Hydrol. Earth Syst. Sci. Discuss., 7, C4808–C4810, 2011
www.hydrol-earth-syst-sci-discuss.net/7/C4808/2011/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Estimate soil moisture using trapezoidal relationship between remotely sensed land surface temperature and vegetation index" *by* W. Wang et al.

W. Wang

w.wang@126.com

Received and published: 25 January 2011

Many thanks to the reviewer's very suggestive comments. Here are some answers to the reviewer's comments:

(1) We agree that, the location we choose to validate the method is not very good, but this is the only place where we can get long series data of ground observations we need for calculting WDI and for validating the method, and this is an area well know by hydrology community. Surely, as suggested by the reviewer, it would be better find a more heterogeneous catchment to apply the method. However, it is really not easy to

get a data set as good as that in WGEW. We will try this in future research.

(2) More words are given about the novelty of this work. Although the idea of using the shape trapezoid to characterize the relationship between land surface temperature (Ts) and vergetation index (VI) has been proposed for many years, it is simply considered by many researchers as a more elaborate way than the triangle method for characterizing the wet and dry edge of the Ts $\sim$VI space. In the algorithm proposed by Moran et al. (1994), when they calculate the value of Ts$-$ a, no consideration was taken about the feedback effects of changes in Ts $-$ Ta on some variables such as ra and Rn which are used in the equations for calculating Ts $-$ Ta. In addition, there is a problem of applying the method for areas with complex terrains and limited availability of ground meteorological observations. In the present study, when we simplify the Ts-Ta versus VC trapezoid to be a Ts $\sim$ VI trapezoid, an algorithm was proposed to iteratively update the values of variables such as Rn and ra so to keep the Ts changing until it reaches a stable value, and an approach was proposed to interpolate the air temperature which is of significant importance in the iterative algorithm.

(3) rsm for the grass-bush rangeland (25 s/m) is based on the work of Moran et al. (1989) in the Alfalfa Experiment Conducted in 1985 in Phoenix, Arizona. Maybe it is a little bit too small, but according to our experiment, rsm is not a sensitive parameter.

(4) Yes, there is some confliction when we talking about the spatial variability in soil moisture which should be clarified. What we want to say is, when we look at the variability of an area, it greatly depend on the scale. In plot scale, some intensive observation, such as those in the Southern Great Plains 1997 (SGP97) Hydrology Experiment, have show that, within fields the standard deviation, coefficient of variation, skewness, and kurtosis increased with decreasing moisture content (Famiglietti et al., 1999), and the semi-arid area exhibits high spatial variability in moisture conditions. But at a large scale, such as 500m by 500m grid observed by MODIS, the within pixel variability is averaged. And in the WGEG area, there is not too much land cover heterogeneity as shown by its EVI values in Fig 7, therefore, we think that and spatial variability at this

scale is low.

(5) Many editorial errors have been corrected.

REFERENCES

Moran, M. S., Pinter, P. J., Jr., Clothier, B. E., and Allen,S. G.. Effect of water stress on the canopy architecture and spectral indices of irrigated alfalfa, Remote Sens. Environ., 29, 251-261, 1989.

Famiglietti, J. S., J. A. Devereaux, C. A. Laymon, T. Tsegaye, P. R. Houser, T. J. Jackson, S. T. Graham, M. Rodell, and P. van Oevelen, Groundbased investigation of soil moisture variability within remote sensing footprints during the Southern Great Plains (1997) Hydrology Experiment, Water Resour. Res., 35, 1839– 1851, 1999.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 8703, 2010.