Workshop CNR IRPI
50 Anni di Attività
Istituto di Ricerca per la Protezione Idrogeologica

CONCEPTUAL AND NUMERICAL MODEL OF COASTAL SPRINGS SUPPORTING THE ENVIRONMENTAL RESTORATION OF MAR PICCOLO (TARANTO, SOUTHERN ITALY)

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IL CONTRIBUTO DEL CNR IRPI AL SISTEMA PAESE PER LA MITIGAZIONE DEI RISCHI GEO-IDROLOGICI

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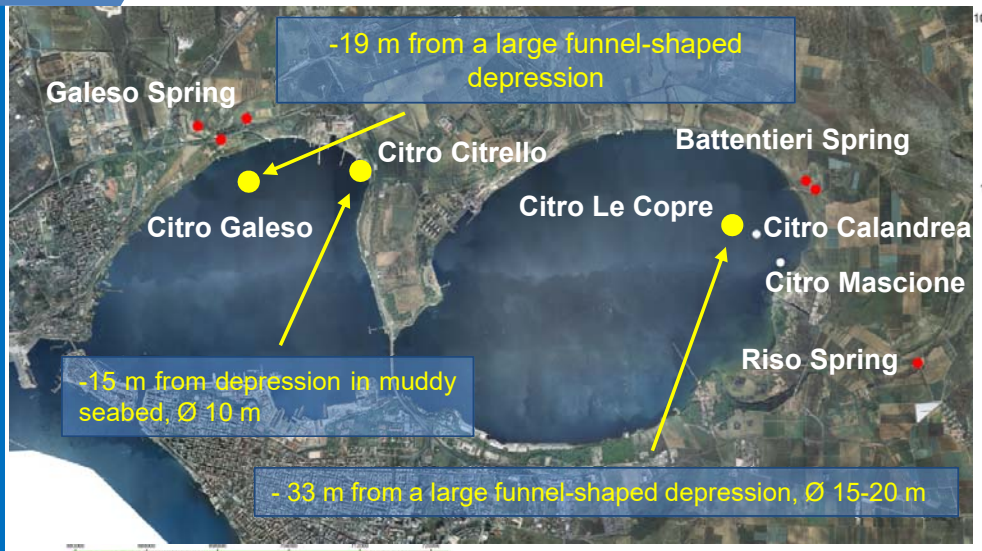
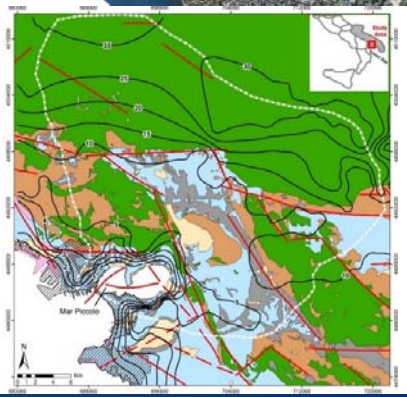
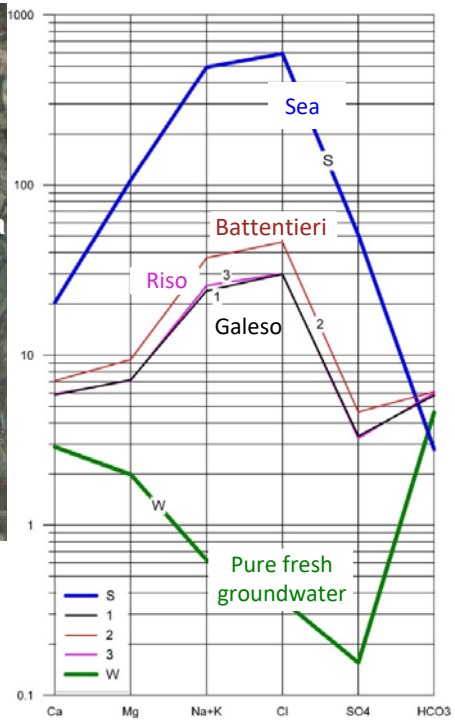
GEOLOGICAL AND HYDROGEOLOGICAL SETTING

The Mar Piccolo ('little sea', approximately 20.7 km^2) basin is a small marine basin that lies to the north of Taranto (southern Italy) and is currently connected to the open sea (Ionian Sea) through two channels.





Geological and hydrogeological map



Radiocarbon (^{14}C) of the Galeso spring = 40.3 +/- 0.2 pMC

The corrected groundwater age was assessed with the models of Pearson (1965)= 1445 years BP.

Parametri chimico - fisici e concentrazione dei costituenti principali dell'acqua di falda

Spring	Temp (°C)	pH	SpC (mS/cm)	O.D. (mg/l)	ORP (mV)
Galeso	18.55	7.18	3.95	5.07	224
Riso	17.04	7.16	3.89	5.37	163
Battentieri	17.11	7.1	5.21	5.9	129

$$f_{sea} = \frac{m_{Cl^-,sample} - m_{Cl^-,fresh}}{m_{Cl^-,sea} - m_{Cl^-,fresh}}$$

Percentuale di mescolamento acqua dolce

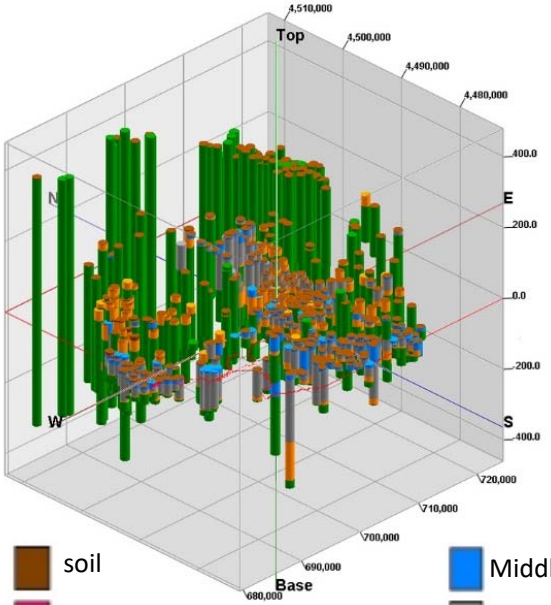
Spring	Percentuale di mescolamento acqua dolce - acqua salata
Galeso	5.6 %
Riso	5.4 %
Battentieri	8.4 %

NUMERICAL MODEL

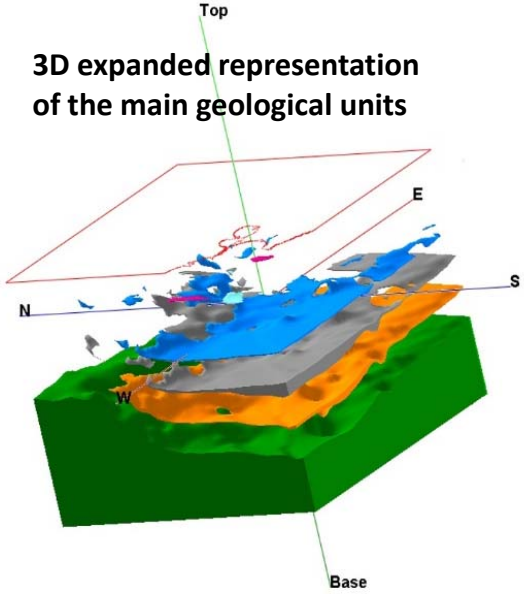
The mean monthly yield of each spring outflow (surveyed or not), travel time, and main path flow was determined using the numerical model **MODFLOW** implemented with the complementary codes **PEST** and **MODPATH**

The wells located in the area used to define hydrogeological interpretation are 716. From the stratigraphic column, was developed a three-dimensional model of the hydrogeological complexes)

a 3D view of stratigraphic logs

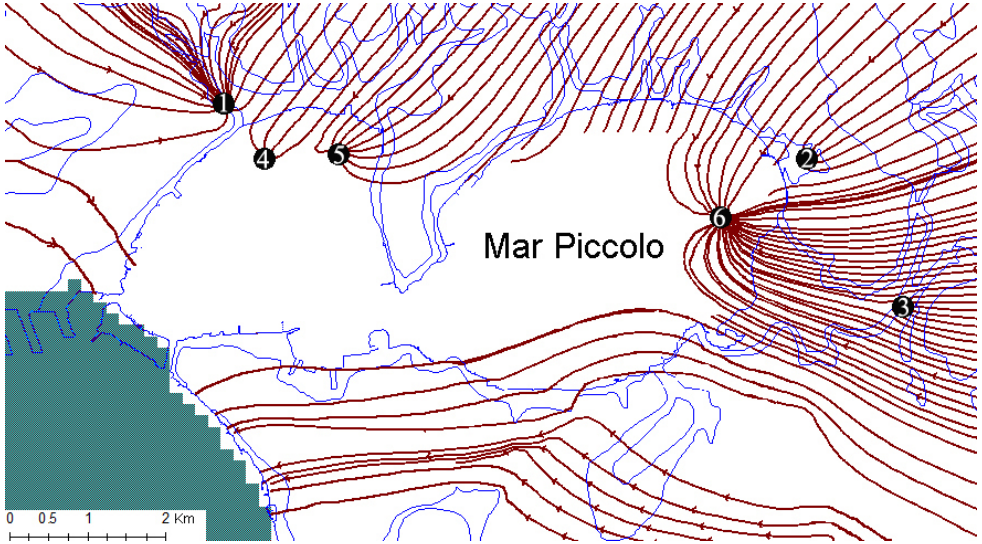


3D expanded representation of the main geological units



- soil
- recent Holocene coastal deposits
- Holocene alluvial deposits
- Middle and Upper Pleistocene calcarenite and sand
- Lower Pleistocene clay
- Middle Pliocene-Lower Pleistocene calcarenite
- Mesozoic limestone

The maximum travel time in the hydrogeological basin was equal to approximately 1500 years, almost matching with the spring groundwater age



Main path flow lines and travel times (displacement between two consecutive arrows corresponds to 10,000 days).