Project Title: An a-train Integrated Aerosol, Cloud, and Radiation Data Product  
Principal Investigator: Bruce A. Wielicki (NASA Langley Research Center)

Science issue: To understand aerosol and cloud vertical profiles and their radiative effect to the atmosphere and surface.

Approach: Integrate cloud and aerosol properties derived from active sensors (LIDAR and RADAR) with MODIS and CERES.  
Satellite-based data: CALIPSO (aerosol and clouds), CloudSat (clouds and drizzle), MODIS (clouds and surface albedo), and CERES (TOA radiative flux).

Models: Atmospheric Transport and Chemistry (MATCH), Goddard Earth Observing System assimilation (GEOS).

Analyses: To produce the CALIPSO-CloudSat-MODIS-CERES merged product, which reduces the uncertainty in estimating atmospheric energy budget (NEWS phase 1 objectives).

Study Period: June 2006 to current

Specific progress made towards IP:

• Clouds and aerosols alter energy inputs to the atmosphere from clear-sky conditions. The magnitude of the perturbation depends on their vertical profile and properties. Regionally, net atmospheric radiation is balanced with horizontal and vertical energy transports. Therefore, understanding cloud and aerosol radiative effects to the atmosphere is critical to understand energy and water cycle.

• Detecting multi-layer clouds and aerosol layers overlapping with cloud layers by active sensors significantly improve our understanding of their impact to the atmosphere.

NEWS linkages: It will be established when the product is ready and archived.

Lessons learned and suggestions: In order to merge data products properly, we need to understand all data products in detail. For example, when multiple sensors derive a similar variable, values often disagree. Understanding the reason for the disagreement and reconcile it require to understand details of all algorithms used to derive the value and characteristics of all instruments. For this reason, communication with science team members of all satellite instruments is a must. In addition, using their data product by ourselves as a researcher greatly improves understanding of their products. Including quality flags from original data in our product to maintain the original data quality and not to mislead our product users are a great challenge.

Updated: by Seiji Kato on Aug. 31, 2009