

# Coastal karst aquifers of the Levant, Syria and Lebanon, and their submarine discharge

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• Many submarine karst springs **SMKS** are known around the Mediterranean, considered as a **potential unconventional resource**.

• The total submarine fresh groundwater discharge is estimated to be:

• 0.5 to 1 billion m<sup>3</sup>/y along the **Lebanese coast**,

• 1 to 3.7 billions m<sup>3</sup>/y along the **Syrian coast**,

• **BUT: no direct measurement and no available water balance to make the estimate reliable.**

• **No information about the coastal aquifers functioning.**

• **Origin of SMKS in Mediterranean regions:**

- during the Messinian salinity crisis (around 5.5 Ma) the sea level dropped down up to 1500 m below present sea level.
- Rivers deeply entrenched their valleys, which were filled by Pliocene marine and continental sediments, and sometimes in Syria volcanic formations (Bassieh Bay) and karst developed up to the bottom of carbonate rocks.
- SMKS occur either at karstic closed depressions, as it is in Chekka, or through cracks in the volcanic cover which confines the aquifer at least locally, as in Bassieh.

• **The goals of the MEDITATE project were:**

- to synthesise all hydrogeological information relating to submarine discharge;
- to analyse the functioning of two SMKS from monitoring Q, C and T, and sea level:
  - in the Bassieh bay, Syria,
  - in the Chekka bay Lebanon

• **Monitoring of temperature, conductivity and flow rate**

• massive sea water intrusion occurs during low flow (up to 60%) and even flow inversion under on-shore pumping conditions, at Chekka, not at Bassieh.

• measured flow rates are very low during low flow (a few tens of L/s of fresh water), while several m<sup>3</sup>/s were previously estimated.

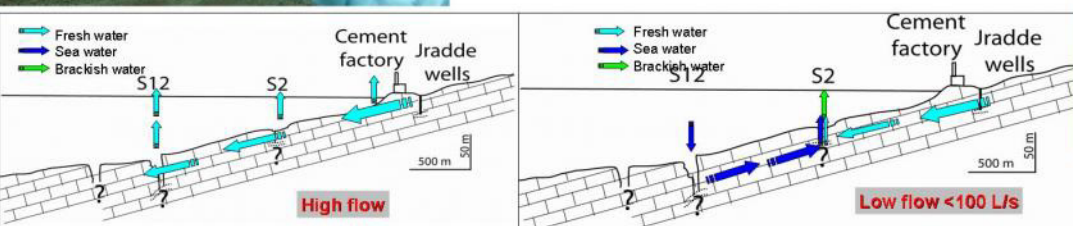
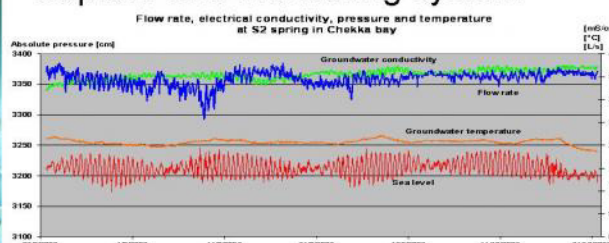
• the water balance of the systems strengthens that the flow rate is in annual average 10 times lower than previous estimates (around 2 m<sup>3</sup>/s at Chekka, i.e. 63 millions m<sup>3</sup>/y).

• **At Chekka, brackish water discharging at low flow rate during summer makes the Chekka SMKS unexploitable**

• **At Bassieh, fresh groundwater discharges at scattered SMKS with low flow rates. As the aquifer is protected from sea water intrusion, the resource should be exploited only from onshore wells.**



Capture and monitoring system



Functioning of Chekka SMKS