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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

Anonymous Referee #1

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General comments. The paper is devoted to investigation of ability to estimate one of the main water balance components, mean monthly evapotranspiration (ET), for a middle size river basin area using MODIS daytime land surface temperature (LST) data. Similar problem definition is seemed highly pertinent because of no being meteorological and water balance stations distributed over the river basin territory in a number sufficient for obtaining LST data and consequent estimating evapotranspiration correctly enough. Practically satellite data present the only regular origin of cell-by-cell measurement results allowing determining values of ET for whole river basin or his

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parts. Developed in the paper approach based on attracting the Bowen ratio for ET calculations and using the Priestley-Taylor equation for defining values of ET for wet surfaces is also interesting significantly. However it is necessary to emphasize that such approach is ought to employ for a month or more long time interval.

Specific comments. Some remarks on the text of paper should be done. 1. The approach described by authors is based on assumption that sensible heat flux over the drying land surface is completely transfer to potential evapotranspiration under constant energy term Qn and minimal energy advection. What are the physical mechanisms of such transferring? What conditions in addition to above should be held in order to this assumption is true? How much do these conditions correspond with real conditions of the processes in question? It seems the named questions are worthy of more extensive discussion. 2. What is the reason to consider energy term Qn to be constant? How does this admission combine with temporal and space changeability of meteorological characteristics on the river basin (including radiation balance)? How typical is this admission for the river basin under investigation? Is it possible to employ suggested approach (particularly the wet-surface equation (WSE)) when Qn is not constant and if that is the case what ET estimation errors may be obtained? Ability of using condition for Qn to be constant is needed in more detail description. Estimation of named errors is also ought to produce. 3. Tws equated to minimal MODIS-derived temperature can mismatch to temperature at which water vapor under given condition becomes saturated. What errors of LST and correspondingly ET estimations does this assumption bring about? 4. Where is formulae ET = 2âĂćETw – PET (page 1437) deduced from? This algebraical expression is desirable to be commented. 5. Estimation of K is obtained by construction sinusoid dependence T on time followed by averaging procedure over the daytime period. At that amplitude of A = Tmax – Td, where Tmax and Td are mean daily maximum temperature in the month and daily mean temperature accordingly. It is necessary to note that scales of Tmax and Td averaging – month and day – are different. Mean daytime air temperature constructed using such estimation of K as well as values of differences Tmax – Td will be unsta-

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ble characteristics. 6. The authors consider excess of wet-environment values of ET above watershed-representative values of ET as evidence of used approach correctness. Unfortunately they does not compare produced ET estimations with the results of actual ground measurements of ET, especially since discrepancy between values of ET determined by described method and derived from water balance equation are quite big.

Technical corrections 1. Figures 9-12 are rather small. It is difficult to follow space changes of temperatures and evapotranspiration. 2. It is necessary to correct “ET” for “et” (3 line, page 1435; 26 line, page 1441).

Resume The paper may be published after corrections.

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