanic hazards, climate change, etc. Global rates also provide the base rate to which regional or individual volcano data can be compared, in order to quantify differences and similarities providing guidance in the identification of volcanoes with overall analogue behaviors. While global volcanic eruption databases, such as the Smithsonian Global Volcanism Project database or the Large Magnitude Explosive Volcanic Eruptions database at BGS, provide the required basic knowledge, substantial deterioration of the geologic information with age has been a serious obstacle to a comprehensive picture. Recent understanding that global eruption inter-event times are exponentially distributed, that being the essential character of Poisson distributed events, is leading to a general model for the global eruption behavior of the Earth. Exponential distributions are entirely characterized by one single rate parameter. Comparing the rate parameters for different VEI classes of eruptions, as well as analyzing the distribution of individual eruption volumes within and across different VEI classes, reveals that relative frequencies for the explosive eruptions with VEI higher than 2 distribute as a power law. This knowledge is employed a) to quantify the global volcanic hazard, in particular in relation to the occurrence of globally impacting eruptions, comparing with known hazards from many well-known adverse events; and b) within a Monte Carlo simulation of the eruptive history of the Earth, allowing us to quantify the distribution of volcanic eruption rates, both in number and volume, and globally or for each given VEI class or group of VEI classes, over different observational time windows from 1 to 100,000 years.