

## NEWS FY 2009 Progress Report

### The NASA Energy and Water cycle Study Science Integration Team: MIT's Supporting Activities and Research C. Adam Schlosser and Xiang Gao

#### 1) Project description

The NASA earth science research program has established the NASA Water and Energy Cycle Focus Area (WECFA) with an integrating NASA Energy and Water cycle Study (NEWS) that has the overarching long-term grand challenge to *document and enable improved, observationally-based, predictions of water and energy cycle consequences of Earth system variability and change*. As a result, a NASA Energy and Water cycle Study (NEWS) Science Integration Team (NSIT) was established. The NSIT addresses all elements of energy and water cycle research and associated technology requirements and mission development, and provide a liaison with the other ESE research focus areas. The NSIT serves as an interface to NASA system components, and to coordinate and integrate the results of the NEWS investigations. Therefore, this work carries out the responsibilities of the NEWS Science Integration Team to include (1) **NEWS science integration** (i.e. data integration, linkage building, crosscutting science, etc.), (2) **NEWS science gap filling** (doing science that must be done, but was not proposed and/or funded), and (3) **NEWS administration** (i.e. NEWS planning, POC responsibilities, Implementation Plan updates, etc.).

#### 2) Accomplishments of past year

In FY 2008, we have continued our efforts within the NEWS Energy and Water Cycle Climatology (NEWCC) project, to synthesize a self-consistent climatology that describes the global energy *and* water cycles. The integration project is overseen by Bing Lin and Adam Schlosser (both NSIT members), and Schlosser's efforts have been assisted by Xiang Gao.

We have continued our efforts to update, compile, quality control, and augment multiple satellite data sets for our global water budget analyses. Table 1 summarizes estimates of

global river discharge that we have compiled in collaboration with Matt Rodell (a NEWS PI), who has been spearheading an effort to product a global water-cycle climatology based on the best available sources of NEWS data and supplementary data (when needed). The global river discharge estimates were based on augmented estimates from the Dai and Trenberth (2002) study. We have been working with the NEWS teams to refine these estimates. Our analyses thus far have indicated a discrepancy in the estimates over Australia. The Dai and Trenberth estimates are quite a bit smaller than what other estimates (from Rodell) indicate. Our continued efforts will rectify this. Further, we have also provided estimates to this water budget assessment of the global atmospheric water vapor content based on our continued efforts with Eric Fetzer’s group (also a NEWS PI) to analyze and quality-control the AIRS/AMSR-E retrievals. We also anticipate that a manuscript will be written in the coming year that will present our overall analysis of the AIRS/AMSR-E data (in the context of the NEWS water budget synthesis).

Table 1. Estimates of global river discharge for the NEWCC water budget assessment.

<b>Continent</b>	<b>Qs (m<sup>3</sup>/yr)</b>	<b>Area (m<sup>2</sup>)</b>	<b>Flux (kg m<sup>2</sup> yr<sup>-1</sup>)</b>
<b>Antarctic</b>	0.00E+00	1.23E+13	0.00E+00
<b>South America</b>	1.18E+13	1.77E+13	6.69E+02
<b>North America</b>	4.75E+12	2.41E+13	1.97E+02
<b>Africa</b>	3.50E+12	2.98E+13	1.18E+02
<b>Europe</b>	1.06E+13	5.32E+13	1.99E+02
<b>Australia/Oceania</b>	8.89E+11	8.85E+12	1.00E+02

Data from the NEWS observational collection has also helped our efforts at improving the Integrated Global Systems Model (IGSM), which is developed at the MIT’s Joint Program on the Science and Policy of Global Change. The IGSM is currently being augmented (through support from DOE projects) such that the uncertainty of regional climate change can be incorporated into probabilistic projections. To do this, a (monthly) climatology of the ratio of precipitation for a given location with respect to its zonal value was required. We used the latest update of the Global Precipitation Climatology

Project (from Bob Adler's group, a NEWS PI) to provide this contemporary picture of precipitation, which will be incorporated into the MIT IGSM.

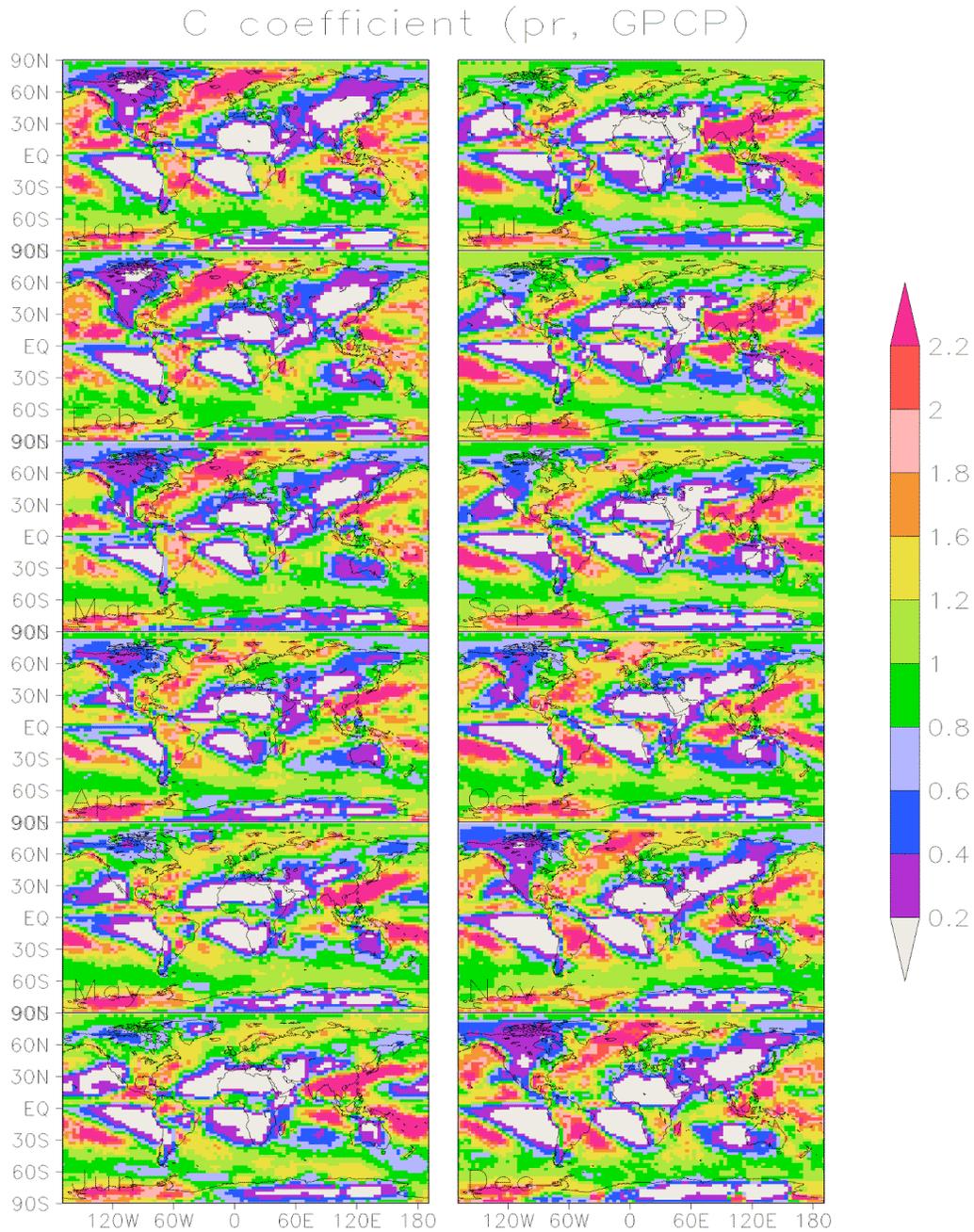


Figure 1. Climatology of the ratio of precipitation to its corresponding zonal average, which is based on the GPCP data set (developed through NEWS). These ratios will then be used to distribute the zonal precipitation with the MIT's Integrated Global Systems Model (IGSM), which operates with a zonally averaged atmosphere, across the longitudinal grids that are depicted in its land and ocean model components.

The most notable NEWS connection and interaction in the past year continues to be the

NEWCC. The NEWCC Google Group page continues to serve as the primary medium of exchange for our collaborative efforts among the NEWS scientists. Most notably, the efforts to produce a global water budget assessment using state-of-the-art data from NEWS investigators (and spear-headed by Matt Rodell) have used the NEWCC site for their efforts. In addition, in late 2008 through early 2009, the PI (Schlosser) spent time at the Climate Change Research Centre (CCRC) and the University of New South Wales (by invitation from its co-director, Andy Pitman). During this time, analyses from the NEWS activities was exchanged with a number of the staff scientists there, primarily through an informal seminar presented to the CCRC research team. Additionally, multiple visits to the Fenner School of Environment and Society at the Australian National University were made during this research visit, and analyses of NEWS assessments were discussed and collaborative opportunities addressed with a number of scientists and research teams (e.g. Peter Sommerville, Natasha Heron, Jack Pezzey, Frank Mills, Ben Macdonald, among others). Through these discussions, it is hoped that an opportunity may arise in which water cycle observations and model estimates over Australia compiled by the ANU team may ultimately be used to augment the NEWS budget syntheses.

#### c) Publications

Schlosser, C. A. and X. Gao, 2009: Assessing Land Evaporation Estimates from the Global Soil Wetness Project Phase 2 Simulations. (Joint Program Technical Report and submitted to *J. Hydromet*).