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Two global databases for dome-forming eruptions (DomeHaz and FlowDat): contributions to hazard assessments and potential for future use

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Dome-forming eruptions can extend for significant periods of time and can be dangerous; nearly all dome-forming eruptions have been associated with some level of explosive activity. Hazards related to these eruptions are numerous and often include mass flows: dome-collapse and column-collapse pyroclastic flows, ash-cloud surges, lahars, and debris avalanches.

Two global databases have been developed and are currently hosted on VHub.org: DomeHaz (https://vhub.org/groups/domedatabase/) contains information about 367 dome-forming episodes 1000 AD to present, including duration of dome growth, duration of pauses in extrusion, extrusion rates, and the timing and magnitude of associated explosions. FlowDat (https://vhub.org/groups/massflowdatabase) includes 257 pyroclastic flows and surges, and records run-out length, volume, cross-sectional and planimetric area, as well as other mobility information.

Analysis using the DomeHaz database has provided useful information regarding the relationship between volcanic composition and cyclicity of dome growth, the identification of patterns in eruptive frequency between different volcanoes, and the timing of large explosions in relation to dome growth. With FlowDat we investigate the relative merits and suitability of contrasting mobility metrics for different types of volcanic mass flows, show that these metrics can be used (with varying success) to predict the run-out of a PDC of given volume, explore the effect of topography, and examine the problem of compiling and generalizing mobility data from worldwide databases using a hierarchical Bayes model for weighting mobility metrics for use as model inputs. This is especially useful for calibrating models at data-sparse volcanoes.

Continuation of this work will include the compilation of a relational database, which can be used to assess probabilities of future eruption style for any dome-building volcano and the associated products and which will be continuously maintained and updated as part of the GVM project. A key component in creating a robust database is high-quality and complete data sets provided by the community. This paper serves as a call for participation from individuals, research groups and monitoring bodies for generating a global database on the hazards associated with lava dome eruption for community use.