

ATS 753  
Spring 2013  
Prof. Kummerow

Simple inspection of the global energy budget reveals that the atmosphere loses a net  $100\text{W/m}^2$  of radiation to space. This net cooling is offset primarily by the release of latent heat by condensing water vapor in the atmosphere. Since the temperature of Earth has not changed significantly in the last 10,000 years, it is clear that the water and energy cycles must be linked in an inextricable way. AT753 is designed to explore this connection between water and energy in the atmosphere.

In order to retain a unifying theme, the course will concentrate primarily on a question of great relevance in today's society – the question of global warming and how our knowledge of the water cycle (or lack of this knowledge) has profound implications in our study of climate. The subject of climate change is unfortunately too broad to adequately cover in any one course. As such, AT753 concentrates on examining the observations of atmospheric hydrologic parameters, and seeks to critically examine if current interpretations of the climate system are or are not justified based upon these observations.

The class will cover the distribution as well as radiative effects of water vapor, clouds and precipitation, current observational capabilities of these parameters and the use of these quantities in global numerical models. As far as feasible, each topic covered in class will consist of background material plus lectures and papers covering the current state of knowledge. Homework consist of reading papers and, where indicated, presenting summaries to the class for broader discussion.

A project will be due at the end of class, in which students will be asked to examine Observations, Climate Models or Reanalyses to assess the closure (or lack of closure) in the energy and water cycles and discuss their findings based upon knowledge gained from the course. A final grade will be assigned based 50% on the weekly oral presentations and 50% on the quality of the final project.

All class material can be found at:  
<http://rain.atmos.colostate.edu/courses/AT753>

Useful; Books for personal library:

Liou, K.N., 1992: Radiation and Cloud Processes in the Atmosphere: Theory, Observations, and Modeling, Oxford University Press, New York, NY, 487 pp.

Peixoto, Jose P. and Abraham H. Ort, 1992: Physics of Climate, Springer Verlag, New York, NY, 520 pp.