

MODIS and VIIRS

Albedo and Reflectance Anisotropy (BRDF)

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MODIS and VIIRS

Albedo and Reflectance Anisotropy (BRDF)

- NPP/NPOESS EDR calls for a (cloud-free) shortwave albedo with the atmospheric state at time of overpass
 - Broadband instantaneous albedos only – no spectral albedos
- The NGST VIIRS land albedo algorithm has been delivered utilizing two retrieval approaches:
 - Dark Pixel Surface Albedo (DPSA) based on MODIS heritage
 - Bright Pixel Surface Albedo (BPSA) based on a direct-estimate top-of-atmosphere method

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- Heritage MODIS implementation provides periodic BRDF and Albedo retrievals over land.
 - A BRDF is retrieved for each pixel where sufficiently high quality and well distributed cloud-free observations are available to characterize the surface anisotropy
 - Albedos (integrals of the BRDF) are intrinsic surface quantities and are governed by the surface cover, vegetation state, and structure

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- Current MODIS product uses both Terra and Aqua to obtain periodic retrievals of BRDF
 - At 500m every 8 days (based on a 16-day window)
- Daily albedos are produced by coupling these periodic BRDFs with instantaneous observations
 - BRDF provides *a priori* description of the surface character
 - Instantaneous observation provides measure of surface and atmospheric state.
- Note: BRDFs are also used by the community to correct directional observations to a common view geometry
 - Nadir BRDF-Adjusted Reflectance (NBAR)

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Albedo and Reflectance Anisotropy (BRDF)

- Long term NPP Land Science Team concerns
 - Broadband instantaneous albedo is not sufficient
 - Most modelers are interested in spectral albedos
 - No access to underlying spectral BRDF IP
 - NGST implemented two algorithms (DPSA and BPSA) for land with no guidance on relative quality
 - Original scheme: BPSA for pure snow and DPSA elsewhere
 - Ocean Albedo algorithm implemented but Sea Ice not addressed

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Albedo and Reflectance Anisotropy (BRDF)

- Recent Disappointing Developments
 - Still no access to spectral albedos and BRDF IP
 - Specifications relaxed
 - albedo produced at 1km but evaluated at 4km
 - Sea Ice albedo only within 0.3
 - Sea Ice Albedo algorithm implemented
 - direct-estimate top-of-atmosphere method
 - BPSA has been declared primary algorithm over all surfaces

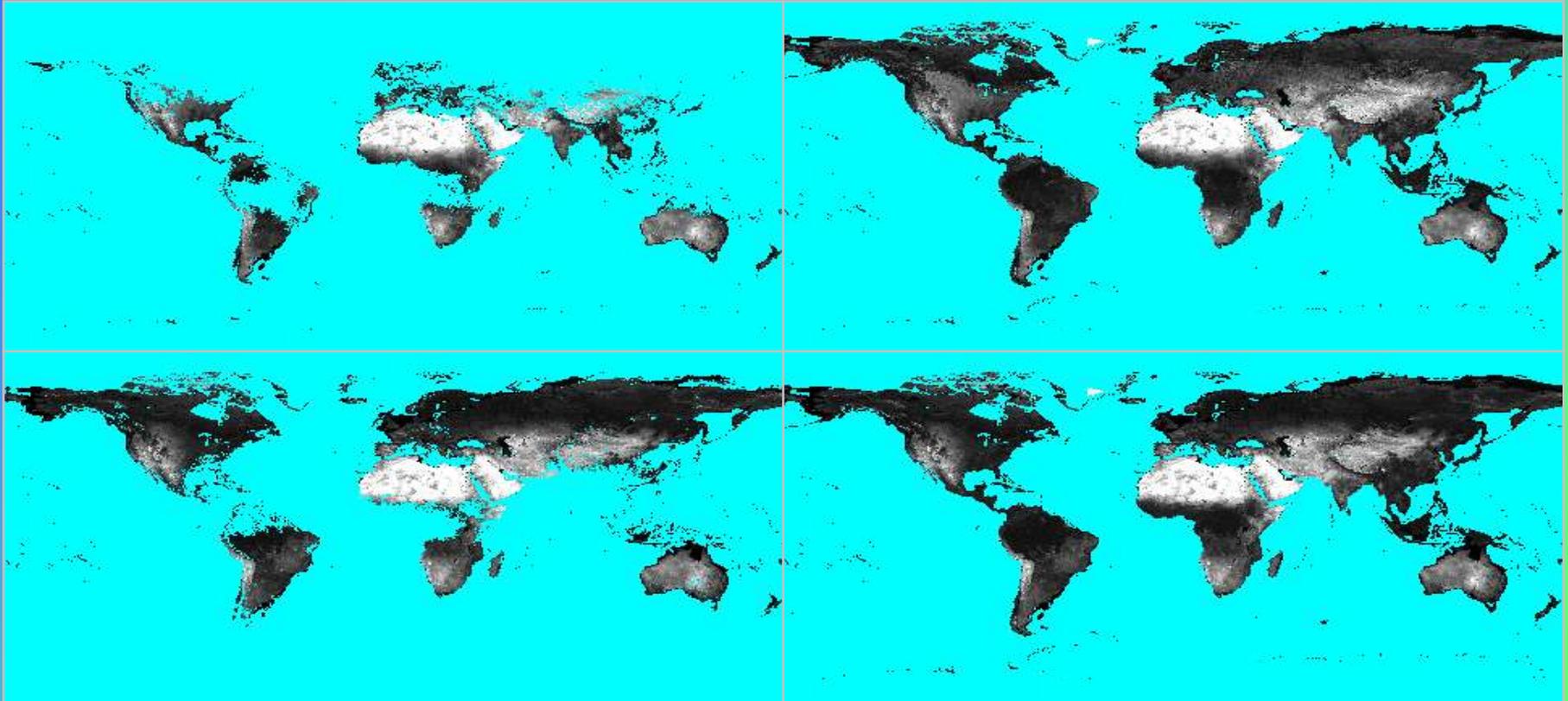
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- MODIS Product Evaluation and Validation
 - V005 reprocessed product
 - 500m tiled, every 8 days (16 day window)
 - 30arc sec, 0.05degree global climate model grids (CMG)
 - Gap filled BRDF (continuation of the collaboration with the Atmospheres Team)
 - 30arc sec, 0.05degree CMGs
 - 500m tiled (in collaboration with the NACP effort)
 - Validation of the MODIS BRDFs with POLDER
 - Extensive Validation over the ARM Southern Great Plains site
 - CLASIC field campaign
 - tower albedometers, Cloud Absorption Radiometer (CAR)
 - Scale tower/CAR/MODIS with high res imagery/land cover
 - ARCTAS field campaign

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- Gap-filled Global BRDF Product

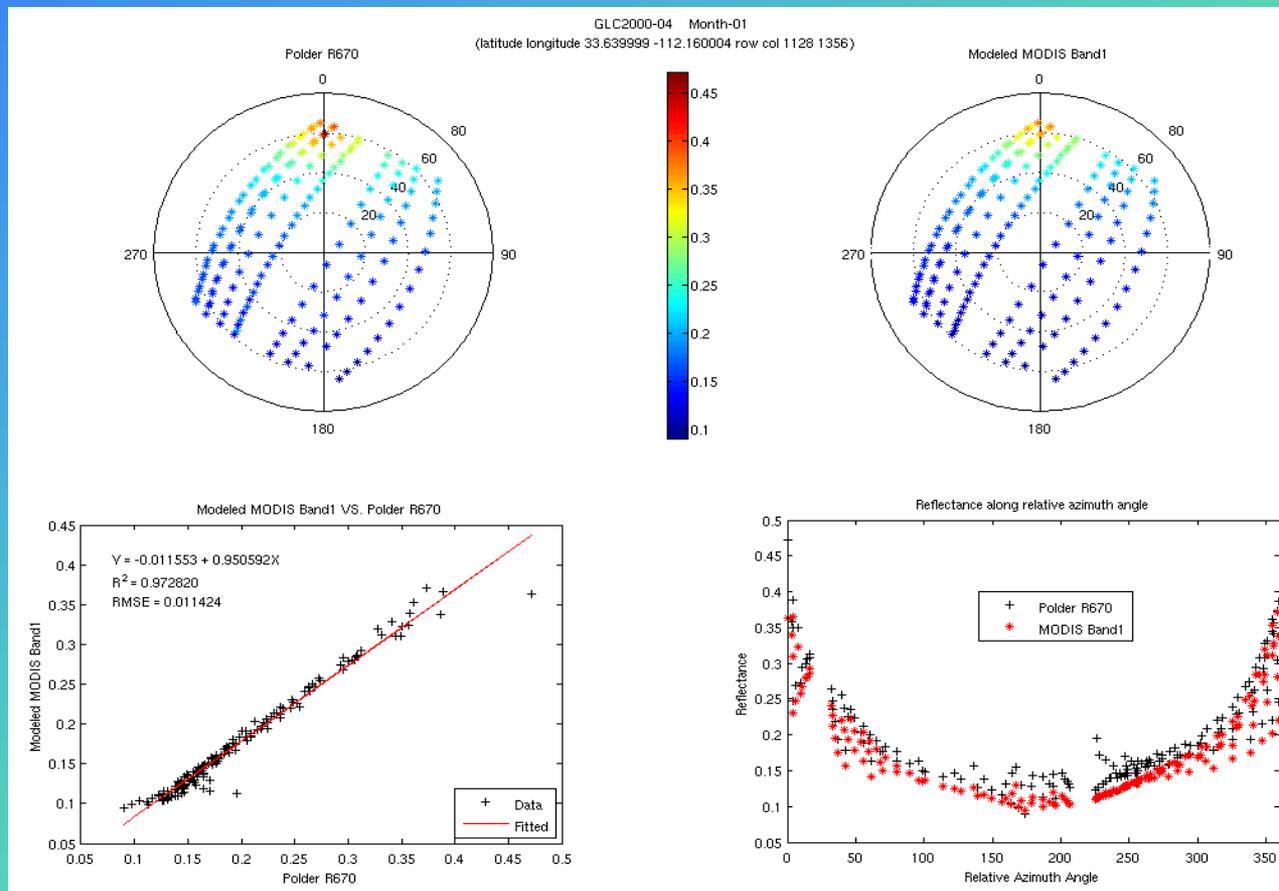


5-year composite maps of the MODIS BRDF (Isotropic Parameter, P0) at Band1 using high quality full inversions only (Left) before gap-filling and (Right) after gap-filling in January (Top) and July (Bottom). Histogram stretch: 0-388.

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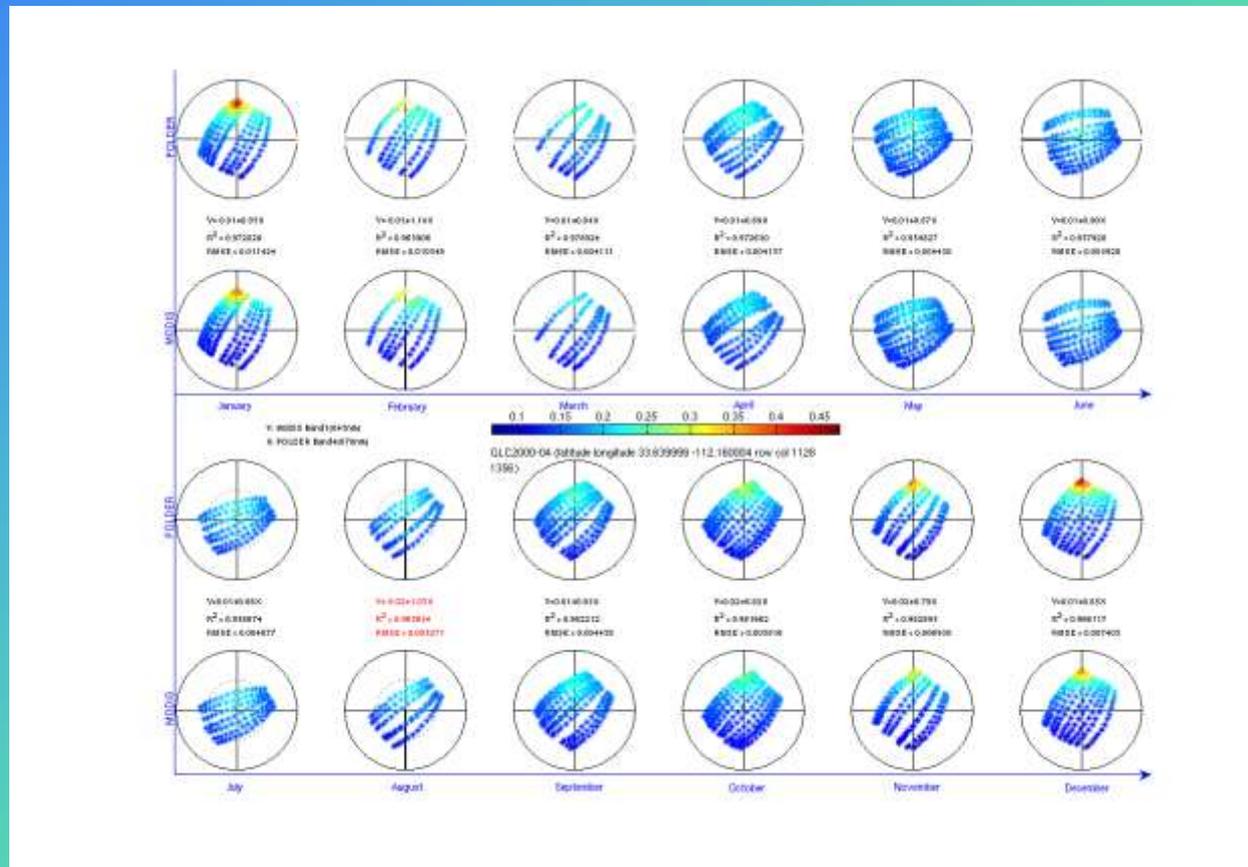
Albedo and Reflectance Anisotropy (BRDF)

- Validation with POLDER-3/PARASOL
 - Selection of sites for a variety of land covers Nov 2005-Oct 2006.



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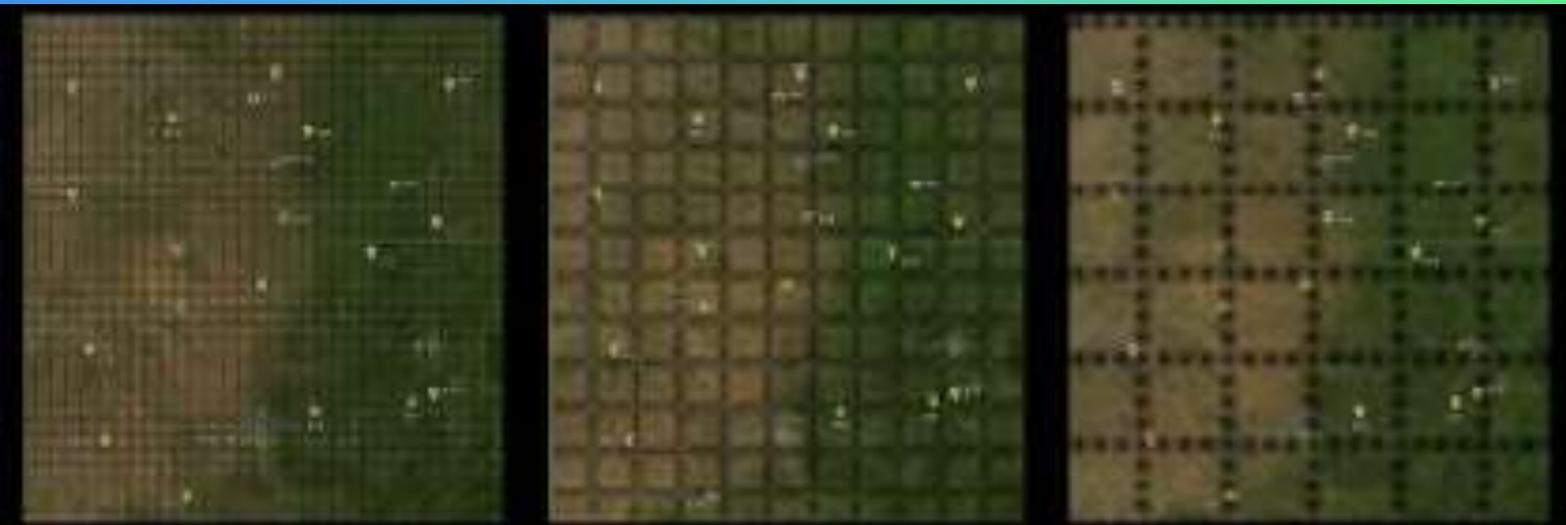
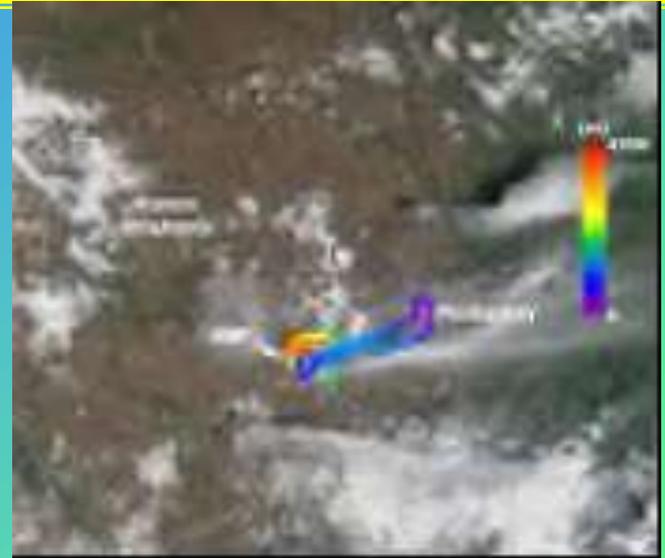


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Albedo and Reflectance Anisotropy (BRDF)

- CLASIC field campaign over the ARM Southern Great Plains site
- Tower data
- CAR

J-31 CAR Flight Track Map



250-500m

1km

0.05degree