



Multivariate Geostatistical Analysis of Uncertainty for the Hydrodynamic Model of a Geological Trap for Carbon Dioxide Storage. Case study: Multilayered Geological Structure Vest Valcele, ROMANIA

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The purpose of the works is to evaluate the uncertainty of the hydrodynamic model for a multilayered geological structure, a potential trap for carbon dioxide storage. The hydrodynamic model is based on a conceptual model of the multilayered hydrostructure with three components: 1) spatial model; 2) parametric model and 3) energy model.

The necessary data to achieve the three components of the conceptual model are obtained from: 240 boreholes explored by geophysical logging and seismic investigation, for the first two components, and an experimental water injection test for the last one.

The hydrodynamic model is a finite difference numerical model based on a 3D stratigraphic model with nine stratigraphic units (Badenian and Oligocene) and a 3D multiparameter model (porosity, permeability, hydraulic conductivity, storage coefficient, leakage etc.).

The uncertainty of the two 3D models was evaluated using multivariate geostatistical tools: a)cross-semivariogram for structural analysis, especially the study of anisotropy and b)cokriging to reduce estimation variances in a specific situation where is a cross-correlation between a variable and one or more variables that are undersampled. It has been identified important differences between univariate and bivariate anisotropy.

The minimised uncertainty of the parametric model (by cokriging) was transferred to hydrodynamic model. The uncertainty distribution of the pressures generated by the water injection test has been additional filtered by the sensitivity of the numerical model. The obtained relative errors of the pressure distribution in the hydrodynamic model are 15-20%.

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