Geophysical Research Abstracts
Vol. 17, EGU2015-11362, 2015
EGU General Assembly 2015

Uncertainty assessment of 3D instantaneous velocity model from stack velocities

Francesco Emanuele Maesano (1) and Chiara D'Ambrogi (2)

(1) Collaborator of Servizio Geologico d'Italia - ISPRA, Rome, Italy (francescoemanuele.maesano@isprambiente.it), (2) Servizio Geologico d'Italia - ISPRA, Rome, Italy (chiara.dambrogi@isprambiente.it)

3D modelling is a powerful tool that is experiencing increasing applications in data analysis and dissemination. At the same time the need of quantitative uncertainty evaluation is strongly requested in many aspects of the geological sciences and by the stakeholders.
In many cases the starting point for 3D model building is the interpretation of seismic profiles that provide indirect information about the geology of the subsurface in the domain of time. The most problematic step in the 3D modelling construction is the conversion of the horizons and faults interpreted in time domain to the depth domain. In this step the dominant variable that could lead to significantly different results is the velocity.
The knowledge of the subsurface velocities is related mainly to punctual data (sonic logs) that are often sparsely distributed in the areas covered by the seismic interpretation. The extrapolation of velocity information to wide extended horizons is thus a critical step to obtain a 3D model in depth that can be used for predictive purpose.
In the EU-funded GeoMol Project, the availability of a dense network of seismic lines (confidentially provided by ENI S.p.A.) in the Central Po Plain, is paired with the presence of 136 well logs, but few of them have sonic logs and in some portion of the area the wells are very widely spaced.
The depth conversion of the 3D model in time domain has been performed testing different strategies for the use and the interpolation of velocity data. The final model has been obtained using a 4 layer cake 3D instantaneous velocity model that considers both the initial velocity (v0) in every reference horizon and the gradient of velocity variation with depth (k). Using this method it is possible to consider the geological constraint given by the geometries of the horizons and the geo-statistical approach to the interpolation of velocities and gradient.
Here we present an experiment based on the use of set of pseudo-wells obtained from the stack velocities available inside the area, interpolated using the kriging geo-statistical method. The stack velocities are intersected with the position of the horizons in time domain and from this information we build a pseudo-well to calculate the initial velocity and the gradient of increase (or decrease) of velocity with depth inside the considered rock volume.
The experiment is aimed to obtain estimation and a representation of the uncertainty related to the geo-statistical interpolation of velocity data in a 3D model and to have an independent control of the final results using the well markers available inside the test area as constraints.

The project GeoMol is co-funded by the Alpine Space Program as part of the European Territorial Cooperation 2007-2013. The project integrates partners from Austria, France, Germany, Italy, Slovenia and Switzerland and runs from September 2012 to June 2015. Further information on www.geomol.eu