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Creating an urban sheltering index: modelling the effects of urban morphology on the decrease in pressure of a pyroclastic flow.

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Previous volcanic eruptions have had devastating effects on resident populations that happened to be in the path of pyroclastic flows (Baxter, Sigurdsson) In the current environment, many volcanoes have levels of urbanisation well beyond any previous pyroclastic flow disasters occurring during volcanic eruptions (Vesuvius AD79, 1631, 1906, 1944, Mont Pelèe, Monserrat et al.). The effects of such pyroclastic flows on urbanised areas are invariably devastating, with high numbers of fatalities and building failure. However, the literature indicates that building damage has not been uniform in flow affected areas (Baxter). This suggests firstly a variability in vulnerability of each individual building (discussed elsewhere) as well as possible morphological reasons for such variations. However, little systematic research has been done to analyse how urban morphology has affected the impact of the flows. As a result, observational data alone has done little to enable a predictive theory of how new forms of urbanisation will react under the continuing risk of a repeat occurrence of 79 AD and 1631 flow dynamics. This research takes a systematic approach to the modelling of pyroclastic flows, using commercially available fluid dynamics software (PHOENICS) to simulate a pyroclastic flow and its impact on various building morphologies in a systematic manner in order to understand various topographical influences on the impact of a flow on buildings within an urban complex. Such data could then be used to analyse a wider area in order to create an index to synthesize the sheltering ability of an urban area against the full impact of a pyroclastic flow.