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3D geological modeling and visualization supporting seismic hazard assessment

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The three-dimensional geological modeling and visualization techniques represent an essential tool to understand and analyse crustal and sub-crustal structures. In the frame of S1 - Seismological Project funded by the Italian Civil Protection Department these techniques couple and support the traditional method for the seismic hazard assessment.
Great amount of data, both geological and geophysical, are produced and collected in the S1 Project "Definition of the seismic potential in Italy for the evaluation of the seismic hazard"; they are characterized by different distribution and different degree of detail, although national-wide datasets are prevailing. The activities carried out are: the support to the processing of data collected within the S1 Project, and the sharing and dissemination of the 3D elaborations deriving from those data, pairing the construction of a Geodatabase, and supporting the models validation.
The 3D modeling techniques have been applied, firstly, to: the Database of seismogenic sources (DISS), the Catalogue of the Italian Seismicity (CSI), a structural model for the lithosphere-asthenosphere system.
The resulting 3D objects are: surfaces representing the geometry of each Individual seismogenic Source, surfaces wrapping an unspecified number of Individual Sources and defining Composite seismogenic Sources, points defining the earthquake location parameters and their related magnitude, volumes, defined by different thickness (h), Vs, Vp and Density values, and describing the main characteristics of the lithosphere-asthenosphere system.
Through a full space visualization, the 3D softwares allow the integration, comparison and analysis of these multi-scale multiple parameters useful in the definition of the seismic hazard. Moreover they enable to verify the model consistency related to the available data and to rebuild or update the model owing to information updating.
The result is a 3D imagery of seismogenic structures and earthquake locations for the entire Italian region coupled with a preliminary 3D elaboration of the structural model for the lithosphere-asthenosphere system. The comparison within these datasets will highlight the existing, both geometrical and parametrical, inconsistencies in the defined models supporting the definition of a more comprehensive model.
Finally the 3D modeled data and bi-dimensional surfaces representative of specific parameters variation (i.e. heat-flow, gravity anomalies), stored in both Geodatabase and 3D space, can be easily retrieved, and used to perform analyses and comparison with other digital geological datasets, supporting the specific activities of Civil Protection Department.