Authors' Response to the second Referee's Interactive Comment on "*Intensively exploited Mediterranean aquifers: resilience to seawater intrusion and proximity to critical points*" by K. Mazi et al.

Title:

The title has been changed slightly; see above.

1. Introduction:

L 94-95 We have added "…in terms of pumping location and rate of extraction" to more fully describe the parameters included in our investigations, as requested by the Referee.

Please note that the model that we use is completely analytical (not quasi-analytical), and it was introduced by Koussis et al. (2012) and further developed by Mazi et al. (2013).

We respond to the Referee's comments regarding the Figures farther below (see heading).

3.2 Analytical Approach

L 377-380 Response to the Referee's requested clarification regarding dimensionality: "We note that, due to considering a vertical plane (see Appendix), all flows are per unit width perpendicular to the aquifer plane (or parallel to the coastline), i.e., the flow units are m^3/m per unit time (day or year)."

REFERENCES

We wish to clarify that our publication Mazi et al. 2013. Tipping points for seawater intrusion in coastal aquifers under rising sea level, *Environ. Res. Lett.* **8** 014001, presents only generic applications. It does not deal with applications in real coastal aquifers, with actual hydrologic data. It introduces the concept of *tipping points* in SWI, applying it to climate-change stress conditions (sea level rise, decline of submarine discharge and decline of boundary head) for two types of regimes (flux- and head-control), also performing a parameter sensitivity study (hydraulic conductivity, slope, aquifer depth at the sea and sea salinity). In contrast, the current manuscript concerns real applications, quantifies aquifer resilience/vulnerability to actual current and to future seawater intrusion forcing, and identifies two different critical SWI limits under groundwater exploitation and/or climatic stress, adding to the tipping-points analysis in Mazi et al. (2013). We believe that the main points of the manuscript are presented clearly already in the Abstract, about which the Referee writes "The abstract is concise and (but) informative enough, and to the point. It covers (briefly): the study sites, concepts & methods of analyses, and also the main results (qualitatively)."

Regarding the presentation of the mathematical model *per se* (Appendix), please note that only the derivation of Eq. A6 is new, and now also the reference to the study of Kacimov et al. (2009) at the end. However, we believe that a terse but content-rich description is useful to the reader who may not be interested in the mathematical details yet wishes to understand the level of modelling complexity.

The paper by Koussis et al. (submitted) has no overlap with the present ms. It deals with a specific feature of the hydraulics/hydrodynamics of SWI, as is evident from its title.

Finally, in the revised ms, L 242-243, we refer to Milnes. 2011. Process-based groundwater salinisation risk assessment methodology: Application to the Akrotiri aquifer (Southern Cyprus), *J. Hydrol.*, **399,** 29–47, as additional source of information on the Akrotiri aquifer, Cyprus. The papers by Chang & Yeh (2010) and by Al-Bitar & Ababou (2005) deal with the heterogeneity of aquifers in a stochastic framework and do not pertain directly to our work here. Please note that the authors and co-workers have performed Monte Carlo simulations in the case of the Akrotiri aquifer (see among the References, Koussis (Ed.) (2001), Koussis, A.D. et al. (2010a, b), Prieto et al. (2006), and Prieto & Destouni (2005)), however, we do not refer to the stochastic aspect of these works in our ms.

FIGURES

Fig. 3 As requested, textures have been replaced by greyscales and legends have been enlarged, however, the final size of the figures will be determined by HESS.

Figs. 4 & 5 The Referee's interpretation is correct that the abscissa is the freshwater discharge to the sea; more precisely, it is its absolute and normalized value. The distance of the toe from the coastline, the ordinant, is also normalized.

Fig. 6 This figure shows the variation of the normalized toe location with the normalized remaining groundwater flow from the pumping location q_{norm}. Please note that q_{norm} is not the normalized "*remaining submarine flow to the sea*".

Regarding the "pumping well", we wish to point out that we have explicitly stated already in the main text (L 358-361, not only in the Appendix) that "the model solution can account for groundwater pumping in a collector trough (line sink, or well gallery)". Obviously, the distribution of pumping wells in an actual field will not conform to this idealization. This configuration, however, is necessary for obtaining analytical solutions in a ***sloping*** aquifer (it eliminates the transverse direction and thus the azimuthal variation of the gravitational flow component). We wish to reiterate that the applications of our model target screening-level assessments and aim at understanding the general functioning of a regional coastal aquifer under various stresses; this is also compatible with the assumption of the sharp interface as well as with the schematizing of the aquifer as having a constant base slope.