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Hydrology and Earth System Sciences Discussions

Interactive comment on "Parameterization of atmospheric long-wave emissivity in a mountainous site for all sky conditions" *by* J. Herrero and M. J. Polo

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We acknowledge the comments made by Reviewer 3, which have helped us to address certain important issues in the work and to improve significantly its quality. Following this, we have incorporated some significant changes into the paper:

1) We have simplified the parametric expressions, both in terms and in significant digits of the coefficients, so they now look more "friendly", without any significant loss of accuracy in the final result. In our first proposal, the fitting of every parametric expression was assessed in terms of the actual adjustment of the interpolated surface directly.

Now, we have used as an indicator of the goodness of fit the error of the estimated versus measured emissivity itself, which has resulted in a lesser importance of several terms, and in their removal. Now all the parametric equations have three terms at most, with coefficients with 3 significant digits in general. Also, Eqs. 6 and 7 have been merged into one single equation (Eq. 6 in the revised version). Reformulation of N (Eq. 8 in revised version) has also led to the recalibration of Brutsaert's C coefficient, even though the same value of 0.34 was found to be correct. Also, in the previous version, the cloud index N of Brutsaert (1982) was applied only for values outside region A in Eq. 2; in fact, this means an additional not-direct parameterization in N. This regionalization has been removed, and now the only parameters that affect the modified Brutsaert equation are those in Eq. 8 (in revised version).

2) We have included the data from two new sites in the same area to validate the parametric expressions and evaluate the generality of both approaches (the 3-state parameterization and the modified Brutsaert equation). One of these sites is very close to the original RP station while the other is located at a different altitude and aspect (see Fig. 1 of the revised version). Their location is very adequate for reaching some meaningful conclusions. Particularly, we were able to discuss the scope of the expressions and the interest of each one based on data (see changes in abstract, site description, results, discussion, and conclusion, lines 23-28, 108-118, 253-256, 261-295 and 340-351 in the revised version, respectively). We found both expressions useful: the complete parametric expression let us obtain accurate values of emissivity at a very local scale, namely the Southern slope of Sierra Nevada over 2000 m; on the other hand, the modified Brutsaert equation has a broader scope and maintains a good performance on the most dissimilar sites. Both expressions estimate emissivity accurately from screen-level measurements, which was the initial objective.

3) The final sentence/statement has been deleted, since it was a speculation.

Specific comments are individually answered in the supplement attached. The revised version of the article is included in an Author Comment (AC C1481: 'Revised version

of the manuscript', Javier Herrero, 15 May 2012).

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/9/C1486/2012/hessd-9-C1486-2012-supplement.pdf

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 3789, 2012.