

# Insights on C-response and Oceanic Induction Correction in Geomagnetic Depth Sounding (GDS) through Forward Modeling

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Geomagnetic Depth Sounding (GDS) allow us to estimate the C-response for studying deep structures. Our analysis assumed a simple spherical harmonic, P01, to describe spatial variations in the external geomagnetic field. To address the oceanic induction effect along coastal areas and islands, we employ forward modeling using conservative staggered-grid finite difference method within a spherical coordinate system. By comparing C-responses with and without a 3-D heterogeneous surface conductance layer, and considering different resistivity values (1000 Ohm-m, 100 Ohm-m, and 10 Ohm-m) for the continent, we observe that a higher resistivity difference between the ocean and island leads to a contrast value on the island. In the case study of Taiwan, with a representation of the continent using 1000 Ohm-m, the C-responses are significantly larger in the northern part and smaller in the southern part, indicating potential overestimation of the forward modeling. Conversely, with 10 Ohm-m, the responses are lower, suggesting potential underestimation. Hence, we suggest using 100 Ohm-m to represent the continent in the model. Additionally, we can calculate a correction factor through forward modeling with and without a 3-D heterogeneous surface to correct observed C-responses. Subsequently, we convert the responses into apparent resistivity for inversion to derive a 1-D conductivity-depth profile.

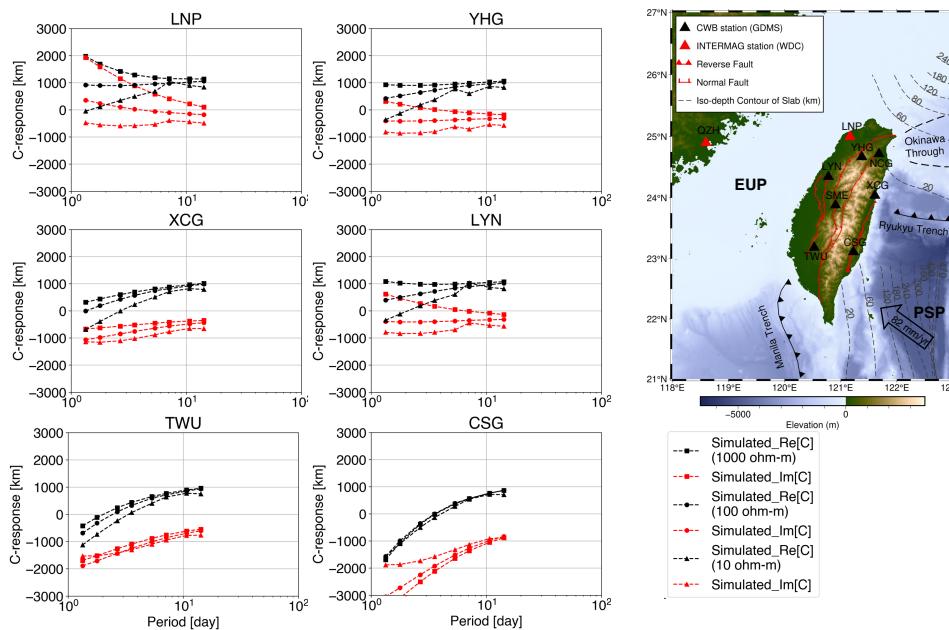


Figure 1. 3-D forward simulated C-response with different continent resistivity assumption at each geomagnetic observatories in Taiwan