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Interactive comment on “A coupled remote sensing and the Surface Energy Balance with Topography Algorithm (SEBTA) to estimate actual evapotranspiration under complex terrain” by Z. Q. Gao et al.

Anonymous Referee #1

Received and published: 2 August 2010

General comments:

The paper describes a model to estimate evapotranspiration at large scale, based on the combined use of a digital elevation model, a landuse classification and remote sensing data. The approach is similar to other models such as SEBAL or S-SEBI. The main originality here is to take into account the effect of elevation (+slope and aspect) on the radiation computation. The method was applied with MODIS data over a large region in North-Eastern of China. The critical point in this study is the validation. Only

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one station is used to compare the flux estimated at different dates to observations. It's not enough, especially as to test a new algorithm including a new information on the elevation. It would be necessary to compare at least two stations at different elevations or with different slope or aspect values. Sometimes, the paper does not give enough information on the data used and the accuracy linked. For some figures or in tables, it is important to add the standard deviation or the confidence interval. Globally the paper is interesting with a lot of references, but it must be corrected in adding information at specific points listed below. It can be published if modifications are made to improve the text.

Specific comments:

Title: Maybe the title can be modified because the expression 'complex terrain' can include a lot of different surfaces and not necessary the relief.

Abstract:

p4877

line 9: explain what do you mean by complex ,

Line 24: explain what is your consistency index?

Introduction:

P4878

line 12: be careful: daily evaporation is not negligible for some surfaces (bare soil. . .)

Line 13: soil moisture is not only driven by precipitation (irrigation. . . can modify also the soil moisture)

P4879

line 6: reference Kogan (remove et al)

Ref Jian (add and Islam)

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Reference Nagler (in reference list it misses 'r' to Nagler p4907 2005b)

P4880

line 14: the sentence 'the residual models are the best ...' is a little bit exaggerated, because SVAT models using remote sensing data with assimilation methods can be also very efficient. Otherwise, residuals models don't represent the soil moisture evolution which is important for water management.

Table 1 does not give a lot of information, see ref Jetse et al, SurV Geophys 2008

The estimation of z_0 in the standard version of SEBAL can be arguable, but other authors have used this model in estimating z_0 with more accurate methods. I would not add SEBTA in this table 1 as it is not yet presented. Moreover, the argument of its use with any time period seems to me wrong since as for SEBAL or S-SEBI, it is based on the use of remote sensing data acquired in the optical range, therefore only for clear days. The temporal scales are the same than other models.

P4880

Line 25: As SEBTA is not yet described in detail, it's embarrassing to write that it's the best at this place! I find that the most important point is the improvement with the topography information. The two other points concerning roughness estimation and automatic calculation for separating wet and dry pixels have been yet performed in other studies with similar models.

P4883

Line 10: the G formation is a critical point (very questionable here) because several papers have shown bad results with such formula (add references and discussion on this point). The coefficients were defined for some surfaces, (it's a very empirical approach, not validated over various surfaces).

-Have you measurements to chose $G=0.5 R_n$ for water surfaces?

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P4884

Line1: It can be difficult to find wet and dry pixels according to the dates and the region studied. The spatial resolution of images used is also important to take into account. (if you have mixed pixels, what do you do?) add discussion

You assume that the wind speed at 200m is more and less stable and not affected by the surface.

This assumption can be questionable according to the region and atmospheric configurations. Add sentences or justifications.

P4884 line 15 why 0.06?

P4885 equation 10 how do you compute a and b?

Equation 12-13 what are K_{wet} and K_{dry} ?

How do you find your coefficients in these equations (not explained)

P4886

Lines 5-6: what is the reference level chosen for the region?

It is not explained why you chose 0.006

P4887 line 23 ratio between what values?

P4888

To compute the ratio, do you use only instantaneous estimations of $ET_i/(R_{ni}-G_i)$? Or if you use ground measurements, give more details on these last data

Equation 23: how do you compute R_n 24?

How many stations do you use? What is the variation in time and space?

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Line 11 what is time scale 0.5h?

P4891 MSAVI give the formula and reference

Figure 3 what is the vegetation index?

P4891 line 9 MSVI ? or MSAVI

Line 10-15: what is really new and original? What is automatically defined? It would be interesting to see the trapezoid schemes obtained for few studied dates and the threshold defined for wet and dry areas.

P4892

Equation 30 the computation of Heff is also very questionable and can conduct to wrong values. A lot of papers have focused on the estimation on roughness, and have show the difficulty to find a relationship with a vegetation index. See references on this point and add comments.

What is your IV vegetation index in this case? MSAVI?

Table 2 is not clear enough, why some lines have no values ?

P4893

How many MODIS data have you used? What is the exact studied period (give a table)

DEM: what is the spatial resolution and the accuracy?

There is only one station for the flux estimation (?). Whay (show the location on the map) and give its main characteristics (elevation, landuse, measurements, time step...)

How many weather stations are used? For what ?

Line 23: explain the abrevs MODMGAD... in a table or in annex, what is the accuracy of the data? And the resolution?

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P4894:

Give more information for the simulated dates

Line 16: climatic data: what climatic data do you use? What do you interpolate?

How many stations? I suppose that you have air temperature measurements on these stations which could be also used for validation.

Figure 5: some days present precipitation events, that means clouds (have you estimated surface flux for these dates?) how do you explain that you have bad estimations when wheat is harvested?

You start with 48 dates but on the graph fig 6 some dates miss why. The coefficients can be arguable. (fig 6 is not necessary, Values can be given in the text or in fig 5 caption)

Table 3 is not well explained, how do you compute weekly, monthly values from your dataset?

P4895

line 24: MODIS 250m for what variables? I thought that all MODIS data were at the same resolution (add information before)

P4896: how do you compute your seasonal value? Give the standard deviation

P4897. The comments about the relationships between slope and ET values for different seasons can be summarized in a table.

Fig 9 add standard deviation and comments

A table with the regions classified according to the main classes for elevation and landuse classes would be welcome to follow the analysis.

P4898. The conclusion could be more nuanced. (discussion on the season, the image number, the rain days...)

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P4898 lines 23-28: put in a table all these values given in the text and add a column in table 4 with standard deviation

P4900 line 14: the introduction of LULC data (give the information before in the text). This approach is not new. Other models use also these data (give refs)

DAETs (annex for abrevs)

Figure 11:- how are performed the simulations? What is the land use on this subregion? What is the date studied? What results for other dates?

P4901 line 28: S-BEBI ? or S-SEBI ;)

P4902 discuss more the Impact of terrain factors (elevation, aspect, slope) on reflectance, ...

Line 12: not really shown because there is not validation on stations with different elevation factors. The paper only show results on simulations and discussed the impact of topography on simulation results. These variations were not validated.

P4903 line 1: 48 images were used but when there are rainy days or clouds, there is no discussion to fill the gap. In the table 3, only 15 dates are presented (add some justifications)

Validation for flux based only for one station (representative ?) so the conclusion must be reviewed and nuanced.

What is your consistency index? Meaning?

Line 14: 'indispensable is strong! the model proposed here, can be useful and can be compared to other models. ...

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 4875, 2010.

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