



The Qartaba Anticline (central Mount Lebanon): Implications for the tectonic evolution of onshore Lebanon

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The area of Lebanon includes three major physiographic elements (Mount Lebanon, the Anti-Lebanon mountain chain, and the Bekaa Valley in between). The western Lebanese ranges (Mount Lebanon) stretch along the coast of the Mediterranean Sea. The prominent Qartaba Anticline is located on the western side of the northern Mount Lebanon. The studied part of this anticline (~20 km long, ~5 km wide) represents a large-scale box-fold structure bounded by two SW- and NE-vergent monoclines.

The mechanism and timing of folding of the Qartaba Anticline are still debated and are not well understood. During several field visits hundreds of structural measurements were made in the study area in order to better constrain the three-dimensional shape of the Qartaba structure. The data show that the eastern and western flanks of the anticline represent oppositely verging monoclines with average dip values increasing from around 15° at the outer limits of the structure to 30° towards the middle of the flanks and reaching values up to 90° at the uppermost flanks. The strata become more or less horizontal on the top of the structure, a few hundreds meters away from the limbs of the monoclines. Therefore the whole structure resembles a large scale box-fold.

Although several generations of brittle faults cross cut the Qartaba structure, no large scale faults have been identified in the field, which could be interpreted as directly related to the folding process itself. Instead, the folding and the limb rotation are strongly associated with dissolution-precipitation deformation mechanisms showing multi-generations of axial plane stylolites at high angles to the bedding planes within the hinge zones of the flanking monoclines.

Pronounced stratigraphic boundaries, such as the one between the Middle to Upper Jurassic Kesrouane and Bhannes Formations, have been taken as reference surfaces in previous reports in order to construct structural and isopach contour maps of the Qartaba structure. In this study, contours were digitized from available maps as well as stratigraphic and structural cross sections. Dip/strike measurements taken in the field combined with measurements derived from high-resolution satellite images were also utilized in the digitized maps. The new three dimensional structural model of the Qartaba Anticline contains important information about the subsurface geology and features substantial implications for the tectonic evolution of the broader area in Lebanon (part of eastern margin of the Levant Basin).