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Dealing with uncertainty and limited data availability at Lake Tiberias, Israel: Imaging salt diapir using hydrogeological data

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Direct data of the Tiberias Basin (TB) deep-seated stratigraphy is limited. Therefore, imaging of suspected underlying salt deposits and their structure is carried out based on salt tectonics theory and shallow seismic data interpretation. It is supported by the geochemistry of surrounding springs and numerical modeling of fluid transport processes within the basin.

The Tiberias Basin (TB) is a narrow pull-apart basin located along the Dead Sea Transform. It encompasses Lake Tiberias, which is the largest fresh water lake in the Levant. Saline onshore and offshore springs and seepages are known to contribute considerable amount of salt to the lake endangering its water quality. Since the early 1980's, deep-seated salt deposits are known to exist in the Tiberias basin subsurface as a result of one deep exploration borehole. Interpretation of onshore seismic data at the southern part of the basin reveals its structure and distribution. However, offshore seismic interpretation is debatable and leads to uncertainty regarding the structure and distribution of salt deposits under the lake.

The results of the current study suggest that a salt diapir rises under the lake, piercing through the basin-fill adjacent to the western boundary fault of the basin. Chemical analyses show that some springs at the western shore of the Lake contain indications of dissolved halite. In addition, numerical modeling of brine flow suggests that shallow salt domes can allow brine plumes to reach the surface and discharge along the western coast. These results allow imaging and support the hypothesis regarding the occurrences of shallow salt structures in the vicinity of the lake and contribute valuable information for sustainable management of its water.