3D back-arc flow and how it affects the thermal regime of a subducting slab.

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We use a 3-D Finite Element thermal modeling program that solves the heat transfer equation, and conservation of mass and momentum equations to obtain temperature and flow in 3D space. Past studies of thermal and flow modeling in subduction zones have mainly used 2D models. Two dimensional models do not allow for along strike flow, therefore, it is difficult to determine how complex 3D plate geometries and oblique subduction would affect back-arc flow and the thermal regime. Calculation of flow and temperature for a number of 3D plate geometries will provide a basis for testing the reliability of previous 2D thermal/flow models to determine under what circumstances a 2D model would be inadequate at producing an accurate thermal/flow region. Concave (inward curving – bowl shape) slabs produce warmer mantle and near slab temperatures when compared to a 2D result. Convex (outward curing) slab features produce cooler mantle and near slab temperatures. Other factors, such as average plate dip angle and subduction rate can influence the results. Our results indicate that slow subduction zones with complex plate geometries would deviate significantly from 2D model results. For a plate subduction model similar to that of the Nankai Trough, Southwest Japan, we could expect differences in mantle wedge temperatures by as much as 100 C. Although these values are comparable to the overall uncertainties of the thermal model, the results do indicate that 3D flow should not be neglected.