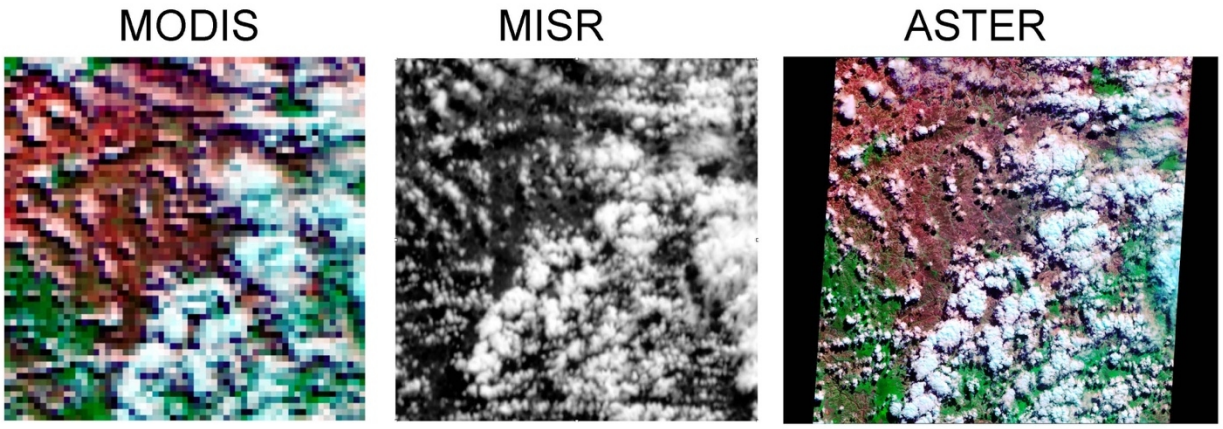
MODIS, MISR, and ASTER images in the Intercomparison of 3D Radiative Codes (I3RC) project



These images show the way three different instruments on board the Terra satellite viewed an approximately 60 km by 60 km area in South-Eastern Brazil on August 9, 2001. Each instrument has a different strength: one takes measurements at numerous wavelengths, another at several view directions, and the third one at a very high spatial resolution. The combined information from the three instruments makes it possible to determine atmospheric and surface properties more accurately than any single instrument would allow. The scene reconstructed from the combined information will be used in the I3RC project for evaluating the performance of various radiative transfer models that simulate 3D radiative processes in the atmosphere. This will be part of a third phase of intercomparisons, which will follow the first two phases described by Cahalan et al. (2005). Case studies of different degrees of 3D complexity, from plane-parallel marine stratocumulus to broken cumulus clouds, will allow us to create a database from which students can learn about 3D radiative transfer and understand where and how plane-parallel approaches to radiative transfer break down. The left panel shows a 1 km-resolution color-composite image using three of the 36 wavelengths measured by the MODIS instrument. Operational MODIS cloud, aerosol, and surface products provide our initial estimate for scene properties, which are then refined using data from the other instruments. The middle panel shows a 275 m-resolution MISR image taken at the wavelength of red light at 60 degree view angle. MISR images taken from nine separate directions reveal the solar reflection properties of the surface as well as the magnitude of some 3D radiative interactions that occur in clouds. Finally, the right panel shows a 15 m-resolution image taken by ASTER. This high-resolution image captures the small-scale cloud variability that gives rise to a variety of 3D radiative effects, thus allowing more thorough intercomparisons. We note that while the MODIS image contains only 3600 pixels, the ASTER image contains as many as 16 million pixels.

Alexander Marshak and Tamás Várnai, with help from Guoyong Wen and Lazaros Oreopoulos