



Practice examples of approaches to the initial density model creation

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The creation of the initial density conception is a key stage of any gravity modeling processing. In fact, its accuracy and completeness determine the final validity of interpretation.

According to geological conditions, the initial density models can be divided into the following classes: a block model, a layered-block model, a layered constant density model, a layered model with the continuous lateral density changes, a layered model with a continuous vertical density changes and a continuous voxel without inside boundaries.

At the same time, the methods and approaches of creating a zero approximation density model depend on many factors such as the research problem, the features of the physical-geological model, the completeness of a priori information and the available computer technologies. Depending on their combination, we consider five approaches to the creation of the initial density model:

1. A block density model based on the laboratory measurements of the rock density from the data of a high-dense network of wells without seismic (the engineering problem: the detection of a potential development of the karst processes).
2. A layered-block density model based on the density of surface rock samples and velocities according to the seismic refraction method for models 2D (case of density inhomogeneities of the upper part of the sedimentary section).
3. A layered model with a continuous lateral density changes based on the velocity-density correlation, leak of the well data and 3D seismic horizons (the seismic-gravity modeling of zones without essential tectonic deformations in the sedimentary cover).
4. A layered model with a continuous vertical density changes based on the accounting the rules of the density-depth variations in different strata and 3D seismic horizons (the seismic-gravity modeling of the sedimentary basins with the intricate tectonic processes).
5. A layered model without density change in the layers based on the 2D gravity modeling on the regional profiles and 2D seismic horizons (the deep seismic sounding and geotraverses).

Consequently, a choice of the method of generation of the initial density model is a creative process. The optimal algorithms depend on the current geological objective, the physical and geological conditions, the volume of a priori data, etc. In this context, considering the five approaches to the initial density model creation, the authors do not claim «completeness» of the list of possibilities and are ready to develop and invent the new ones in their works.