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# Topographic effect on Radio-Magnetotelluric and Slingram signals: application to a levee along the Loire river, France.

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We study the influence of the topography of a levee on the electric and magnetic signals obtained with the Radio-Magnetotelluric method (RMT) and the Slingram method, respectively.
For the RMT method, field measurements have been modelled with a finite element commercial software (AC/DC and Radio-Frequency modules of Comsol Multiphysics). A levee situated in Orléans (France) along the Loire river has been considered in order to design a model taking into account the skin depth and the incident wavelength. The effect of the incident electromagnetic field direction has been assessed with two different incident wave directions: BBC 5 from Salford (UK) and France-Inter from Allouis (France). The simulations highlight the tri-dimensional effects of the topography in the apparent resistivity, observed on the crest of the levee, depending on the incident field direction and topography.
For the Slingram method, the magnetic field has been simulated using the AC/DC module of Comsol. The ratio of the primary magnetic field on the secondary one, received in a loop is determined above a straight levee. The study aims to show the various responses obtained in function of both vertical and horizontal coil configurations. We show that the signal also depends on the topography and the right configuration of the coils alignment with respect to the levee stretch direction. In this study, a buried gas pipe is also characterized by the two methods. Numerical modelling of 3D electromagnetic effects on geophysical signals helps to interpret the field measurements and offers to the stakeholder an optimized methodology for geophysical surveys on levees.