COMET – A PYTHON TOOLBOX FOR 1D/2D/3D MODELLING AND INVERSION OF MAGNETIC RESONANCE AND RESISTIVITY DATA

The forward calculation of nuclear magnetic resonance (NMR) data depends on the knowledge about the subsurface resistivity distribution. This resistivity information is often gathered by means of other geophysical investigations, such as direct-current (DC) resistivity or transient-electromagnetic measurements (TEM). However, the obtained resistivity distributions may be smooth, thus cannot be incorporated in the common forward calculation directly as they use simplified (blocky) resistivity for the calculation of the magnetic fields.

To overcome this simplification, and aiming a combined inversion of electrical resistivity, water content, and relaxation times, we present the COMET (coupled magnetic resonance and electrical resistivity tomography) toolbox. This open-source Python toolbox provides the forward calculation and inversion of surface NMR data. It supports smooth resistivity structures in 1D or 2D, arbitrary loop layouts and the inversion engine is suited for 1D, 2D and even 3D. The magnetic field calculation for 2D is managed by the open-source library "custEM" (customizable electromagnetic modelling).

Using the toolbox we exemplarily investigated the effect of simplified blocky versus smooth resistivity distributions not only on the kernel or data, but on the inversion results. We show preliminary results of this investigation along with small examples on how easy the toolbox can be used.