Geomagnetic depth sounding study in and around the Korean peninsula

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1. Introduction

Geomagnetic depth sounding (GDS) was performed to analyze the characteristics of deep resistivity structure in and around the Korean peninsula. The data that have 0.01nT precision were provided by 5 geomagnetic observatories and measured every one or five second. In this study, amount of 15 days of geomagnetic data were used for interpretation. Generally the sea seriously affected the GDS data due to its high conductivity. However, though Korean peninsula is surrounded by seas in three sides, the results given by induction arrow strongly show that the trend of electrical conductivity at neighborhood of Korea is reigned by NE-SW anomaly, which agrees with the geological structure. And it is believed that some trend is related with the electrical structure around East China Sea.

2. Conclusion

Figure 1 shows the induction arrows for each periods and observatory sites. Most of them are correspondent between real and imaginary values except some erroneous point or period. The length of the arrow means the relative strength of induction. Seen from figure, the length of real part is mostly bigger than that of imaginary part, so that the data have reliable quality for interpretation.

Figure 2 shows the induction arrows on the map of the Korean peninsula for real and imaginary components. Most of the arrows have direction toward SE except for Jeju site indicating to south or southwestern. But for right interpretation, the sea effect should be considered.

Because sea is sensitive to have great conductivity compared with rocks or soils, it should be dealt with carefulness for interpretation. Generally sea effect is simulated by thin-sheet model for approximation of sea conductivity. By Bapat *et al.* (1993), overall pattern of sea effect in the Korean peninsula is toward the East Sea (Sea of Japan) and monotonically increase due to the bathymetry. Bapat *et al.* modeled that the central-western region of peninsula including three observatory, Icheon, Yongin and Daejeon sites is not greatly affected by sea, counterbalancing the Yellow Sea near and the East Sea (Japan Sea) far apart but deep. Therefore induction arrows from these

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주요어: **Geomagnetic depth sounding, induction arrow, electrical structure**
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three stations can be interpreted without any correction.

Three observatories in center of the Korean peninsula, Icheon, Yongin and Daejeon provide some regular pattern whose induction arrows indicate SE direction in most the periods. Previously described, the induction arrow is believed to indicate normal to the electrically anomalous body. The longer period over 120 minute seems to be affected by sea. This tendency reflects the NE-SW electrical conductivity structure, and it coincides with the tectonics in the southern Korean peninsula. Generally, because the partial melting zone or mantle upwelling area is appeared as highly conductive layer (Ogawa *et al.*, 2001), this trend may be considered as the surface structures shown as belt, lineation or directional characteristics of granites have relation with upper mantle zone.

And the Kyeongju site is strongly influenced by the surrounding seas. Therefore we should consider the sea effect. The Bapat's model (1993) suggest the difference arrow in this site eliminating the sea effect indicates roughly WSW direction where some well-developed granite zone is located in the southern part of Kyeonsang basin (figure 1).

Finally arrows observed in Jeju island point to southwestwards. However considering the sea effect, the difference arrows seem to have much more intense westwards components than observed ones. This pattern is in accord with the results from Kyushu, Japan (Shimoizumi *et al.*, 1997) and this strongly suggest existence of highly conductive layers beneath the East China Sea, which may be considered to be a part of mantle upwelling.

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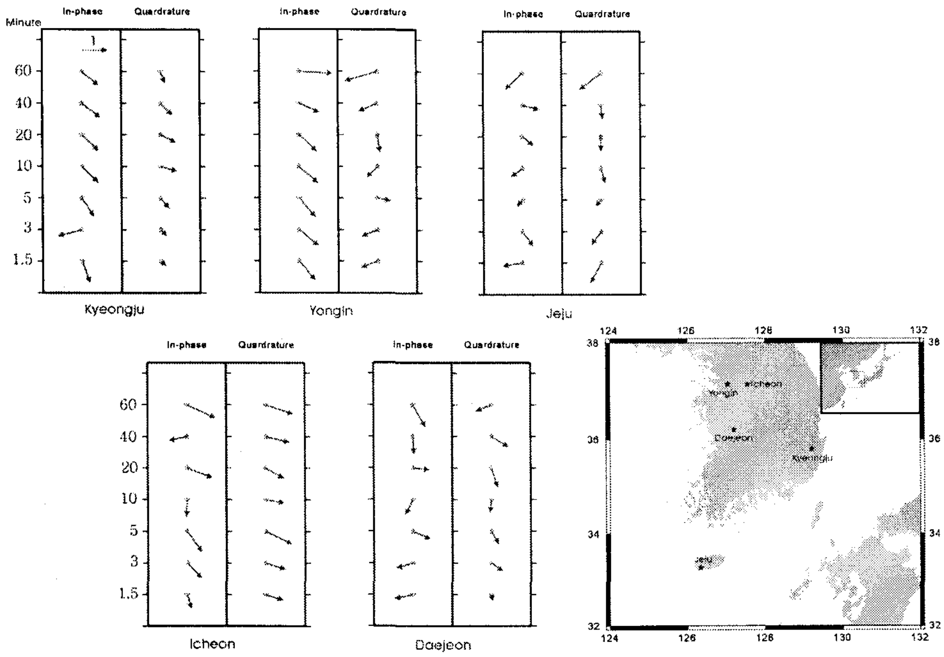

Figure 1. The real and imaginary induction arrows plotted with period for five geomagnetic observatories located on the map.

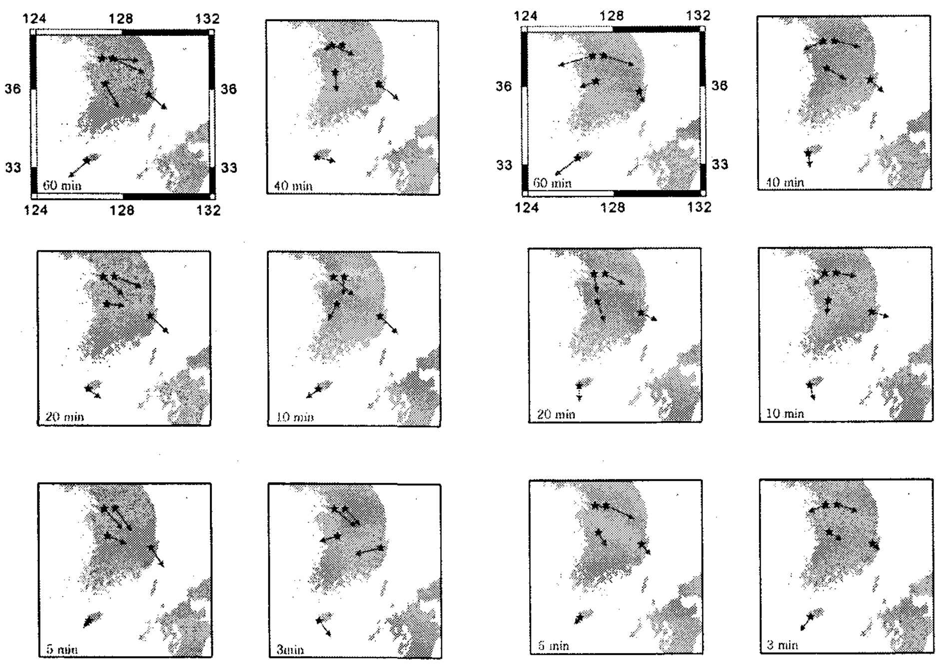

Figure 2. The induction arrows of real (left) and imaginary (right) part plotted on the of the Korean peninsula.