

Airborne Electromagnetic Survey, Present and Future

Toru Mogi (Graduate School of Science, Hokkaido University)

The AEM is defined as both transmitter and receiver mounted on an airplane and measuring secondary field induced by eddy current in a conductor at subsurface, generated by the primary field applied from a transmitter. The AEM has been introduced associating with development of airplane since 1950s and utilized for a reconnaissance survey of metal ore in the broader countries like Australia, Canada and Russia. Various types of the AEM system have proposed and used. Environment and disaster prevention issues have become important in 1990s and the AEM has been applying for these fields. In particular, the AEM has often used for distribution of groundwater and contamination tracing, infiltration of seawater. The towed bird type helicopter-borne survey is useful for these surveys because they require detailed electrical conductivity structure in limited area. This type of survey has been utilized for surveys of volcanoes, active faults and land slide area in Japan recently. It has been pointed out several issues such as less accuracy or limited depth of investigation within several hundred depths. But it has emphasized advantages of fully covering survey area even difficult entering place at high resolution.

From these points of view, the AEM has to develop to increase the accuracy and penetration depth. The accurate measurement will be realized by increasing accuracy and dynamic range of magnetometer, A/D converter, motion sensors and GPS. And full waveform acquisition in time domain data will contribute to improve the data and to increase resolution of the subsurface structure. It requires applying lower frequency to increase penetration depth, but the accurate measurement is difficult because ratio of secondary and primary field greatly reduced at lower frequency. It must be increase the distance between transmitter and receiver to overcome this issue. But this is difficult on the airplane or in the towed bird. The AEM using ground source is one of way to overcome the problem. We have developed grounded electrical source AEM (GREATEM) since 2003 and recently obtained resistivity structure up to 1000m depths under an appropriate condition. Integrated survey together with other airborne geophysical surveys and combination of surface survey will improve the efficiency and enlarge its application fields.