



Shortening values in the southern Fars arch of the Zagros – assessing uncertainties by structural and gravity sensitivity analysis

Ralph Hinsch (1), Martin Vögele (1), Gholamreza Gharabeigli (2), Abbas Majidi (2), Tam Lovett (1), Ali Asghar Julapour (2), Gabor Tari (1), and Walter Kosi (1)

(1) OMV Upstream, Exploration, Vienna, Austria (ralph.hinsch@omv.com), (2) National Iranian Oil Company, Exploration Directorate, Tehran, Iran

OMV Upstream and the National Iranian Oil Company conducted a joint geoscientific study in the southern Fars area from 11/2016 until 10/2018. The study area is located within the Simply Folded Belt of the Zagros, famous for its largescale whaleback folds and salt glaciers.

Reflection seismic (on- and offshore), gravity, well and surface geology data were integrated in an attempt to assess stratigraphic thicknesses/top basement morphology and to constrain reasonably balanced cross sections and shortening estimates. The modelling uncertainties are addressed and discussed based on thorough modelling parameter sensitivity studies.

The amount of shortening in the balanced sections from the study varies from 8-15% whilst other published authors report values up to 25%. The main differences between the sections are the stratigraphic thicknesses used/depth to basement and the amount of internal/layer parallel shortening. Stratigraphic thicknesses were estimated from 3D gravity modelling, exploiting available depth-converted reflection seismic and velocity data, as well as log information from multiple offshore wells (used for Gardner co-efficient calibration). The resulting density model was subsequently used to quantify depth-to-basement uncertainties and later to structurally invert for the crystalline basement depth. This modelling exercise suggests that gravity inversion results are driven by density uncertainties in the thick Paleozoic strata and the basement rocks. Resulting uncertainties between +/-3.5 km on top basement location are therefore expected. An area balancing approach shows that lower shortening values (< 15%) can be achieved using high stratigraphic thicknesses (11-13 km) and a general mild dip of the decollement (0.5°) towards the North. High shortening values (> 20%) are required for thin stratigraphic thicknesses (9-11 km) and/or a high dip of the basement (1°) towards the North.

The study results indicate an overall high uncertainty that needs to be considered for balanced sections in the Fars area and, as a consequence, reported shortening values might have a relatively high spread. Furthermore, based on the uncertainties, it is not possible to clearly define whether basement is actively involved in the deformation or not.