

Resolution study of tomographic P-wave velocity models and geological interpretation at the Empordà basin.

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ABSTRACT

Several reflection seismic profiles were acquired in the Empordà basin (NE of Spain) during the 80s for oil exploration purposes. This seismic reflection data set was recovered by CEPSA S.A and made them available to the Cartographic and Geologic Institute of Catalunya (ICGC for its name in Catalan). Refracted data were analyzed by ICGC and the retrieved velocity models were analyzed and interpreted in this work. These refraction data were modeled using travelttime tomography inversion to obtain the subsurface velocity fields associated to each 2-D profile. A typical resolution analysis (checkerboard test) is performed in order to assess the resolution of the retrieved P-wave velocity tomograms. Checkerboard tests suggest that vertical and horizontal resolution limit is between 250 m and 500 m for profiles with denser acquisition geometry and between 500 m and 1000 m for the only one with sparser acquisition. A geological interpretation for the area is built based on the velocity tomograms along with coincident seismic reflection images and surface geology information. Tomograms provide velocity information on the upper 800 m of the subsurface with velocities ranging from 2000 m/s for unconsolidated or non-cemented deposits to 5000 m/s for the bedrock. The combination of refraction and reflection information highlights the basin geometry, with its Neocene deposits over older Paleogene conglomerates bedrock, and Cretaceous - Jurassic limestones.