3D Reconstruction of geological structures based on remote sensing data: example from Anaran anticline, Lurestan province, Zagros folds and thrust belt, Iran.

M. Snidero, A. Amilibia, O. Gratacos, and J.A. Muñoz

Geomodels research centre, GGAC, Dept. Geodinàmica i Geofísica, Facultat de Geologia, Universitat de Barcelona. 08028 Barcelona. (msnidero@ub.edu)

This work presents a methodological workflow for the 3D reconstruction of geological surfaces at regional scale, based on remote sensing data and geological maps. This workflow has been tested on the reconstruction of the Anaran anticline, located in the Zagros Fold and Thrust belt mountain front. The used remote sensing data-set is a combination of Aster and Spot images as well as a high resolution digital elevation model. A consistent spatial positioning of the complete data-set in a 3D environment is necessary to obtain satisfactory results during the reconstruction. The Aster images have been processed by the Optimum Index Factor (OIF) technique, in order to facilitate the geological mapping. By pansharpening of the resulting Aster image with the SPOT panchromatic one we obtain the final high-resolution image used during the 3D mapping. Structural data (dip data) has been acquired through the analysis of the 3D mapped geological traces. Structural analysis of the resulting data-set allows us to divide the structure in different cylindrical domains. Related plunge lines orientation has been used to project data along the structure, covering areas with little or no information. Once a satisfactory dataset has been acquired, we reconstruct a selected horizon following the dip-domain concept. By manual editing, the obtained surfaces have been adjusted to the mapped geological limits as well as to the modeled faults. With the implementation of the Discrete Smooth Interpolation (DSI) algorithm, the final surfaces have been reconstructed along the anticline. Up to date the results demonstrate that the proposed methodology is a powerful tool for 3D reconstruction of geological surfaces when working with remote sensing data, in very inaccessible areas (eg. Iran, China, Africa). It is especially useful in semiarid regions where the structure strongly controls the topography. The reconstructed surfaces clearly show the geometry in the different sectors of the structure: presence of a back thrust affecting the back limb in the southern part of the anticline, the geometry of the grabens located along the anticline crest, the crosscutting relationship in the north-south faulted zone with the main thrust, the northern dome periclinal closure.