Exploring the interface of probabilistic hazard analysis and risk assessment using BET_VH, Okataina Volcanic Centre, New Zealand

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Volcanoes are characterized by complex long-term hazardscapes. Uncertainties in future eruption style and sequence make it difficult to define the magnitude, time scale and intensity at which different dangerous phenomena will manifest. Long-term hazard analysis tool BET_VH (*Bayesian Event Tree for Volcanic Hazards*) introduces a way to account for this inherent uncertainty in hazard modeling by integrating such variables together into one inclusive event-tree framework, allowing for a probabilistic evaluation of many different eruption types, vent locations, and hazard outcome scenarios and their associated uncertainties.

BET_VH's capacity to integrate multiple sources of information, expand upon existing hazard data, and generate detailed spatial information about the likelihood of a wide spectrum of hazard scenarios could play an important role in constructing effective and relevant long-term evaluations of risk. The custom and versatile nature of the BET_VH analyses supports hazard mapping tailored to both large- and small-scale long-term risk assessment interests. This study uses BET_VH to analyze Okataina Volcanic Centre tephra fall hazard at accumulation thresholds considered damaging to agriculture, a primary and sustaining industry of New Zealand. We investigate how the robust probabilistic hazard data generated can contribute to and enhance existing risk assessments by providing quantitative values for use in land-use planning, agricultural management practices and other risk reduction strategies in the region.

The study provides insight into the advantages of using a streamlined probabilistic framework for long-term hazards analysis in complex volcanic environments, and discusses the strengths and limitations of integrating quantitative hazard data into risk assessment and management.