

Data Assimilation and Use of EOS Data in Land Surface Model

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Designing Conception on the Land Satellite Data Assimilation System of NSMC/CMA

•The China Land Data Assimilation System (CLDAS) project aims at the construction and evaluation of a routine system for soil moisture and temperature initialization in NWP applications, which is partially inspired on the NSMC/CMA FY-3 Satellite system Project, containing assimilation on the following variables:

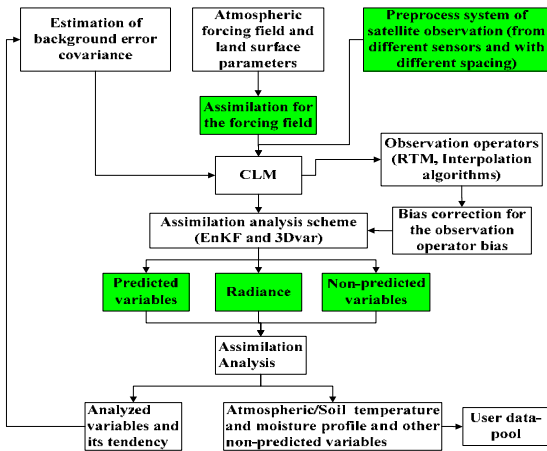
•Assimilation for preparation of forcing fields: One 3Dvar analysis system, based on datasets of reanalyzed ECMWF (or NCEP), in situ observation and satellite retrieved products, was developed to prepare the forcing fields (radiation, air temperature, precipitation, humidity and wind, etc.) needed by land surface model CLM.

•Assimilation for predicted variables: Both atmospheric and land surface variables (soil temperature and moisture) are taken as analysis variables. The Kalman filter and 3Dvar method are adopted to design the assimilation scheme.

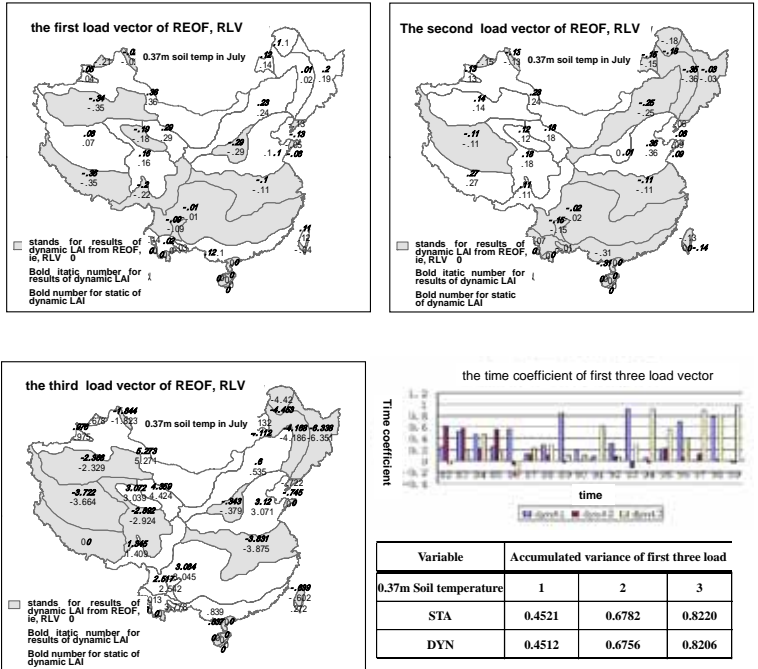
•Assimilation of radiance: The fast radiation transfer model was taken as observation operators for the direct assimilation of radiance.

•Assimilation for non-predicted variables: We designs the common frame of observation operator for non-predicted variables, adopting different observation operators according to the variable itself, with its corresponding tangent linear model and adjoint model constructed from interpolation operator or some experience retrieval algorithms.

Frame of Land Satellite Data Assimilation System

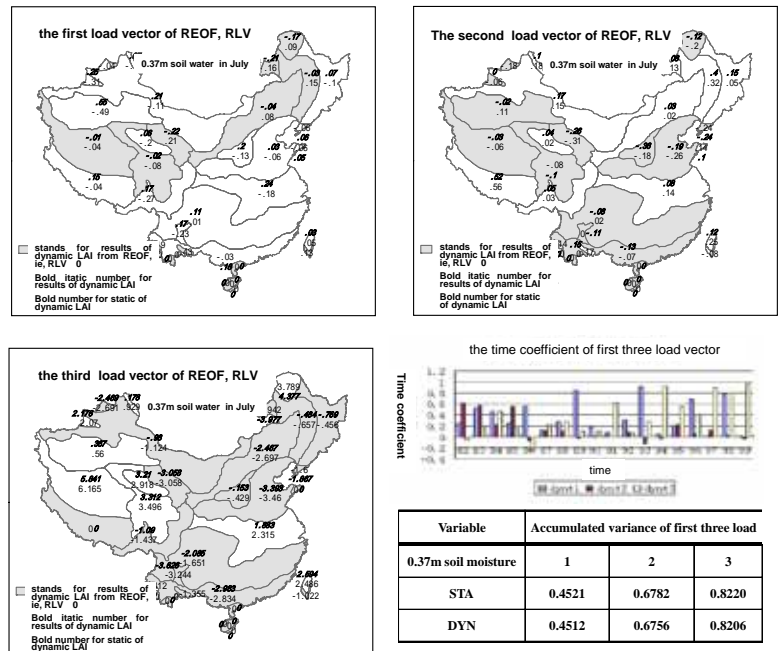


Impact on the Soil temperature by assimilating LAI

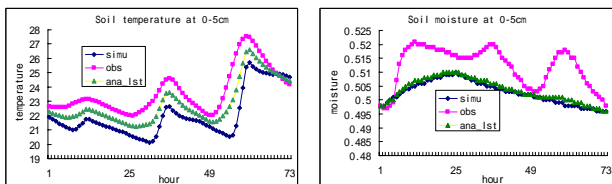


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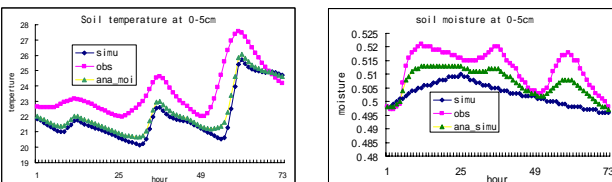
Impact on the Soil Content Water by assimilating LAI



Validation by a Single Site Test



Effect of assimilating surface soil temperature on the analyzed soil temperature and soil moisture, on the left for analyzed soil temperature, on the right for analyzed soil moisture



Effect of assimilating surface soil moisture on the analyzed soil temperature and soil moisture, on the left for analyzed soil temperature, on the right for analyzed soil moisture

Conclusion

The validation from Yucheng comprehensive experiment site and REOF analysis from 20-year LAI assimilation indicates that the preliminary results obtained are still inspiring. There are still many detailed work to do for the routine operation of LDAS, such as how to get dynamic P in 3dvar, how to select the spacing interpolation algorithm, etc.