

# **Ground Measurements of surface Bidirectional Reflectance Factor (BRF) using The Portable Apparatus for Rapid Acquisition of Bidirectional Observation of the Land and Atmosphere (PARABOLA III)**

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The PARABOLA version III provides measurements of sky (down-welling) and ground (up-welling) radiances in all directions on a spherical grid of  $5^\circ$  in the zenith-to-nadir and azimuthal planes. These measurements are provided in 8 channels (444, 551, 650, 860, 944.0, 1028, 1650 and 400-700 nm) for a set of unique sun zenith angles covering the range from zenith to horizon. An iterative technique employs the PARABOLA observations to retrieve the surface Bidirectional Reflectance Factor (BRF) as well as the Hemispherical Directional Reflectance Factor (HDRF). The retrieval method requires knowledge of the atmospheric optical depth which is simultaneously measured by a sun photometer, but can also be estimated from direct beam measurements where the field-of-view includes the Sun. Ground measurements of the surface BRF plays a crucial role in the validation and vicarious calibration of the Multi-angle Imaging Spectro Radiometer (MISR), scheduled to fly in the second part of 1999, on the EOS terra platform. MISR provides global images of the Earth's surface at nadir and at angles of  $\pm 26^\circ$ ,  $\pm 45^\circ$ ,  $\pm 60^\circ$  and  $\pm 70^\circ$  relative to nadir, in four bands (446, 558, 672 and 866 nm). Global characterization of the surface BRF, among other products, is produced from such images where cloud-free. The PARABOLA observations and the procedure of retrieving the surface BRF from these observations are described here for vicarious calibration experiments using AirMISR that were carried out at Lunar Lake, CA (June, 1997) and at Rogers Lake, CA (Dec., 1998.)