AUTHORS REPLY TO REVIEWER 1 (Prof. M. Giudici)

INTRODUCTION

We thank the reviewer for his thoughtful and thorough review, as well as for his generally positive comment to the manuscript.

REPLIES TO GENERAL COMMENTS TO THE PAPER

(comments by the reviewer are in BOLD-ITALIC)

1) The data set is quite complete and of good quality. The data processing is somehow limited and the model quite simple, but the conclusions are sufficiently supported. For instance, it could be nice to attempt to compute cross-correlation between piezometric head and the rainfall cumulated over different periods, in order to quantitatively differentiate the response of the measurement points, whose data are plotted in figure 2 (see Giudici, M., Manera, M., and E. Romano, The use of hydrological and geoelectrical data to fix the boundary conditions of a ground water flow model: a case study, Hydrology and Earth System Sciences, 7, 297-303, DOI:10.5194/hess-7-297-2003, 2003).

<u>Short reply:</u>

We agree in principle, but we believe that computing cross-correlation between piezometric head and the rainfall cumulated over different periods is somehow beyond the scope of the manuscript.

<u>Long reply:</u>

The cross correlation approach applied by the reviewer in his cited work of 2003 is certainly an interesting one. However, we feel that such an analysis and a proper discussion of the possible results, would actually be the core of another paper, and that its inclusion in this paper would make the manuscript too lengthy and would change too much the focus of it.

2) In section 7, it could be useful to show that the uncertainty on the measured quantities yields a relatively small uncertainty on the outcomes. This is not the case for a classical hydrological balance based on purely hydrological data.

<u>Short reply:</u>

We agree

<u>Long reply:</u>

We agree and we will include uncertainty analysis. As the estimates of supplemental annual deep inflow (Vdw, which was assessed in about 7800-17500m^3 for the hydrologic year 2009 based on formula 2 at page 7718) was carried out in three steps, each of which brings an aliquot of uncertainties to the final calculation.

However, the uncertainty in Vdw is affected by uncertainties related to the estimated annual rainfall recharge volume (Vr) calculated using the Thornthwaite and Mather formula (that, according to Fetter 2001, is in the order of 25%), and by uncertainties related to measured or calculated isotopic values and calculation of aliquots and volume of deep water inflow (the sum of which is in the order of 11%)

While we are actually unable to precisely calculate errors related to Vr, we are able to compute (and report in the paper) the uncertainties related to measured or calculated isotopic values that were used to estimate the aliquot of deep water inflow and it's volume, by using the common error propagation methods reported in Taylor (1997).

The estimate of the aliquot and volume of deep water inflow was carried out in the 3 steps described in sections 6 and 7. In the 1st step, as described in lines 4-10 at page 7718, tritium was used to define the aliquot of deep water (aliquot a) and the aliquot of recharge water (aliquot b) with respect to the total represented by water contained in the local aquifer that was sampled in DrA (total c). Each aliquot is characterized by a determined value of tritium with a given precision related to instrumental errors (see table below):

	Measured Value	**Precision**
δ^{18}Or recharge water (recent rainfall) (b)	-9.13‰	±0.1‰
δ^{18}Of flysch aquifer (from DrA) (c)	-5.33‰	±0.1‰
T.U. flysch aquifer (from DrA) (c)	3.5 T.U.	±0.2 T.U.
T.U. recharge water (recent rainfall) (b)	9.8 T.U.	±0.2 T.U.
T.U. deep water (old water) (a)	0 T.U. (assumed)	-----
	Calculated value	**Uncertainty**
Aliquot of recharge water (recent rainfall) (b)	0.35	±0.03
Aliquot of deep water (old water) (a)	0.65	±0.03

In the 2nd step (as explained in lines 8-12 at page 7716), "a" and "b" aliquots were used to estimate the δ^{18}O of deep water (δ^{18}Odw) based on the following relation: $a*\delta^{18}Odw + b*\delta^{18}Or = c*\delta^{18}Of$

	Calculated value	**Uncertainty**
δ^{18}O Deep water (δ^{18}Odw)	+5.5‰	±0.5‰

In the 3rd steps (as explained in lines 18-20 at page 7718) these values were used to calculate the relative δ^{18}O isotopic ratio which is then multiplied to Vr to estimate the volume of deep water recharge (Vdw).

	Calculated value	**Uncertainty**
$(\delta^{18}Of - \delta^{18}Or)/(\delta^{18}Odw - \delta^{18}Of)$	0.26	±0.03

Intended consequent amendments to the paper:

- ✓ We will we will include estimated uncertainties in the paper

Cited references:

Taylor JR (1997) An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements, University Science Books, 2nd edition, Sausalito, CA.

Fetter, C.W.: Applied Hydrogeology, Prentice Hall (2001) 691 pp.

REPLIES TO SPECIFIC COMMENTS TO THE PAPER

(comments by the reviewer are in BOLD-ITALIC)

The reviewer has indicated a number of specific points where typing or other minor errors are found

Short reply:

We agree with all of them, and we thank again the reviewer for the specific indications

Intended consequent amendments to the paper:

Correct the paper accordingly