The electrical structures beneath the Suda seamount in western Pacific from the marine magnetotelluric soundings

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Six ocean bottom electromagnetic (OBEM) receivers were deployed above the Suda seamount in western Pacific Ocean to collect the varying natural electromagnetic (EM) signals to investigate the electrical structure beneath the seamount. The receivers were deployed along one line crossing the seamount in the direction of NE-SW, during a geophysical cruise from September to October 2020. Three receivers were deployed at top of the seamount and others were placed at its foot at a space interval of about 20 to 30 km. The OBEM receiver is made of four glass-spheres with a geomagnetic field measurement resolution of 0.01 nT. The OBEMs measured two horizontal components of the electric field and two components of the geomagnetic field at a sampling rate of 150 Hz. All of the instruments are recovered successfully. However, the time information in the series collected by one receiver is lost, and the data collected at another one is seriously contaminated. Therefore, only the data collected at four OBEM receivers were available for further processing.

The raw time series data collected at each station were processed to estimate the magnetotelluric (MT) impedance tensor using the computer code BIRRP. The Rho+ algorithm is used to examine whether or not the apparent resistivity and its phase data are consistent with the modeling assumption of one-dimensionality. The WALDIM is also used to evaluate the dimensionality beneath each station, and the results show a strong 3D/2D or 3D/1D effect from the periods 50 s to 10^4 s.

Due to the strong 3D effect of the topography on the MT data, an average conductivity structure is estimated using 1-D Occam's inversion to fit the determinant average and the sum of the squared elements of each MT impedance tensor. The results of the 1-D conductivity structural model reveal the strong dependence of the tectonic setting on the data. The OBEM study is a sensitive tool to investigate the temperature, the presence of melt, hydrogen (water) content, and anisotropy in the upper mantle beneath the ocean floor.