Magnetotelluric and airborne magnetic data analysis to delineate subsurface structure in South-Eastern part of Korea

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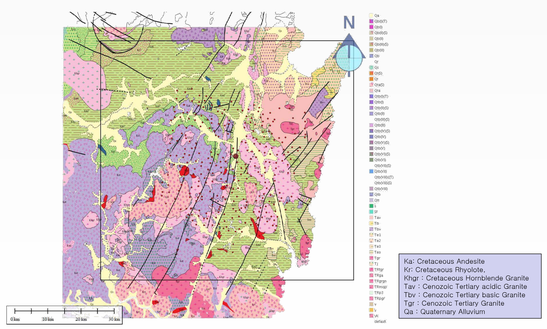
Summary

In this study, we re-analyze geophysical survey data in order to confirm surface lineaments and delineate intermediate to deep geo-electric structure to enhance understanding of geological structures in the region of South-Eastern part of Korea. The south-eastern part of region in South Korea becomes geologically more important after earthquakes in Gyeongju (ML 5.8), 2016, and Pohang(ML 5.4), 2017, since those are the largest events among those which have been instrumentally recorded in South Korea. To obtain an image of geoelectric structures, we re-process magnetotelluric (MT) sounding data, which were originally acquired during 2012~2017 in the region near south Gyeongju and north Ulsan for geothermal resources exploration. The area where MT sounding were performed cross the major faults zones, Milyang Moryang, Yangsan, and Ulsan Faults developed in this region which are apparently dominant in NNE direction. The purpose of the MT surveys lies in delineating the extension of the surface traces of major faults. The successive 2D inversions are done and compared with the lineaments from airborne magnetic data. In addition, geological modeling of the region encompassing the whole area of MT stations are also performed to obtain conceptual image of the area. The geoelectric image clearly shows fault zone conductors and correlation of surface features and subsurface extensions over the region and will help understand subsurface structure of major faults zone in South-Eastern part of South Korea, and these analysis will be further analyzed for national screening of the sites for HLW geologic disposal.

Motivation

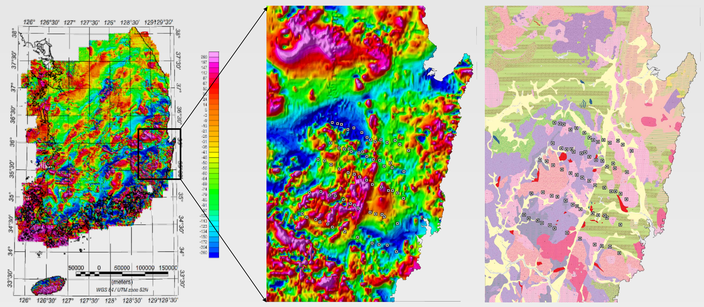
SE part of Korea

- Several Nuclear Power Plants and Gyeongju ILW/LLW repository
- Major Known Faults
  - ① Jiin Fault
  - ② Miryang Fault
  - ③ Moryang Fault
  - ④ Yangsan Fault
  - ⑤ Ulsan Fault
  - ⑥ Dongrae Fault
  - ⑦ Ilkwang Fault
- Recent Largest Earthquakes
  - ① Gyeongju(ML:5.8, 2016)
  - ② Pohang(ML:5.4, 2017)
- Use Regional Airborne Magnetic Data and Magnetotelluric Data to confirm surface lineaments extending into deep earth in the region
- Will be used in fundamental study for future nation-wide screening of the sites for HLW geological disposal program

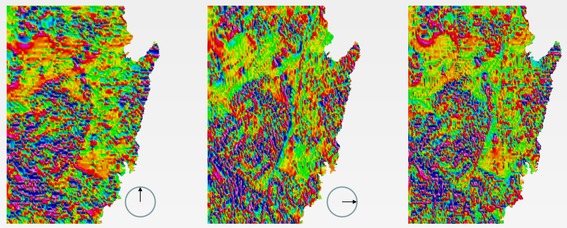


1: 250,000 Geology Map and Falut Map (http://mgeo.kigam.re.kr, KIGAM, Korea)

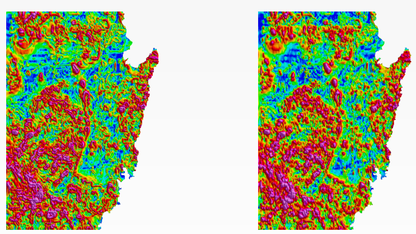
Airborne Magnetic Data Analysis for Surface Lineaments



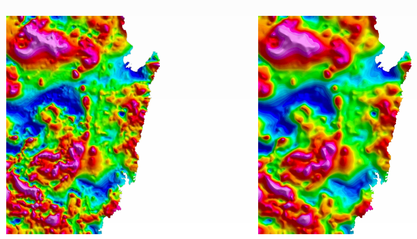
Magnetic Anomaly Map and Geology Map with MT stations



Horizontal Derivative along North (left) and East(right) and Vertical Derivative

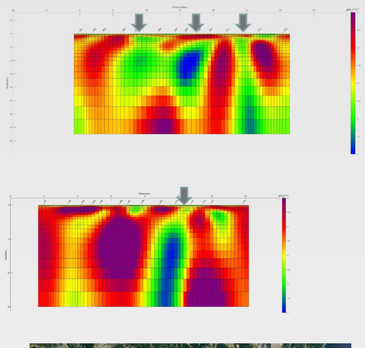


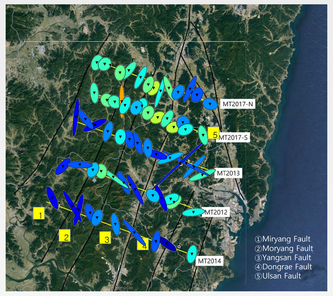
Slope Analysis (Left) and Analytic Signal (Right)



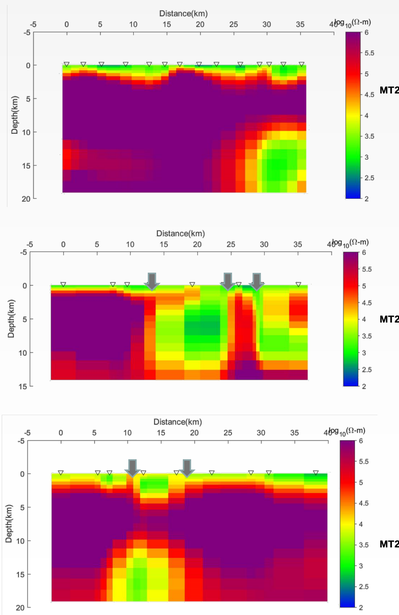
Upward Continuation 400 and 800

AMT and MT Data Analysis For Deep Structures

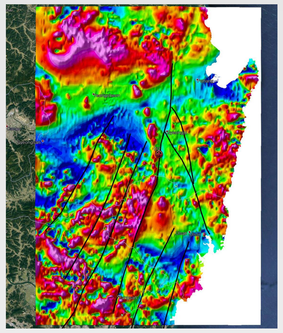




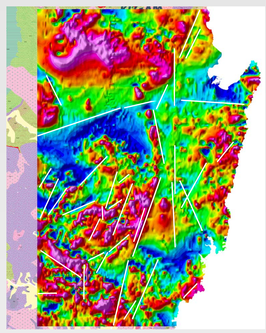
Phase Tensor at 10Hz



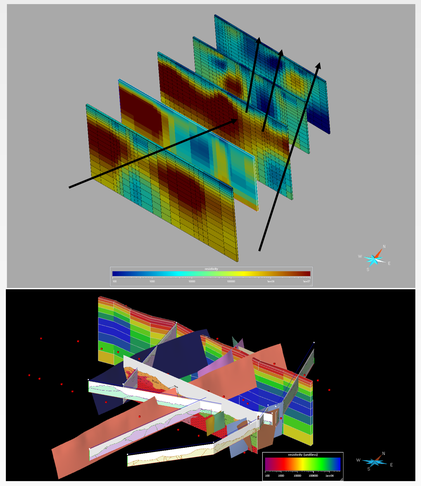
Surface Lineaments & Deep Structures Geologic Model



Faults Maps with Airborne Magnetic data



Magnetic Lineaments



New updated Geologic Model from Geophysical Data Analysis

References

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Acknowledgement

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