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ELECTROMAGNETIC FIELDS INDUCED BY SURFACE RING WAVES IN THE DEEP SEA

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The paper studies electromagnetic fields induced by the motion of a conducting fluid of infinite depth in an external magnetic field. The Maxwell equations are formulated in terms of the Hertz magnetic vector, and general solutions are obtained for electromagnetic fields and current density for a certain family of potential velocity fields of fluid. In particular, we studied the electromagnetic effects associated with a radially symmetric system of progressive surface waves in the deep sea, generated either by underwater oscillating sources (monopole point source, vertically oscillating sphere), or by the dispersive decay of initially localized disturbances of the sea surface (Cauchy-Poisson waves). For an initial perturbation of a liquid surface of a special type we obtain analytical expressions for electromagnetic fields in the air, induced by Cauchy-Poisson waves. For these solutions we consider various asymptotics and investigate the behavior of the obtained solutions in the case of large times and distances from the origin. It turned out, that variations of the electromagnetic field in the air at a sufficiently high altitude over the ocean can be probable precursors of tsunami waves. The results can be useful in the development of systems for detecting tsunami waves by remote sensing methods.

Keywords: Surface waves; tsunami waves; electromagnetic field variations; magnetic hydrodynamics.

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