PROPOSAL FOR FLUXNET SYNTHESIS PUBLICATION FOR OPENED FLUXNET-LA-THUILE DATA SET

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TITLE OF PAPER AND OUTLINE

Toward Assimilation of Satellite Data in Modeling Water Vapor Fluxes over Land

This study applies microwave and infrared satellite data to improve model estimations of evaporation over land. These satellite data contain information about near-surface soil and vegetative moisture. The relationships of the measurements to the fluxes is indirect, so analysis of fluxes depends on mathematical or statistical models, which integrate information from other sources. For fluxes over global land areas, bulk formulations for the fluxes are problematic because there are essential parameters for which reliable information is not available, and because the results are highly sensitive to errors in these parameters and to errors in the satellite-provided variables. Data assimilation systems are an attractive option because they have the potential to optimally account for the information content and the error characteristics of all the data sources, while introducing physical constraints with a numerical model. Successful assimilation requires that the model parameterizations and variables are compatible with the satellite measurement sensitivities. When they are incompatible, the satellite information is effectively rejected or misguides the analysis.

In this study, we will identify environments and regions where current land surface models are inconsistent with satellite-derived parameters related to evaporation, and hence where modeled evaporative fluxes are likely to be erroneous. This identification will be done employing simple physical and statistical models of expected relationships. For selected environments where inconsistencies are prominent, we will characterize the discrepancies by performing detailed analyses of model variables and satellite and *in-situ* measurements, such as near-surface air temperature. The analyses will focus on the surface transfer processes for moisture and energy, and remote sensing phenomenology. The results are intended to provide direction toward improving surface models and their assimilation of data for water vapor flux modeling. This improvement is an essential step toward monitoring and predicting variability of water and energy cycles as manifestations of global change.

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Use of FLUXNET data

Wherever a region selected for detailed analysis coincides with flux tower data within FLUXNET, we plan to use the data to shed light on discrepancies among other

datasets. We recognize the representativeness differences associated with the different scales of measurement, and will do an assesment of the homogeneity of the area surrounding the flux tower by using visible imagery and direct discussions with the site's PIs prior to any use of the data.

PROPOSED SITES TO BE INVOLVED

As our study involves the global scale, we are in principle interested in all available sites. However, as mentioned above, due to the large scale miss-matches we favour sites surrounded by relatively homogeneous terrain, and we are happy to get advice on this issue or get a reduced dataset based on this criteria.

PROPOSED RULES FOR CO-AUTHORSHIP

No co-authorship can be decided at this state of the study, as it will depend on the use of the different datasets involved and the progress achieved.

Coordinator's CV

Dr. Carlos Jimenez

He has focused his research over the past 10 years on the analysis of satellite observations to characterize the natural environment. He has developed operational retrieval algotithms for the inversion of atmospheric radiometric data and applied statistical algorithms for fast inversion of satellite data. He has conducted validation of atmospheric products from different sub-milimeter instruments, such as Odin-SMR and EOS-MLS. At present, his main research is related to the global estimation of land surface parameters from multi-satellite observations. He is also involved in satellite remote sensing of ice clouds from analysis of passive microwave observations and is active in the development of sub-millimeter instruments for future cloud satellite missions. He is an author in more than 20 papers in international journals and current member of the Global Water and Energy Cycle Experiment (GEWEX) radiation Panel (GRP).

Selected project-related publications

Jimenez, C., C. Prigent, B. Mueller, S. I. Seneviratne, M. F. McCabe, E. F. Wood, W. B. Rossow, G. Balsamo, A. K. Betts, P. A. Dirmeyer, J. B. Fisher, M. Jung, M. Kanamitsu, R. H. Reichle, M. Reichstein, M. Rodell, J. Sheffield, K. Tu, and K. Wang, Global inter-comparison of 12 land surface heat flux estimates, submitted to JGR, 2010JD014545.

Jimenez, C., J. Catherinot, C. Prigent, and J. Roger, Relations between geological characteristics and satellite-derived infrared and microwave emissivities over deserts in Northern Africa and the Arabian Peninsula, submmited to JGR, 2010JD013959R.

Papa, F., C. Prigent, F. Aires, C. Jimenez, W. B. Rossow, and E. Matthews (2010), Interannual variability of surface water extent at the global scale, 1993–2004, J. Geophys. Res., 115, D12111, doi:10.1029/2009JD012674.

Jiménez, C., C. Prigent, and F. Aires (2009) Toward an estimation of global land surface heat fluxes from multisatellite observations, J. Geophys. Res., 114, D06305, doi:10.1029/2008JD011392.

Collaborator's CV

Dr. Alan Lipton

Alan Lipton has performed a broad range of research in satellite remote sensing, including applications in the infrared, microwave, and visible spectra. His research topics have included retrieval techniques for cloud and surface characteristics. In addition, he has developed methods for assimilation of satellite sounder and imager data in mesoscale numerical weather prediction models, to improve analyses and forecasts of water vapor, clouds, and surface temperatures. He was Deputy Algorithm Lead on the NPOESS/CMIS microwave system algorithm development effort. A current focus of research is analysis of surface properties, including assimilation model representations, with advanced satellite data products.

Selected project-related publications

Moncet, J.-L., P. Liang, J. F. Galantowicz, A. E. Lipton, G. Uymin, C. Prigent, and C. Grassotti, Land surface microwave emissivities derived from AMSR-E and MODIS measurements with advanced quality control, submitted to J. Geophys. Res., 2010.

Galantowicz, J.F., J.-L. Moncet, P. Liang, A. E. Lipton, G. Uymin, C. Prigent, and C. Grassotti, Subsurface emission effects in AMSR-E measurements: Implications for land surface emissivivity retrieval, submitted to J. Geophys. Res., 2010.

Lipton, A. E., J.-L. Moncet, S.-A. Boukabara, G. Uymin, and K. J. Quinn: 2009: Fast and accurate radiative transfer in the microwave with optimum spectral sampling. IEEE Trans. Geosci. Remote Sens., 47, 1909–1917, doi:10.1109/TGRS.2008.2010933.

Lipton, A. E., and G. D. Modica, 1999: Assimilation of visible-band satellite data for mesoscale forecasting in cloudy conditions. Mon. Wea. Rev., 127, 265-278.

Lipton, A. E., and J. M. Ward, 1997: Satellite-view biases in retrieved surface temperatures in mountain areas. Remote Sens. Environ., 60, 92-100.