

3D PARAMETRIC MODEL OF A POTENTIAL TRAP FOR CARBON DIOXIDE STORAGE. CASE STUDY: OIL STRUCTURE VALCELE, ROMANIA



MUSTANG EC FP7, Collaborative Large Scale Integrating Project



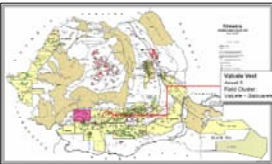
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1. OBJECTIVE:

3D MODEL OF A POTENTIAL TRAP FOR CARBON DIOXIDE with 2 components:
 • 3D STRATIGRAPHIC MODEL
 • 3D PARAMETRIC MODELS (PERMEABILITY, POROSITY ETC.)

2. LOCATION: WEST VALCELE - ROMANIA

oil structure belongs to Getic Depression



3. DATA AVAILABLE: 241 boreholes

explored by geophysical logging



4. GEOLOGY OF THE SITE:

The Valcele structure represents an anticline of the Paleogene covered with Burdigalian deposits, locally Badenians and Sarmatians, as well as with Pliocen formations, all broadly molding and borrowing the structural shape of the Oligocene. The selected series for CO₂ storage are **OLIGOCENE** and **BADENIAN**:

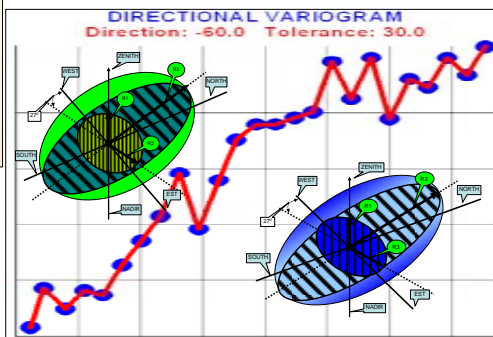
OLIGOCENE, the most important oil complex (500 - 1500m):
 • **LOWER SERIES** (sandstones, sands, conglomerates, with marlstone intercalations: Ol1b7, Ol1b6, ..., Ol1b1);
 • **SUPERIOR SERIES** (argillaceous series with marlstone, clay with few sandstone intercalations: Ol1a1, ..., Ol1a10).
BADENIAN (HELVETIAN-old name; 20-1000m):
 • **LOWER SERIES** (argillaceous series with thin intercalations of fine sand and calcareous sandstones: He III undivided, He III 4, ..., He III 1)
 • **MEDIUM SERIES** (sand and sandstones: He II): He II A, He II B2, He II B1;
 • **SUPERIOR SERIES** (sandy series with marly and argillaceous intercalations: He I): He I b1+b2, He I c+d.

5. METHODOLOGY:

3D models were built based on data obtained from 71 selected boreholes using geostatistical methodology:

- **indicator kriging** for 3D stratigraphic model;
 - **universal kriging** for 3D parametric models (exemplified for porosity and permeability);
 - **conditional simulation** for assessment of uncertainty models.
- The main **steps** of data processing were:
- **statistical analysis** of the data;
 - **declustering** for representative distribution;
 - **trend analysis**;
 - study of the **anisotropy** made with surface variograms;
 - evaluation of **values** and **errors** distribution.

6. VARIOGRAPHIC ANALYSIS of the parameters

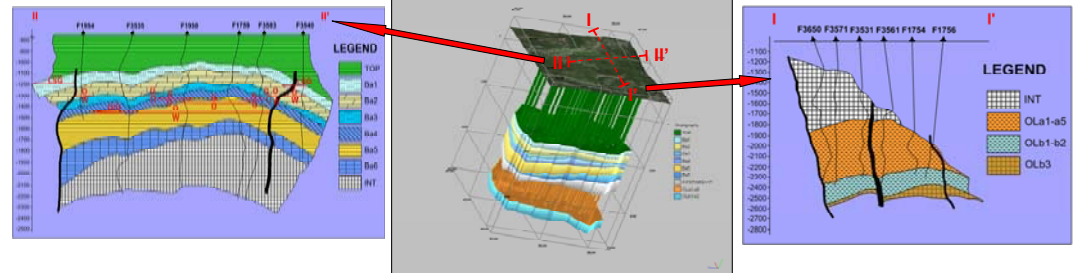


7. MEAN VALUES of the PARAMETERS

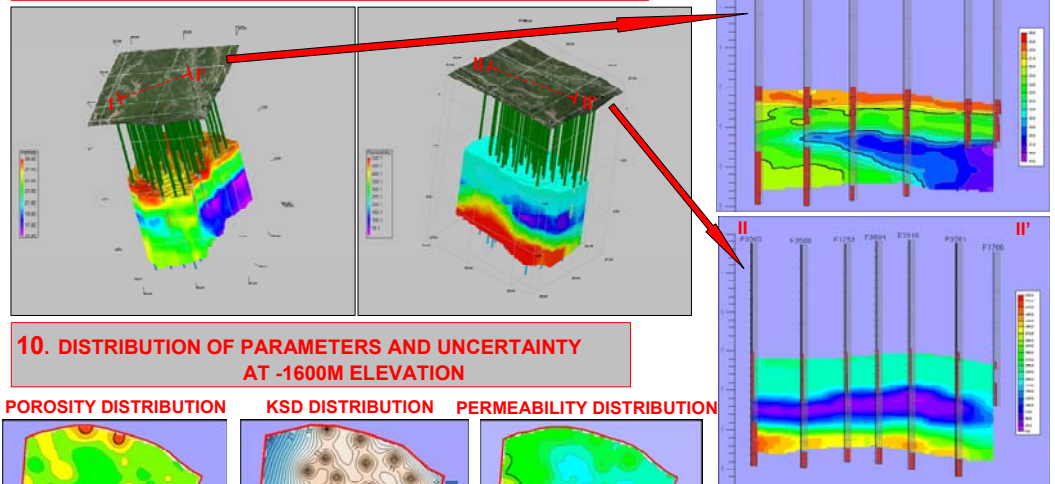
obtained by statistical analysis of geophysical logging data

STRATIGRAPHIC SERIES		POROSITY	PERMEABILITY
		n[%]	Kp[mD]
TOP	TOP	28	225
Helc+d	Ba1	28	225
Helb1+b2	Ba2	29	220
HellB1	Ba3	23.4	210
HellB2	Ba4	24	213
HellA	Ba5	25	212
Hell1	Ba6	17	40
INT	INTERMEDIAR	22	50
OLa1a5	OLa1a5	26	500
OLb1b2	OLb1b2	22	450

8. 3D STRATIGRAPHIC MODEL

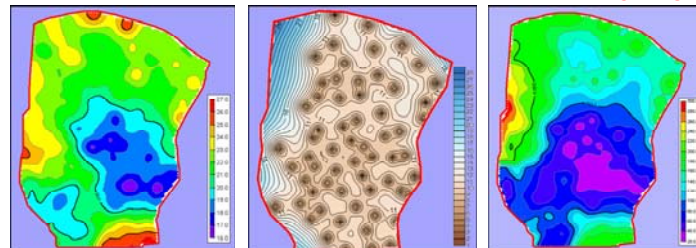


9. 3D PARAMETRIC MODEL (POROSITY and PERMEABILITY)



10. DISTRIBUTION OF PARAMETERS AND UNCERTAINTY AT -1600M ELEVATION

POROSITY DISTRIBUTION KSD DISTRIBUTION PERMEABILITY DISTRIBUTION



CONCLUSIONS: on base of all the parameters distribution (porosity, permeability, conductivity etc.) it will be selected the **best location** for the carbon dioxide injection, after the testing of the permeability faults.

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