Prpagations of earth-origin electromagnetic pulses in an electrically high conductive medium

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In order to clarify whether earth-origin electromagnetic (EM) pulses detected in the earth could be related to earthquakes or not, we have been measuring their arrival directions at two observation sites, and have made it possible to identify their source locations from intersecting points of their précised arrival direction lines. On the other hand, in the theory of EM wave propagations, it is said that EM waves are strongly dissipated exponentially with a characteristic distance so-called Skin-depth in an electrically high conductive medium, and cannot propagate for al long distance in it. Thus there is a contradiction between the facts of EM pulse detections and the theory of EM propagations in the high conductive earth medium.

Recently, we found an important feature of earth-origin EM pulses in an electrically high conductive earth medium. We constructed a new borehole at a sea-shore where is in Seto Marine Biological Laboratory, Field Science Education and Research Center of Kyoto University at Shirahama-cho, Wakayama-prefecture. The layer structure around the borehole is composed of a shell layer from the ground surface to 20 m in depth and sand-stones layer below the level of 20 m in depth. Thus these layers could be easily penetrated by the sea-water. As the result, EM measurements in this borehole can be regarded as measurements in a high conductive medium. We noticed, in the initial measured result, that we could not detect electric field of an earth-origin EM pulse in spite that its three-directional magnetic components could be strongly detected. This suggests that the magnetic field of an earth-origin EM pulse can survive even in an electrically high conductive medium. In order to see a electric field component, we set three axial electric dipole antennas above the ground surface, and detected simultaneously with three magnetic components in the borehole.