Hydrol. Earth Syst. Sci. Discuss., 11, C3611–C3614, 2014
www.hydrol-earth-syst-sci-discuss.net/11/C3611/2014/

Hydrology and Earth System Sciences Discussions
Open Access

Interactive comment on "Estimates of global dew collection potential" *by* H. Vuollekoski et al.

H. Vuollekoski et al.

henri.vuollekoski@helsinki.fi

Received and published: 4 September 2014

We thank Anonymous Referee #1 for his/her efforts, and answer to the referee's concerns as follows:

1. p. 9527.The re-analysis of meteo data is crucial for the results. More information about the final uncertainty and level of confidence have to be given. In particular, how such data can be extrapolated to areas where no local measurements are available (e.g. Africa)?

The best available answers to this comment can be found in Dee at al (2011), which is already referenced on p9527.

We are of the opinion that including a discussion of the uncertainties and level of confidence of the ERA-Interim data set is not necessary nor within the scope of this paper because (1) ERA-Interim is a publically available data set produced by ECMWF and the authors of this manuscript did not play any role in creating or validating this data set, (2) numerous studies already exist in which the validity and error estimates of ERA-interim are presented (e.g. Betts et al (2009), Mooney et al (2010), Bao and Zhang (2013)) and (3) over 2000 articles have already been published in peer-reviewed journals which apply the ERA-interim data set in a similar manner to what we do in this manuscript.

In response to the second point of this comment, via the 4D-Var data assimilation system observations from all regions of the Earth (including Africa and Antarctica) are included in the ERA-interim reanalysis. Although surface, local observations are indeed sparse in regions such as Africa they certainly do exist and are augmented considerably by satellite observations, aircraft observations etc. Please see Dee et. al (2011) for details of the type and number of observations which are assimilated.

However, we do acknowledge that the ERA-interim cannot be regarded as “truth”. Therefore, we will modify section 2.2 to make sure this is clear to readers. We do not include quantitative error estimates as this would be exceeding complex as (1) all meteorological variables taken from ERA-interim to run the dew model have different errors and (2) the magnitude of errors strongly depends on the time of day, season, and global location.

Betts, A. K., M. Köhler, and Y. Zhang, 2009: Comparison of river basin hydrometeorology in ERA-Interim and ERA-40 reanalysis with observations. J. Geophys. Res., 114, D02101

Mooney, P. A., F. J. Mulligan, and R. Fealy, 2010: Comparison of ERA-40, ERA-Interim and NCEP/NCAR reanalysis data with observed surface air temperatures over Ireland. Int. J. Climatol., 31, 545–557,

Bao, X and Zhang, F. 2013: Evaluation of NCEP–CFSR, NCEP–NVAR, ERA-interim, and ERA-40 reanalysis datasets against independent sounding observations over the Tibetan plateau. J. Climate, 26, 206–214.

2. p. 9529-30. The exchange coefficients h and k that have been used do not correspond to what is measured, as the authors themselves are noting. Thus the dew yield that is calculated is far from the reality and can give to erroneous interpretations.

To our knowledge no directly comparable measurements on dew formation exist, which makes it impossible to say that the chosen coefficients are wrong (or right). But even if the approaches in measurement and large-scale modeling differ, the underlying physical processes (and their descriptions) are the same. We decided to use the exchange coefficients that have been found to give reasonable estimates by other authors.

As a matter of fact, it is well known that dew does not form for wind larger than typically 4-5 m/s, but is at maximum for zero-wind (which is not zero because of the natural convection) . This is in contradiction with the model, presumably because of the wrong values chosen for the exchange coefficients.

There is no physical reason for dew not occurring at higher wind speeds, as long as the collector is able to cool itself faster than the wind is heating it. Please note that our paper does not concern naturally occurring dew, but dew on an artificial, efficiently cooling collector surface. We will further clarify this difference in the revised manuscript.

3. p. 9531. Due to the model that does not account properly of the exchanges and the extrapolation of the meteo data, it is not surprising to see a difference with the collected dew. It would be interesting to have both and simulated values, to figure out what is the difference. In the Zangvil paper, the mean dew yield is on order of 0.08 mm/day, in the present model, it is about 0.3 mm/day. There is nearly a factor of 4 between both values.

We are very happy that our model predicts significantly higher values than those reported by Zangvil (1996), who used a Hiltner dew balance, and the author reports the values of dew as representative to those observed in the desert "naturally". The values presented in our paper represent those from the efficiently cooling OPUR film. We will further clarify this difference in the revised manuscript.

4. p. 9520, L28. There are studies based on measurements in some countries (India). There is a recent study based on another approach (artificial neural networks) for Morocco, see I. Lekouch, Lekouch et al., Journal of Hydrology 448–449, 60–72 (2012).

The mentioned studies are not global, but useful references nevertheless. These will be added to the revised version of the manuscript.

5. p. 9520, L6. The paper is not published, this ref. is not useful

This reference will be replaced in the revised manuscript.

6. Abstract. It has to be noted that the estimation is based on a calculation and reanalysis of meteo data. A level of confidence (uncertainty) has to be given.

The abstract does mention the usage of reanalysis data. Please see our answer to the first comment.

HESSD

11, C3611–C3614, 2014

Interactive Comment