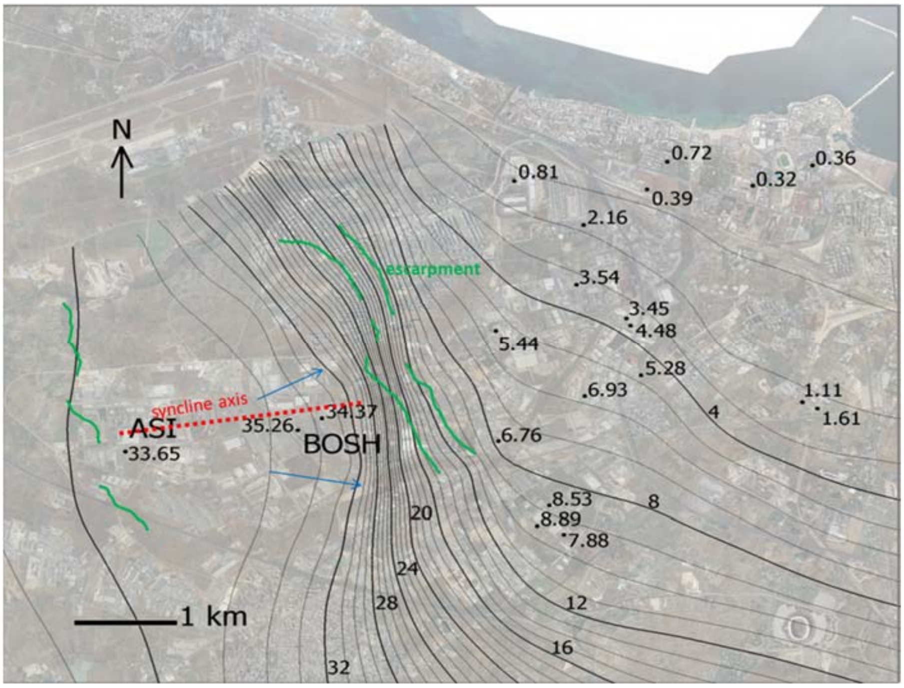
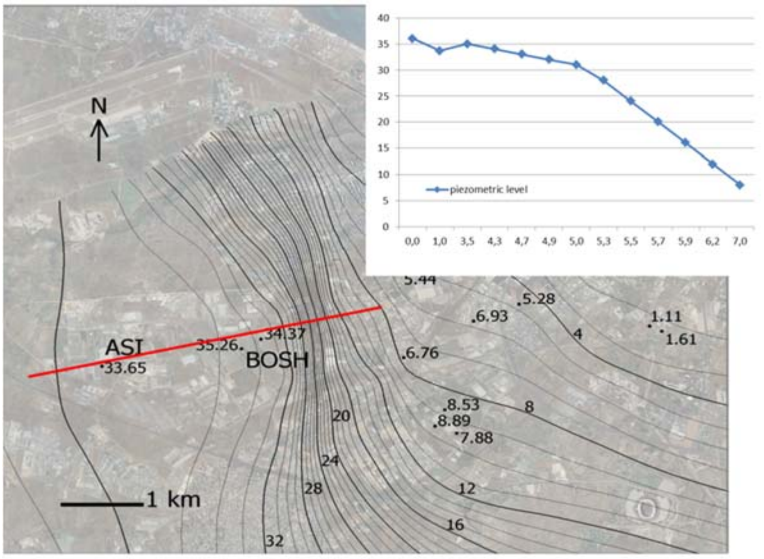
1. The observed high hydraulic heads has to be better explained (L359-L366). It cannot be due to the zone of poor connection only.

The position of the escarpments and of the anticlinal axis has been inserted in the piezometric map (see figure below).



What can be seen is:

a) The anticlinal behaves as a local subterranean watershed;
b) The lower hydraulic head values (5-8 m, asl) are downstream of the escarpments.



Profilo lungo la linea rossa.

Downstream of the escarpments there is the Calcarenite di Gravina formation, whereas upstream (BOSCH and ASI areas) the Calcare di Bari formation; a possible explanation for the increase in hydraulic gradient is: 1) lower transmissivity as showed through the step drawdown tests; 2) the transition from a more permeable outcropping lithotype to a less permeable one resulting in a decrease of the effective infiltration; 3) hydraulic disconnection due to lower interconnectivity of the fracture system.

2. The flow model is calibrated in steady state on data collected in Feb. 2012. Are these data representative of steady state?

The data collected in Feb 2012 reasonably show a regional trend for water table height, orientation, flow path distribution and gradient. Of course a monthly collection of hydraulic head data may improve the estimates of aquifers properties and the simulation of hydraulic head and contaminant transport.

3. There is salt water intrusion at the coast boundary and it seems you neglected it in the modelling. Why?

In the study area groundwater is floating on an underlying saltwater zone. It has been involved by the process of seawater intrusion showing a concentration of salt variable from 0.5 and 2.5 g/l (Cherubini, 2008). Anyway this salt concentration gives rise to a small effect on the density of freshwater. Therefore it is reasonable to assume a constant density model neglecting the saltwater intrusion.

4 The transport seems to be simulated in 2D. Are you sure that the concentration at the source is homogeneous over the all depth of the aquifer to allow this approximation? Are the measured concentrations representative of the average concentration over the depth?

The groundwater flows through a sub parallel fractured layer separated by compact rock blocks. In the study the stratigraphic sequence observed during drilling of wells, from bottom upward, is Jurassic dolomites (with a thickness of 21m), Cretaceous limestone (with a thickness of 26m), and Pleistocene sandstone (with a thickness of 5m) (Masciopinto et al. 2013). The whole thickness of the fractured layer where groundwater flows varies in the range of 10 – 30 m, whereas the field scale of the horizontal flow is of the order of magnitude of 10^4 m. The source of contamination is located in an industrial area where in the past chlorinated solvents have been spilled directly into the groundwater wells. For this reason a two dimensional flow and transport and point source contamination assumption can be considered reasonable. The concentration has been monitored into the groundwater wells using a bailer. In order to obtain the representative aquifer conditions, purging immediately prior to sampling has been carried out.

5. The subtitle L356 is misleading. How did you detect the sources?

The paragraph at L356 doesn't talk about sources but it is about the' Analysis of the scenario of contamination for the study area'.

The subtitle 'Detection of the sources of contamination at L533 has been changed into '*Analysis of the scenario of contamination'* which is no more misleading.

6. The most innovative part of the work is the comparison between linear and non-linear flow. (Fig. 13). Please provide more information and highlight the differences between Cherubini et al (2014) work.

The following periods:

“Figure 13 shows the breakthrough curves of hypothetical continuous contamination released in correspondence of the hot spot, determined for linear and nonlinear flow model, evaluated at the downstream boundary for nf = 20. The nonlinear model shows a delay in the breakthrough compared with the linear one. This is coherent with what detected by Cherubini et al (2014) who found a delay in advective solute transport for a nonlinear flow model in a fractured rock formation respect to the linear flow assumption.”

Have been substituted with:

“Figure 13 shows the breakthrough curves of hypothetical continuous contamination released in correspondence of the hot spot, determined for linear and nonlinear flow model, evaluated at the downstream boundary for nf = 20.

Figure 14 shows the mean travel time at varying number of fractures for the linear and nonlinear model. With increasing number of fractures, the travel time increases in a linear way, because the cross section area increases as well. The figures highlight that travel time for the nonlinear model is higher than the linear assumption. In particular way the percentages of error are in the range of 6.22 – 5.34 % passing from n_f=4 (Re = 0.02 – 10.60) to n_f=28 (Re = 0.002 – 1.51). This is coherent with what detected by Cherubini et al (2012, 2013, 2014) who carried out hydraulic and tracer tests on an artificially created fractured rock sample and found a pronounced mobile–immobile zone interaction leading to a non-equilibrium behavior of solute transport.

The existence of a non-Darcian flow regime showed to influence the velocity field by giving rise to a delay in solute migration with respect to the values that could be obtained under the assumption of a linear flow field. Furthermore, the presence of inertial effects showed to enhance non-equilibrium behavior. In particular manner they found that percentage of error on the travel time respect to the linear flow assumption varied in the range of 5.90 – 40.75 % corresponding to a range of Re of 29.48 – 52.16. These results highlight that as the scale of observation increases the error on the mean travel time respect to the linear flow model becomes more relevant. In fact, at field scale also for Re just above the unit (nf = 28) the error is equal to 5.34 % comparable with the error of 5.90 % found at laboratory scale for Re equal to 29.48. This means that under anthropic stresses multiple pumping or injections give rise to a higher flow velocity and then higher Re leading to a dramatic delay on contaminant transport. Therefore, nonlinear flow must be considered in order to have a more accurate estimation of the breakthrough curve and mean travel time of contaminated scenarios. ”