Hydrol. Earth Syst. Sci. Discuss., 6, C577–C579, 2009
www.hydrol-earth-syst-sci-discuss.net/6/C577/2009/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Estimating spatially distributed monthly evapotranspiration rates by linear transformations of MODIS daytime land surface temperature data" *by* J. Szilagyi and J. Jozsa

J. Szilagyi

jszilagyi1@unl.edu

Received and published: 4 May 2009

Reply to comments on "Estimating spatially distributed monthly evapotranspiration rates by linear transformations of MODIS daytime land surface temperature data" by J. Szilagyi and J. Jozsa

First of all, we would like to thank the reviewers for their valuable comments that lead to an improved manuscript.

Below we list how the reviewers' recommendations were incorporated into the revised

text of the manuscript and also answer their questions.

Referee #1:

1) We made changes to the original text (lines 150-153, 157, 178-181), explaining the physical mechanisms that can lead to a complementary relationship (CR) between actual and potential evaporation rates. We included reference to a new paper by the above authors (i.e., Szilagyi and Jozsa, 2009b) which is devoted solely to the explanation of the assumptions and the requirements necessary for the CR as well as describes the physical mechanisms in detail. 2) A constant net energy term at the evaporating surface is a common assumption to almost all CR-based methods, such as the AA model of Brutsaert and Stricker (1979) or the WREVAP model by Morton (1985), both cited in the text. Of course, the net energy term changes along the year, but it is typically assumed to be constant over the calculation time-step, which can be weekly to monthly. However, in the absence of weather fronts it is possible to apply the CR for sub-daily periods with adjustments to the available energy at the surface, such as was done by Parlange and Katul (1992), mentioned (lines 175-177) and referenced in the revised text. 3) A detailed sensitivity analysis (including LST) has been included in Szilagyi and Jozsa (2009a). Reference to that study is included in lines 424-425 of the revised text. 4) The ET = 2ETw – PET is derived from Brutsaert and Stricker (1979), the reference now included in the revised text in line 157. 5) Employing mean monthly values (e.g., mean daily or maximum temperatures, vapor pressures) in the calculations is equivalent to performing the ET calculation for a typical day, the variables attaining the mean values on such a day. In that sense, estimating the daytime mean air temperature from the mean daily and maximum temperatures is congruent, we believe. 6) The present method yields ET estimates for a pixel size of about one km by one km. Any direct measurements of ET, such as the application of fast response (i.e., eddy-covariance techniques), or Bowen-ratio instruments or lysimeters, yield results typically on a much smaller spatial scale, prohibiting or greatly hindering the comparison of the present technique with the latter ones. A good approach, we

believe, for validating the ET estimates of the proposed technique is via water balance calculations for the natural spatial unit, which is the watershed. Such a validation is customarily done for long-enough periods so that changes in the stored water volumes over the period can become negligible. As our example shows, even this latter very common and straightforward validation approach may be complicated in extended dry periods (such as the majority of the years for which the MODIS images are available) with a series of below-average precipitation years and extensive irrigation practices over the catchment. Without a thorough knowledge of the hydrology of the study watershed, such a validation could have resulted in faulty conclusions. This just emphasizes the value of local knowledge when testing a new method. 7) The original size of Figures 9-12 is bigger than shown in the available text. 8) Many thanks for noticing the two typos! Interestingly the original text, before the conversion at HESS, does not contain them, so something must have gone wrong during the text file conversion, which we did not pick out later.

Many thanks again for the valuable and constructive comments.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 1433, 2009.