On the electrical conductivity profile beneath the west Philippine basin

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We have been conducting long-term seafloor electromagnetic (EM) observations at two sites in the northwest Pacific since 2001. The older site was established at the deep seafloor (~5600m) on the northwest Pacific basin (Site NWP), while the new one was installed on the west Philippine basin (Site WPB) in 2006 at the slightly deeper (~5700m) seafloor. The ages of the oceanic basins at those sites are approximately 129 Ma for Site NWP (Shipboard Scientific Party of ODP Leg 191, 2000) and 49 Ma for Site WPB (Salisbury et al., 2006), respectively. The EM instruments deployed at those sites are seafloor EM stations (SFEMS; Toh et al., 2004 and 2006) and capable of measuring vector EM fields at the seafloor for as long as one year or more with other physical quantities such as the instruments' attitude, orientation and temperature.

One of the objectives of the seafloor long-term EM observations by SFEMSs is to make a comparative study of the oceanic mantle with and without influence of the so-called 'stagnant slabs' in terms of their electrical conductivity. It is anticipated that the mantle transition zone under the influence of the stagnant slab has a higher electrical conductivity because the transition zone there could be wetter than that in the absence of the stagnant slab. In this context, the mantle transition zone beneath Site WPB can be said to have influence by the stagnant slab, while that beneath Site NWP does not. It, therefore, is possible to estimate how much water is present in each transition zone by comparison of the electrical conductivity profiles of the two.

Because the one-dimensional electrical profile beneath Site NWP has been reported elsewhere (e.g., Ichiki et al., 2009), here we show the one derived at Site WPB using both the magnetotelluric and geomagnetic depth sounding methods. However, it should be also noted here that the penetration depth beneath Site WPB is significantly smaller than that beneath Site NWP because there is still not enough data accumulation at the new site and because the solar activity has been very low since 2006.

References

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