Hydrol. Earth Syst. Sci. Discuss., 8, C5035–C5038, 2011
www.hydrol-earth-syst-sci-discuss.net/8/C5035/2011/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Spatial horizontal correlation characteristics in the land data assimilation of soil moisture and surface temperature" *by* X. Han et al.

Anonymous Referee #1

Received and published: 22 November 2011

Summary

This paper studied how to improve the data assimilation of soil temperature and surface temperature by considering the spatial correlation characteristics of data. Data missing frequently occurred in satellite measurements of soil moisture and surface temperature. In this paper, the authors tried to mitigate the influence of data missing on data assimilation through exploiting the spatial correlation characteristics of data themselves. According to their spatial correlations, valid observations of neighboring grids were used for assimilating soil moisture and surface temperature in grids uncov-

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

ered by observations. An experiment was conducted with synthetic data using the local ensemble transform Kalman Filter (LETKF), which considered the spatial correlations between grids. Results of this paper showed that the performance of data assimilation could be improved substantially when observations of neighboring grids of uncovered grid were used based on spatial correlation. Therefore, this paper can provide good experiences for the community of land surface data assimilation. However, some parts of this paper still need to be revised. Therefore, this paper is suggested to be published in HESS after substantial revision.

Major comments

(1) In this study, ground truth and synthetic observations are simulated using CLM model at a resolution of 1 km with interpolated forcing data and land surface data, such as soil type. Both soil moisture and surface temperature are heavily related to atmospheric inputs and soil types. The hourly 1 km atmospheric forcing data are derived by interpolating GLDAS data, which are at 25 km and 3 h resolutions. The spatial patterns of the 1 km forcing data are significantly influenced by the data interpolating method, which means the spatial correlation characteristics of simulated soil temperature and surface temperature are unavoidably affected by the data interpolating method. In addition, the upper reach of the Heihe Basin is a data-sparse area. There may be a very limited number of soil samples over this area. So, the HWSD soil data may not be able to represent the variability of soil types at the resolution of 1 km over this area. Due to these two reasons, I would argue how much of the spatial correlations of your data (truth and synthetic observations) account for the characteristics of real soil moisture and surface temperature. Please justify the rationale of your data selection.

(2) In your experiment design, simulated soil moisture and surface temperature at 09/11/2008 6:00 are selected as the ground truth; simulated soil moisture and surface temperature at 09/11/2007 6:00 are used as model values to be updated. According to the NSE values in table II and table III, the ground truth and the model values are very poorly correlated for both soil moisture and surface temperature. I don't quite un-

HESSD

8, C5035–C5038, 2011

derstand the rationale for such an experiment design. Could you please provide your reasons in the paper?

(3) In section 3.3, you give a very detailed description about the local ensemble transform Kalman filter. Could you please just briefly introduce the algorithm since it is not the main focus of this paper? You may just describe the part related to spatial correlation and point readers to literature for the rest of details.

(4) Could you add more discussions on the threshold of neighboring observations used in data assimilation? According section 4, there are different numbers of neighboring observations for optimal data assimilation of soil temperature and surface temperature. Since the number of neighboring observations is directly related to the spatial correlation characteristic of observation data, it will make your paper more valuable if you dig a little bit deeper.

(5) You use spatial correlation as a criterion of selecting neighboring observations for grid with missing values. However, high correlation does not necessarily mean close magnitudes between grids. You may discuss a little bit about this in your paper.

Minor comments (1) Please pay more attention to the use of the article “the” in your writing. (2) In section 3.1, could you please explain the reason for selecting 1000 meters as the range for generating synthetic observations? (3) Please revise lines 251 to 253 to make them understandable. (4) What does “the true reference” mean in line 333? (5) From line 371 to line 373, you select 0.001 as the threshold of correlation. I believe that 0.001 is too small for a meaningful correlation. Please justify your selection of this threshold of correlation. (6) NSE has an upper boundary (1.0). In your discussion, you use “NSE values are xx times larger than” (for example LINE 396). Is it proper to compare NSE values in this way? What is the physical meaning if the NSE value of data A is 2 times larger than that of data B? (7) Is “spatial horizontal correlation” a professional term? Does it have the same meaning with “spatial correlation”? If yes, you may just use “spatial correlation”.

HESSD

8, C5035–C5038, 2011

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 8831, 2011.

HESSD

8, C5035–C5038, 2011

Interactive Comment