Hydrol. Earth Syst. Sci. Discuss., 9, C1042–C1043, 2012
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Hydrology and Earth System Sciences Discussions

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

Anonymous Referee #3

Received and published: 22 April 2012

The manuscript presents a model showing that soil water content variability is able to explain the variability of malaria incidences in three provinces in South Africa better than rainfall and temperature, more commonly used to model malaria outbreaks. The eco-hydrological model is derived by reasonably simplifying a full model of malaria transmission, thus showing how a model parsimonious in the use of parameters can be a useful tool to reproduce malaria incidences.

The manuscript is very well written, thus easy and pleasant to read. The methods are clearly explained and the results properly discussed. I fully support the publication of the manuscript.

MINOR/TECHNICAL COMMENTS

- Eq. 3: the birth rate μ equals the death rate; is that a common assumption?

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- Page 2837, line 25: the term surface water storage sounds a bit vague to me. What does that include (ponds, lakes, rivers,...)?

- Pages 2837-2838: the list of assumptions is not really linked with the previous text. Although this is not a big problem, I believe that a phrase introducing the assumptions would help the readability.

- Assumption 1: Since H_{TOT} is constant, the assumption here is that the susceptible population remains constant. I cannot understand why this implies that $H_I << H_{TOT}$. Maybe, the authors could provide some comments to explain this point.

- Assumption 1: with this assumption, the authors dismiss Eq. 3, which is no longer mentioned. However, it seems to me that Eq. 3 needs to fit within the assumptions taken by the authors. If one divides both sides of Eq. 3 by H_{TOT}, that equation becomes ($x = H_S/H_{TOT}$)

$$\frac{dx}{dt} = \mu + \gamma \left[1 - x - \frac{H_I}{H_{TOT}}\right] - \eta_0 \frac{M_I(t)}{H_{TOT}} x - \mu x. \quad (1)$$

If one assumes $x = const$ and $H_I << H_{TOT}$, then $dx/dt = 0$ and the additional assumption $M_I << H_{TOT}$ is required (is this reasonable?). Such an equation can be then used to calculate x for the given parameters of birth/death and loss of immunity. The authors might want to check that this is correct and maybe add it to the manuscript. However, that does not really change their model, because they use Eqs. 17-18, which are not affected by these considerations on Eq. 3.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 2831, 2012.