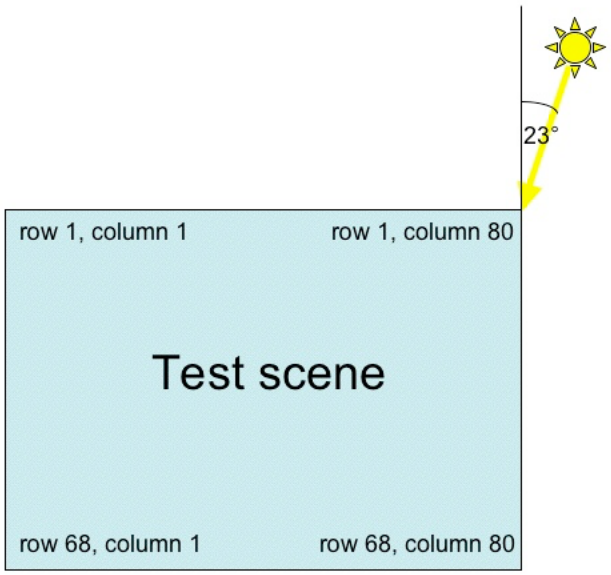
Case 6: Broken Cumulus clouds observed by Terra over Brazil

Synopsis:

- Case 6 is based on a scene that was observed by the Terra satellite around 13:15 UTC on August 9, 2001.
- The scene covers a 68 km X 80 km area centered at 17.1°S and 42.1°W, in central Brazil.
- Stage 1 involves 1 km-resolution simulations of solar reflection at 0.67 μm wavelength, for the view directions of MISR AN, CA, and CF cameras (that is, for nadir and 60° viewing zenith angles).

Detailed scene description:

- Input parameters are defined either at 1 km resolution or as constant values throughout the scene.
- Radiative transfer calculations should assume periodic boundary conditions.
- The solar zenith angle is 41° and the solar azimuth is 23° off the satellite track.



- Surface reflection is heterogeneous and anisotropic. Surface radiative properties are characterized at 1 km resolution using the easy-to-use Li-Sparse-Ross-Thick model. The fields of the three parameters required for this model were kindly provided to us by Yujie Wang and Alexei Lyapustin based on MISR retrievals. The model is described, among others, in the manual of the SHARM code and in a paper by Lucht et al. (2000).

- Atmospheric absorption is assumed negligible at 0.67 μm.
- Rayleigh optical thickness is 0.0435; the representation of vertical profile of Rayleigh scattering is left to each participant. An article by Bodhaine et al. (1999) provides further details on Rayleigh optical thickness calculations.

- Aerosol optical thickness throughout the scene is assumed to be 0.05, the median value of MODIS retrievals in the scene. The aerosol is assumed to be uniformly distributed in the layer below the cloud base.
- Aerosol scattering phase function is provided in a text file, based on nearby Aeronet retrievals.

- Cloud base is assumed to be at 1 km altitude above ground.
- Cloud top altitude (above ground) is provided at 1 km resolution. Cloud top altitudes were estimated using MODIS 11 μm brightness temperature values.
- Cloud optical thickness is provided at 1 km resolution, using the operational Collection 4 MODIS cloud product.
- Cloud extinction coefficient is assumed to be vertically constant for each pixel.
- For Stage 1 simulations at 0.67 μm, cloud droplet effective radius is assumed to be constant. Droplet scattering phase function is provided in a text file, based on Mie calculations for a lognormal drop size distribution with 10 μm effective radius and with a standard deviation that is 0.3 times the mean radius.

Downloading scene parameters:

- All input data (60 kB): I3RC_Case6_input.zip.
- This file contains 1km-resolution fields of all three surface parameters for the Li-Sparse-Ross-Thick model, cloud optical thickness, and cloud top altitude (above ground, in km), as well as aerosol and cloud scattering phase functions.
- The 1 km resolution fields are provided in ASCII text files that contain 68 rows and 80 columns.
- Scattering phase function text files contain two columns: one for the scattering angles (°) and the other for the corresponding phase function values.

Description of experiments:

- Experiment 1: Simulation of 0.67 μm nadir reflectance values at 1 km resolution.
- Experiment 2: Simulation of 0.67 μm reflectance values at 1 km resolution. Viewing zenith angle is 60°. Viewing azimuth is 0°, parallel to the columns in the scene. This simulation provides back scatter reflectances 23° off the solar plane.
- Experiment 3: Simulation of 0.67 μm reflectance values at 1 km resolution. Viewing zenith angle is 60°. Viewing azimuth is 180°, parallel to the columns in the scene. This simulation provides forward scatter reflectances 23° off the solar plane.

Output files:

- Participants are requested to submit two files for each experiment: One containing the simulated reflectance values, and another containing the estimated absolute (not relative) uncertainty of these reflectances. Reflectance is defined as the radiance multiplied by pi and divided by the cosine of solar zenith angle and by the solar irradiance.
- All file names should start with "I3RC_Case6_", then include the experiment ID (e.g., "Exp2_"), a 5-digit model ID (including 4 digits for institution), and either "Refl.txt" or "UncR.txt" to identify reflectivity and uncertainty files. Using this convention, a sample file name is "I3RC_Case6_Exp3_UMBC1_Refl.txt".
- Submitted files should contain 68 rows and 80 columns of floating point numbers in ASCII text format.
- Results for oblique views (Experiments 2 and 3) should be registered at ground level.