Pecube model design guidelines

In order to design a robust Pecube model geometry, it is helpful to compile all of the available data that might constrain the model. Below is a list of items to consider. Incorporating as many of these items as possible will ensure your model honors available geologic constraints.

Topography

- Regional DEM: DEM at a resolution of 250m or higher. The spatial extent of the region you intend to model should obviously include all of your data with some 'padding' around the edges of the dataset. This 'padding' is additional area included in the model domain. As a guideline, you should add length/width to the model extent that is at least 1 and preferably 3 times the topographic wavelength of regional topography.
- Topographic evolution: Are there constraints on the topographic evolution of the region? Consider items such as the timing of any glaciation, fault activity, uplifted reference surfaces, etc. within the model domain.

Themochronometer data

- The main constraint on a Pecube model is the thermochronometer data available in the model region. For this, more data is better, so seek out any/all existing data within the region and include it in the data file.

Rock thermophysical properties

- The thermal properties in Pecube, by default, are spatially invariant. However, it is useful to compile available data on the thermal properties of the rocks in the region. These include volumetric heat production (A; W m^{-3}), thermal conductivity (k; W m^{-1} K^{-1}), thermal diffusivity (; m^2 s^{-1}), heat capacity (c_p; J kg^{-1} K^{-1}) and density (; kg m^{-3}). In Pecube, these must be converted to thermal diffusivity (in km^2 Ma^{-1}) and heat production (in °C Ma^{-1}). The conversions are given below. Be careful that you convert things to the units expected in Pecube if you're using standard SI units.
  - Thermal diffusivity in Pecube (; km^2 Ma^{-1}): $\kappa = \frac{k}{\rho c_{\mathrm{p}}}$
  - Heat production in Pecube (H; °C Ma^{-1}): $H = \frac{A}{\rho c_{\mathrm{p}}}$
- For typical values in different rock types, see Ehlers, 2005 RiMG

Regional heat flow data

- If any surface heat flow data is available for the region, this should be considered as surface heat flow can easily be calculated from Pecube output and compared to observed values.

Tectonic/structural features

- If there are significant tectonic features (faults, shear zones, etc.) within the model domain that are thought to have been active in the time considered in the model, these too should be incorporated in the model design (in the `fault_parameters.txt` file).