# Computational modelling of geophysical data without meshing the physical models

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Geophysical data modelling involves synthesizing theoretical responses, i.e., measurements to be expected over a known physical model, namely, an Earth model with inhomogeneous physical properties in the subsurface. A key ingredient in the modelling is how to represent the geometries of the physical model, the so-called discretization, which will determine how much details of the model structure to be recovered and what might be the most suitable numerical mathematical method to do the modelling. This research focuses on modelling electromagnetic (EM) data for 3D Earth models with complex geometric structures. Complex Earth models can have arbitrary orientation and surface structure, and therefore are more realistic scenarios of the real world than simplified prisms and spheres. However, the discretization of such complex models in 3D is not a trivial task, since accurate geometric representation is not the only requirement; accuracy and efficiency of mathematical methods can also be significantly affected. Currently available modelling methods require the physical model meshed, and are sensitive to the structure of the discretization. These methods are hence called mesh-based methods. An alternative are meshfree modelling methods that do not generate meshes. An important advantage of meshfree methods is that numerical performance is much less dependent on the model discretization. Also, the creation of such discretization can be greatly simplified and speeded up. We will introduce how one can apply meshfree methods to synthesize geophysical data, and present possible directions to the solution of EM data modelling with them.

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