



Highlights: October 2009

Announcements:

-NEWS A-Train Data Product Catalog

The catalog is now publicly available. For more information go to

<http://www.nasa-news.org/resources/>, see NEWS study publication “Interannual Variability of the Global Radiation Budget” listed below or email seiji.kato@nasa.gov

-Did you know that two of our NEWS PIs; Judy Curry and Tim Liu, were elected as Fellows of the American Association for Advancement of Science for contributions to atmospheric and hydrologic science

Papers in Progress and Publications:

-Li, R., Q. Min, B. Lin, **Estimation of evapotranspiration in a mid-latitude forest using the Microwave Emissivity Difference Vegetation Index (EDVI)**, *Remote Sensing of Environment*, 113, 2011-2018, 2009.

For more information contact: bing.lin@nasa.gov

-Myoung B., and Y. Deng, 2009: **Interannual Variability of the Cyclonic Activity along the U.S. Pacific Coast: Influences on the Characteristics of Winter Precipitation in the Western U.S.** *J. Climate*, 22, 5732-5747.

For more information contact: yi.deng@eas.gatech.edu

-Grecu M., W. S. Olson, C.-L. Shie, T. S. L'Ecuyer, and W.-K. Tao, 2009: **Combining satellite microwave radiometer and radar observations to estimate atmospheric latent heating profiles.** *Journal of Climate* (in press).

For more information contact: Bill.Olson@nasa.gov

-Jiang, X., D. E. Waliser, W. S. Olson, W.-K. Tao, T. S. L'Ecuyer, J.-L. Li, B. Tian, Y. L. Yung, A. M. Tompkins, S. E. Lang, and M. Grecu, 2009: **Vertical Heating structures associated with the MJO as characterized by TRMM estimates, ECMWF reanalyses and forecasts: A case study during 1998-99 winter.** *Journal of Climate* (accepted).

For more information contact: Bill.Olson@nasa.gov

-Dong, X. B. Xi, K. Crosby, C.N. Long, R. S. Stone, 2009: **A 10-yr Climatology of Arctic Cloud Fraction at Barrow, Alaska.** *Journal of Geophysical Research* (submitted) For more information contact:

dong@aero.und.edu

-Kato, S., S. Sun-Mack, W. F. Miller, F. G. Rose, Y. Chen, P. Minnis, and B. A. Wielicki, 2009: **Relation of Cloud Occurrence Frequency, Overlap, and Effective Thickness Derived from CALIPSO and CloudSat Merged Cloud Vertical Profiles.** *Journal of Geophysical Research Atmosphere CALIPSO special issue* (submitted)

For more information contact: seiji.kato@nasa.gov

-Kato, S., **Interannual Variability of the Global Radiation Budget**

For more information go to: <http://www.nasa-news.org/resources>

NEWS Integration work in progress

1. El Nino Precipitation & Atmospheric Heating Anomalies

Olson, L'Ecuyer & Greco

This work is the result of the combination of Q1-QR (Greco and Olson) and QR(L'Ecuyer) from the 1998-2007 TRMM record to create an approximate total diabatic heating (Q1) product. The precipitation and Q1 anomalies are the differences of the 1998 monthly means and the 10-year average monthly means. The El Nino signature in both precipitation and zonal-mean Q1 are evident.

For more information contact Bill Olson

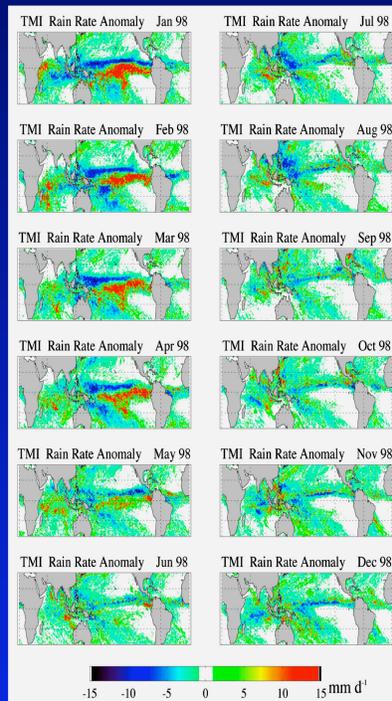
Bill.Olson@nasa.gov or

Tristan L'Ecuyer

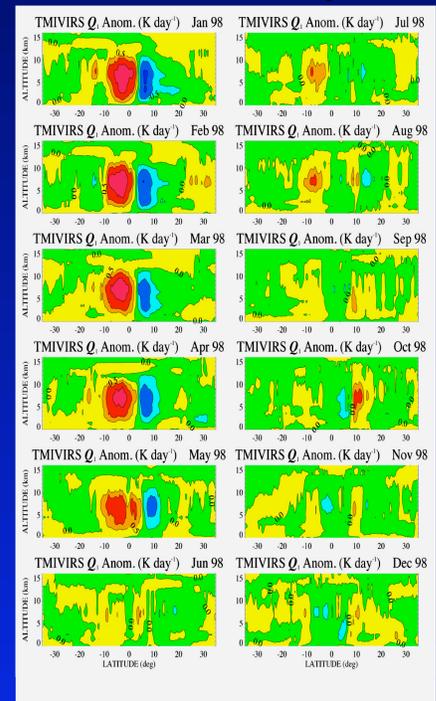
tristan@atmos.colostate.edu

El Nino Precipitation & Atmospheric Heating Anomalies

TMI Surface Rain Rate Anomalies



TMIVIRS Zonal-Mean Diabatic Heating Anomalies



Shown is the progression of monthly surface precipitation and diabatic heating anomalies during 1998. El Nino conditions at the beginning of 1998 are associated with a southward shift of Pacific ITCZ precipitation and the related heating/cooling anomaly couplet. *from Olson, L'Ecuyer, Greco (NEWS)*

2. NEWS A-Train Data Product Catalog

The data product is now publicly available and was presented at a GEWEX Radiation Panel in Germany.

<http://www.nasa-news.org/resources/>

Wielicki/Acting PI: Seiji Kato and team

The Wielicki/Kato team cataloged four months of data integrating four NASA's satellite data sets, CALIPSO, CloudSat, CERES, and MODIS (the product is called CCCM, and plan to continue the process. They plan to process at least one year of data before the end of 2009 and more in 2010. Four months of data (July and October 2006, January and April 2007) will be publicly available from Langley Atmospheric Science Data Center the week of October 6th. Product documentation has been done and they have defined more than 400 variables included in the product, and also how they were generated. For more information contact Seiji Kato :

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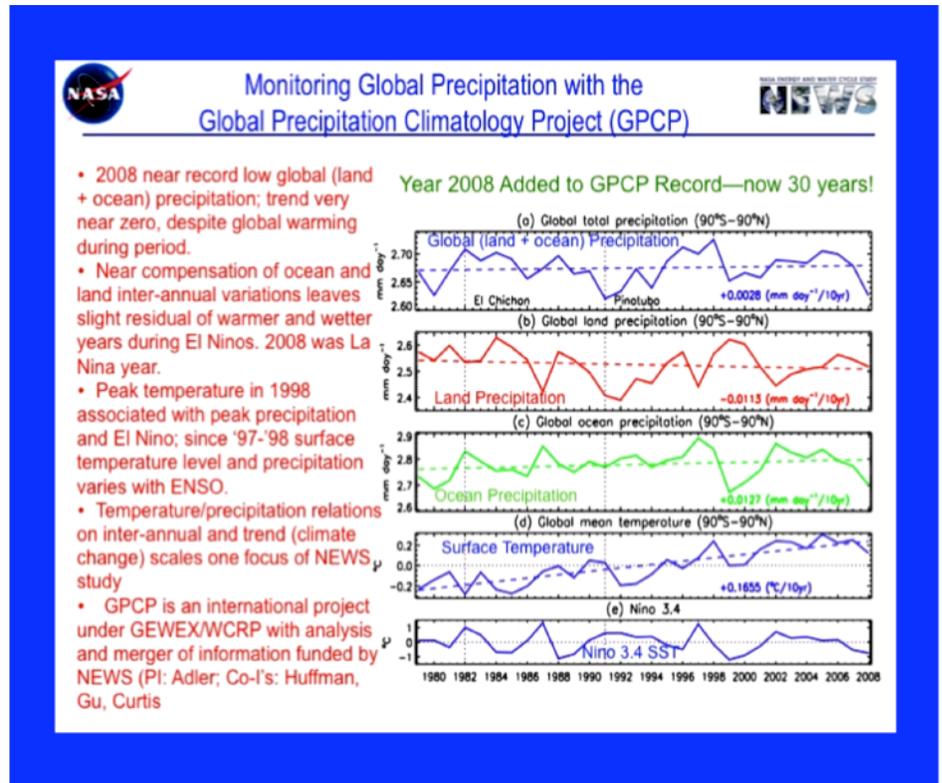
3. Monitoring Global Precipitation with the Global Precipitation Climatology Project (GPCP)

Adler and team

Highlight to the right is based on adding 2008 to the GPCP data set (now the new version 2.1). Looking at the whole record you can see some interesting things regarding temp. and precip. trends (or lack thereof) and some clear indications of ENSO affecting global numbers--both for temp. and precip. 2008 was a dry year globally, probably due most to La Nina, but there is an interesting pause in global warming since 1998 (partly due to ENSO and solar cycle?) and this may also be related to relatively dry (precip.-wise) last few years.

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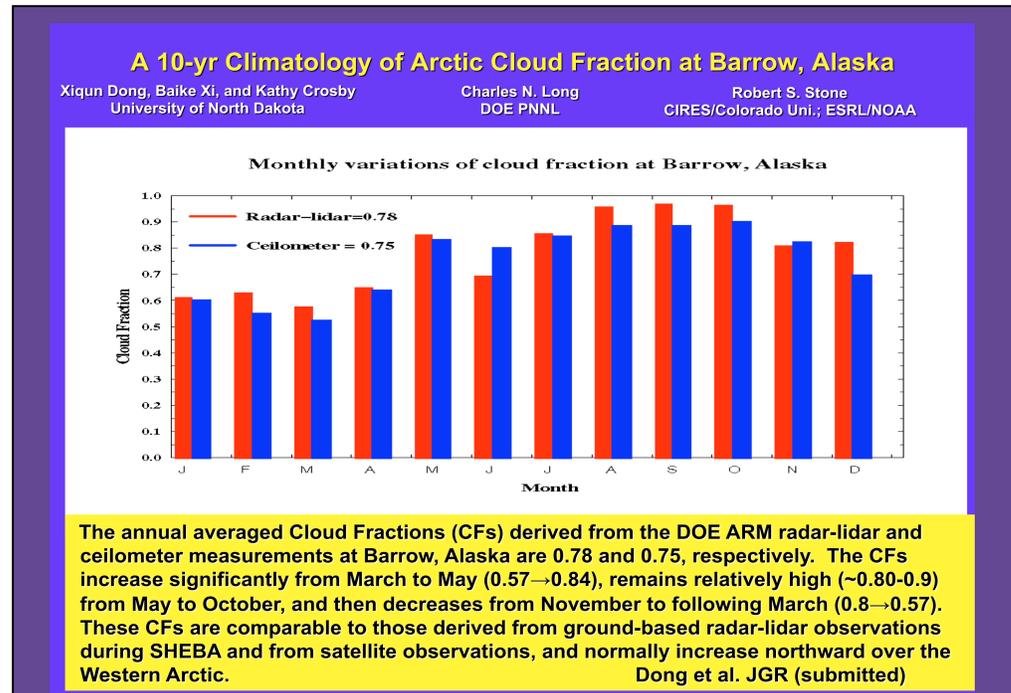


NEWS highlights of interest to NASA HQ and/or other Agencies

4. A 10 year Climatology of Arctic Cloud Fraction at Barrow Alaska, Dong et.al. JGR, Submitted

For more information contact:

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5. Satellite-Scale Modeling of Land-Atmosphere Coupling

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Satellite-Scale Modeling of Land-Atmosphere Coupling

Joseph A. Santanello, Jr. and Christa D. Peters-Lidard, NASA-GSFC Code 614.3

The degree of local coupling ('LoCo') between the land and atmosphere is a function of complex processes and feedbacks that require further understanding and quantification.

The daily variability of heat and moisture states and fluxes near the Earth's surface is reflective of both land surface (soil moisture) and atmospheric (boundary-layer depth) conditions. As a result the modeled and observed evolution of temperature (T) and humidity (q) can be used as a diagnostic of LoCo.

A unique NASA modeling system (LIS-WRF) has been developed and successfully applied to a framework for diagnosing LoCo that combines physically-based process models with observations of land and atmospheric properties at satellite scales.

Results show that soil moisture anomalies lead to significantly different signatures of heat and moisture evolution and highlight the potential utility of routine observations of T and q from current and future NASA satellite platforms.

Hydrospheric and Biospheric Sciences Laboratory

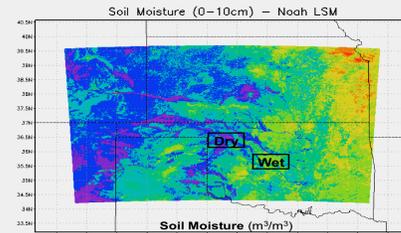


Fig. 1: Near-surface soil moisture map of the Southern Great Plains Region.

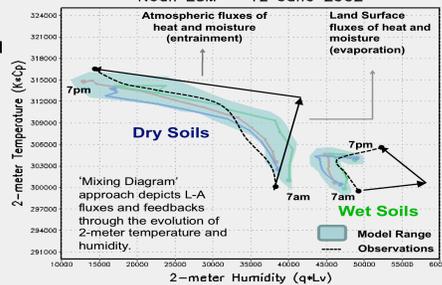


Fig. 2: Daytime evolution of specific humidity vs. potential temperature for the dry and wet soil moisture locations in Fig. 1



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References:

- Kumar, S. V., C. D. Peters-Lidard, J. L. Eastman, and W.-K. Tao, 2008: An integrated high resolution hydrometeorological modeling testbed using LIS and WRF. *Environmental Modelling and Software*, **23**, 169-181.
- Santanello, J. A., C. Peters-Lidard, S. Kumar, C. Alonge, and W.-K. Tao, 2009: A modeling and observational framework for diagnosing local land-atmosphere coupling on diurnal time scales. *J. Hydrometeorol.*, **10**, 577-599.

Data Sources: The community-supported Weather Research and Forecasting (WRF) model has been coupled to NASA-GSFC's Land Information System (LIS), which provides a flexible and high-resolution representation and initialization of land surface physics and states. Within the LIS-WRF framework, the land surface energy balance and mixed layer equilibrium established by difference land-atmosphere scheme couplings are evaluated in terms of the diurnal temperature and humidity evolution simulated by each. In addition, surface meteorological observations of 2 meter temperature and moisture, surface flux towers, and radiosonde-based vertical profiles of temperature and humidity are used for evaluation purposes and obtained from the ARM-SGP program.

Technical Description of Image:

Figure 1: Near-surface soil moisture (0-10cm) valid at 7am on 12 June 2002 as simulated from a 2.5 year spinup of the Noah land surface model (using LIS) over a 1-km horizontal resolution domain in the U.S. Southern Great Plains (SGP). The soil temperature and moisture states generated by this simulation is then used as input to the coupled LIS-WRF simulation over the identical domain. The high-resolution of LIS and its datasets produce improved initial conditions, whose impacts can then be evaluated in the evolution of LIS-WRF variables related to land-atmosphere coupling.

Figure 2: Diurnal co-evolution (7am-7pm) of 2m-specific humidity and 2m-potential temperature on 12 June 2002 as simulated by LIS-WRF for the dry and wet soil moisture locations in Fig. 1 using the Noah land surface model coupled to the YSU, MYJ, and MRF planetary boundary layer (PBL) schemes. The shaded regions for each indicate the model range for each land surface and PBL scheme coupling. Also shown are the vectors that represent the fluxes of heat and moisture from the land surface versus those from the atmosphere due to entrainment.

Scientific significance: The degree of local land-atmosphere coupling (LoCo) is a critical component of prediction models and impacts the simulation of sensible weather, turbulence, convective initiation, and precipitation across a range of scales. This work, funded by the NASA Energy and Water Cycle Study (NEWS) and supported by the NASA MAP and Air Force (AWFA) programs, serves as the backbone for an international effort (GEWEX) to evaluate LoCo in models and observations across the globe. A coupled regional model (WRF) that combines a suite of atmospheric turbulence schemes with a flexible, high-resolution land surface interface (LIS) is used to evaluate the behavior of different land-atmosphere couplings. This work combines unique NASA models with observations to evaluate the significance and accuracy of these interactions and can be applied to any model and location of interest. In turn, this work assesses the impact of land-atmosphere coupling on the variability and simulation of the local, regional, and global hydrological cycle.

Relevance for future science and relationship to Decadal Survey: The diurnal evolution of temperature and humidity near the surface (MODIS, AIRS), in combination with surface flux estimates based on soil moisture estimation (SMAP) and remote sounding of the lower troposphere (AIRS, CALIPSO) will all be provided via remote sensing from NASA platforms in the next decade. Therefore, a simple yet robust technique such as this will enable satellite remote sensing to be used to evaluate land-atmosphere coupling continuously across the globe.

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