Modelling groundwater saewater contamination in a coastal aquifer: the case of Sibari Plain (Calabria)

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The Sibari Plain represents a coastal plain located in the northeastern Calabria Region (southern Italy). The late Pleistocene-Holocene plain evolution is characterized by uplift and alluvial fans development along the outer limit, fault activity and the Crati Delta progradation in the middle sector and its result is a complex stratigraphic architecture.

The plain is characterized by two well defined aquifers and the analysis of the hydrostratigraphic units shows a very complex framework made by the association of "jigsaw-puzzle" and "labyrinth" systems. The thicknesses and geometry of aquifers and aquitard were estimated by well-log data to be used for numerical the hydrogeological modelling.

The computer codes selected for numerical groundwater modelling were MODFLOW and SEAWAT. Model was calibrated with PEST code with a correlation coefficient equal to 0,90. The water balance of both aquifers was calculated.

Furthermore, 103 wells were sampled and analyzed for a geochemical characterization. Geochemical data were interpreted following a reliable procedure which comprises: the classification of waters and the inspection of chloride plots, reaction path modeling of ionic exchange by means of the EQ3/6 software package and the interpretation of isotope data. The final aim of this procedure was the elaboration of the conceptual model of the site, which was based not only on the outcomes of the interpretation of geochemical data but also on the synthesis of these results with geological and hydro-geological evidence. The chemistry of groundwaters is dominated by Ca-HCO_3 (70 samples) and Na-Cl (14 samples) compositions. The Latter is typical of the coastal areas where sea water ingression or a mixing with brine deep waters are possible.

The presence of buried salt rocks, deep mineralized water bodies and fault system with subsurface evidences suggests the possible existence of plumes of deep mineralized waters, which use the tectonic discontinuities to rise toward the surface.