Impact of subduction of H_2O on intermediate depth seismicity, slow slip, and mantle wedge hydrology.

*Peter E Van Keken[1]

1. Carnegie Institution for Science Washington

Metamorphic dehydration of H_2O from hydrated rocks going down in the Earth’s subduction zones is known to affect a large number of physical and chemical processes, including arc volcanism, intermediate-depth seismicity, slow slip, and deformation of the mantle wedge. I will provide an overview of recent progress on our understanding of such processes by the combined use of geodynamical modeling, metamorphic petrology, and seismology.

Intermediate-depth seismicity in a number of well-studied subduction zones appears to be related to the dehydration of blueschist-facies rock in cold subduction zones and that of antigorite in warm subduction zones. In the case of the cold Alaska subduction zone seismicity appears to be limited to the predicted dehydration boundary, but seismicity is wide spread and occurs more shallowly in Tohoku and Hokkaido, suggestion rehydration embrittlement is favored over dehydration embrittlement.

Two-phase flow models confirm that fluids tend to at least partly flow back up the slab supporting such mechanism for intermediate-depth seismicity. Focusing of flow in the lowermost mantle wedge in subduction zones with concave geometry may be responsible for the patches of high rates of slow slip events observed in Cascadia and Nankai.

Fluids originating from the slab below arc depth are also expected to cause serpentinization of the cold fore-arc corner in the mantle wedge, although the most effect serpentinization is observed in warm subduction zones where dehydration below the fore-arc also contributes free fluids.

Keywords: subduction zones, intermediate-depth seismicity, two-phase flow

