The formation of lithosphere at a mid-ocean ridge and the subsequent movement of that lithosphere across the underlying convecting asthenosphere results in deformation through shearing and the preferential orientation of minerals. This deformation can result in anisotropy in measureable physical properties that, in turn, can be used to infer processes occurring during the formation of the lithosphere.

A large seismic and MT experiment in the Western Pacific (NoMelt experiment) shows strong seismic anisotropy in the lithosphere (Lin et al., in prep.) but no evidence for electrical anisotropy (Sarafian et al., 2015). While at ERI, I worked with Tetsuo Matsuno and Kiyoshi Baba to revisit those data, using 1D anisotropic models to demonstrate the limits of acceptable anisotropy within the data.

There is good evidence that the oceanic crust is electrically isotropic, except where it is bent and faults reactivated at a subduction zone, therefore, we focus on possible mechanisms of electrical anisotropy in the oceanic mantle. In a model of lithosphere formation where the uppermost (~60km) of lithosphere is formed at the mid-ocean ridge and represents a compositional lid, whilst the underlying lithosphere is sheared and accreted onto the base of the overlying plate with cooling/age, then we might expect, at the least, a layer towards the base of the lithosphere with significant electrical anisotropy.

Two questions arise:

1. Could MT data detect such a layer if it existed?
2. Is such a layer compatible with observations from the NoMELT region and, if so, what are the constraints on the properties of such a layer?

To answer the first question we constructed a simple 1D anisotropic model with an uppermost isotropic layer (thickness *ho*) overlaying an anisotropic layer (degree of anisotropy *alpha*) to a depth consistent with the lithospheric thickness reported in Sarafian et al. (2015). These simple 1D anisotropic models predict large splits in phase at periods from ~100s to several thousand seconds. The amount of splitting is dependent on several key parameters including *ho, alpha* as well as the thickness of the anisotropic layer. Because the lithospheric thickness is held constant, as the thickness of the isotropic layer is increased (and the anisotropic layer becomes thinner) the splitting decreases. Only a small amount of phase splitting was observed in the NoMELT data, suggesting only modest anisotropy. We are currently working to answer the second question and to quantify the amount of anisotropy consistent with observations. We will work to write up our results over the coming months.