

Interactive comment on “An eco-hydrologic model of malaria outbreaks” by E. Montosi et al.

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Overview

The study investigates the use of an eco-hydrological approach to estimate the malaria incidence data in South Africa. Briefly, results show that soil moisture is able to predict malaria's cases variability better than the other climatic factors that are usually employed, i.e., rainfall and air temperature.

General Comments

With pleasure I have read this paper, which is well written, well structured and clear; the language is fluent and precise. It addresses an important topic that I found to be very interesting. It is very nice to see how the authors have used a surface water balance

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model to predict malaria incidence in South Africa. Moreover, I really appreciate the attempt made by the authors to address this important issue through an "hydrological" approach. In fact, I believe that multidisciplinary studies, as the one here presented, should be highly welcome as they might show new and interesting ways to investigate this types of issues.

Anyhow, the main reason to post this comment is related to a possible development (improvement) of the analysis carried out in the paper, or likely a further aspect that could be discussed. In fact, alternatively to the use of a soil water balance model to estimate soil moisture, satellite data might be employed. In South Africa several soil moisture products were developed, also with high spatial resolution (see e.g. *Bartsch et al., 2009*) and <http://www.ipf.tuwien.ac.at/radar/dv/asar/>). In fact, due to the low density of the meteorological stations in the study area, the reliability of rainfall and temperature data (used also as forcing data for the soil water balance model) could be low. Satellite soil moisture data will provide an additional information that might improve the results. For instance, *Brugger et al. (2011)* obtained that the seasonal cycle of *Culicoides* spp. abundance (a family of small flies) is well described by temperature and precipitation observations, as well as soil moisture from Advanced SCATterometer (ASCAT) satellite data. Using the latter significantly improves the performance of the Poisson regression model used in their study. A similar approach could be easily adapted also for the estimation of malaria incidence.

Concerning the paper, I would suggest two aspects that can be addressed to further improve its readability and relevance. The first one is related to the interpretation of the results reported in Table 1. Actually, it is not totally clear if the values represent the correlation coefficient or the Nash-Sutcliffe efficiency index. I believe that they should be a mixture but it should be specified better. In fact, it would be interesting to see clearly which is the correlation between malaria's cases and rainfall, temperature and simulated soil moisture values; without and with the removal of the seasonal cycle.

Additionally, as I expect that the HESS readers (like me) are not very familiar with

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studies investigating the prediction of malaria incidence, it would be useful the authors can add some information about the results obtained by previous studies (especially in the same region) that attempted to predict malaria incidence. So, the reader might better understand which is the added value of the approach developed for this study.

Finally, one minor comment: in Figures 2 and 3 it should be specified that the starting date is July 1996, and not January 1996 as I supposed at the beginning.

Reference

Bartsch, A., Doubkova, M., Wagner, W. (2009). ENVISAT ASAR GM soil moisture for applications in Africa and Australia. *ESA conference on earth observation and water cycle*, 18 - 20 November, 2009, Frascati, Italy.

Brugger, K., Rath, C., Stracke, D., Pathe, C., Wagner, W., Rubel, F. (2011). Statistical modelling of *Culicoides* spp. (Diptera: Ceratopogonidae) using ASCAT soil moisture data. *EUMETSAT/ ESA Scatterometer Science Conference 2011*, Darmstadt, Germany, 11-13 April 2011.

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