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Hydro-mechanical model of a reactivated paleo-salt karst system in the Lisan area, Jordan

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The Dead Sea is a pull-apart basin forming a terminal lake (-429 m) located over the Jordan - Dead Sea transform fault. The slope of the fresh/saline interface is ten times shallower than observed near the ocean because salinity is ten times greater than in the average sea water. Underground lateral extension is acting as a high density layer over which groundwater is in hydrostatic equilibrium.

Since the 1960s, a slice of brine 0.033 km x 77 km x 16.5 km vanished due to water resources over-exploitation in the catchment area. Monitoring of wells in the Dead Sea zone indicated that the water table does not drop at the same pace as the lake. The head difference is increasing with time. Groundwater moves so rapidly towards the lake to compensate for the imbalance provoking the proliferation of sinkholes, subsidence, and landslides. Since the 1980s, the emerged spaces have been covered by industrial and touristic infrastructures.

Such a dynamic system provides a test bed to study an Early Warning System to help minimizing geo-hazards effects. The reactivation of a paleo-channel located below a US$ 48 M salt evaporation pond of the Arab Potash Company, Lisan peninsula, provides an illustrative case-study.

Sinkholes lineaments whose orientations fit with the main structural directions highlight the role of conduit played by faults and fractures. Rapid underground water circulation explains the appearance of tamarisk in unexpected places. Time series analysis of high and very high resolution visible/radar satellite images acquired from the 1970s and on indicated major changes in the landscape.

This work underlines the need of very carefully analyzing all available data sources acquired prior to and during the recession of the lake level before the development of human activities along the coast.

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