November 14 Status Report

- The data from Eliza Calder provides a reasonably complete picture of dome collapse events over several years. The smallest reported flows travelled about 0.6 km, but the actual runout distance of these flows is not certain, nor is their actual size. The suggestion is to consider only flows that travelled more than, say, 1 km, or perhaps greater than 2 km. Wolpert estimates that such a pruning of the data discards about two-thirds of the information present in the data (if there is no correlation in the data). A closer look is required. In particular, straightforward data analysis techniques (filtering, power spectrum) should be performed to better understand what is present. We still need to translate the discussions into hard estimates of errors in the data, and this will require further discussions with Eliza.

- Inputs include the initial volume of a flow (Wolpert model) and the location of that mass (non-stationary), internal and bed friction angles (asssumed distributions), and, for the specific site, the topography $DEM(\mathbf{x})$. The simulation provides the flow depth $h(\mathbf{x}, t)$ and velocity $\mathbf{v}(\mathbf{x}, t)$ at all grid points, for $0 \leq t \leq T$.

- What to monitor? We would like functionals of the solution - $\max_t h(\cdot, t)$ and $\max_t |v(\cdot, t)|$ - at as many points as possible (all?), and at least at some dozens of designated places of particular interest.

- Of course the emulator needs to be constructed for each volcanc site. The total elevation $DEM(\mathbf{x}) + h(\mathbf{x}, t)$ is likely to be a smoother function to emulate. We need to face the question of how to set the zero. Because the flow depth will be but a small fraction of the total $DEM + h$, accuracy must be carefully checked. It is reasonable to define sectors of the geography, and to consider a tree Gaussian process model (with a linear piece). Other suggestions include emulating $\log(h)$ with a cutoff. Principal component analysis should reduce the actual work to understanding $O(\text{dozen})$ components over space and time.

How to proceed?