



Characterization of seepage surfaces from Space-borne radar interferometry stacking techniques, Southern Dead Sea area, Jordan

Giulia Tessari (1), Damien Closson (2), Najib Abou Karaki (3), Simone Atzori (4), Simone Fiaschi (1), Mario Floris (1), Paolo Pasquali (5), and Paolo Riccardi (5)

(1) Geosciences Department, University of Padua, Padua, Italy (giulia.tessari@studenti.unipd.it), (2) Department of communication, information, systems and sensors, Royal Military Academy, Brussels, Belgium (damien.closson@yahoo.fr), (3) Environmental & Applied Geology Department, University of Jordan, Amman, Jordan (eqamm@yahoo.com), (4) Istituto Nazionale di Geofisica e Vulcanologia, Centro Nazionale Terremoti, Roma, Italy (simone.atzori@ingv.it), (5) Sarmap S.A., Purasca, Switzerland (ppasquali@sarmap.ch)

The Dead Sea is a terminal lake located in a pull-apart basin of the Dead Sea Transform fault zone. It is the lowest emerged place on Earth at about -428 m bsl. Since the 1960s, the over-pumping of its tributaries leads to a decrease in the water level. Eventually, it became more pronounced decades after decades. In 2014, it is more than 1m/year. The overall drop is around 33 m.

With salinity ten times greater than the ocean water one, the lake body and its underground lateral extensions act as a high density layer over which the fresh ground waters are in hydrostatic equilibrium. The slope of the interface between saline and fresh waters is ten times shallower than normally expected near the ocean.

According to a number of wells along the Jordanian Dead Sea coast, the water table level does not drop at the same speed than the Dead Sea. An increasingly important gradient is constantly being created along the coastal zone. In many places, the fresh ground waters move very rapidly towards the base level to compensate for the imbalance. This statement is supported by a body of observations:

- a) appearance of vegetation (Tamarisk) in arid areas (precipitation: 50 to 70 mm/year) dominated by salt deposits such as the Lisan peninsula;
- b) presence of submarine circular collapses visible along the coast. Their diameters decreasing with distance from the shore line;
- c) appearances of springs and recurring landslides along the coast.

With the exception of the submarine features, all these elements are located in the land strip that emerged progressively from the 1960s, 33 m in elevation, ranging from a few decameters up to several kilometers wide. In many places, the surface is characterized by superficial seepages causing subtle to very pronounced subsidence, and sinkholes.

In this contribution, we show that advanced differential radar interferometry techniques applied to ERS, ENVISAT and COSMO-SkyMed images stacks are able to underscore the most affected places. The mapping of these areas and their monitoring is essential to set up susceptibility maps in relation with geotechnical issues to existing and future infrastructures such as hotels and dikes.