

# Impact of Land Processes on WRF

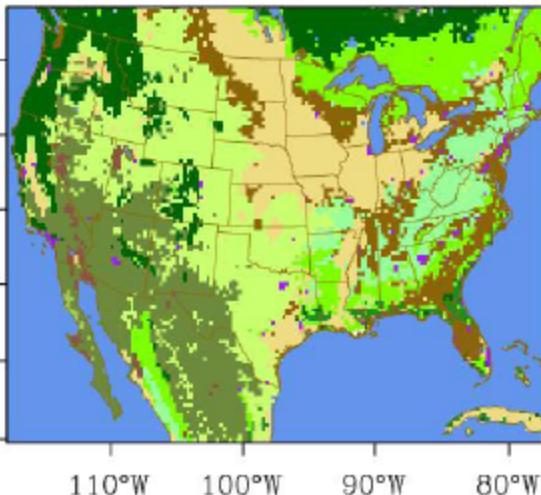
*Vince Wong & Michael Ek*

EMC/NCEP/NOAA

1. Implementation of MODIS-IGBP Vegetation Data
2. MODIS Albedo Data
3. AVHRR Green Vegetation Fraction near Real Time Data

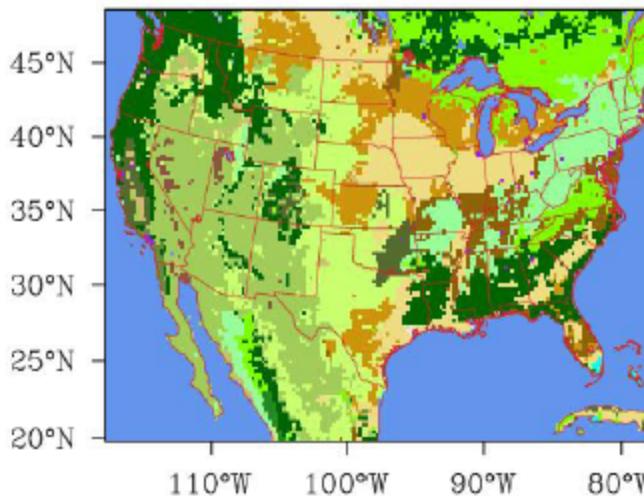
# Modis Vs USGS Landuse

**Vegetation Type (Modis LU)**



- Evergreen Needleleaf Forest
- Evergreen Broadleaf Forest
- Deciduous Needleleaf Forest
- Deciduous Broadleaf Forest
- Mixed Forest
- Closed Shrubland
- Open Shrubland
- Woody Savannas
- Savannas
- Grasslands
- Permanent Wetlands
- Croplands
- Croplands/Natural Vegetation Mosaic
- Urban and Built-up
- Snow and Ice
- Barren and Sparsely Vegetated
- Water
- Wooded Tundra
- Mixed Tundra
- Barren Tundra
- Urban and Built-up
- Dryland Cropland and Pasture
- Irrigated Cropland and Pasture
- Mixed Dryland/Irrigated Cropland and Pasture
- Cropland/Grassland Mosaic
- Cropland/Woodland Mosaic
- Grasslands
- Shrubland
- Mixed Shrubland/Grassland
- Savanna
- Deciduous Broadleaf Forest
- Deciduous Needleleaf Forest
- Evergreen Broadleaf Forest
- Evergreen Needleleaf Forest
- Mixed Forest
- Water
- Herbaceous Wetland
- Wooded Wetland
- Barren and Sparsely Vegetated
- Herbaceous Tundra
- Wooded Tundra
- Mixed Tundra
- Bare Ground Tundra
- Snow and Ice

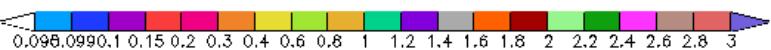
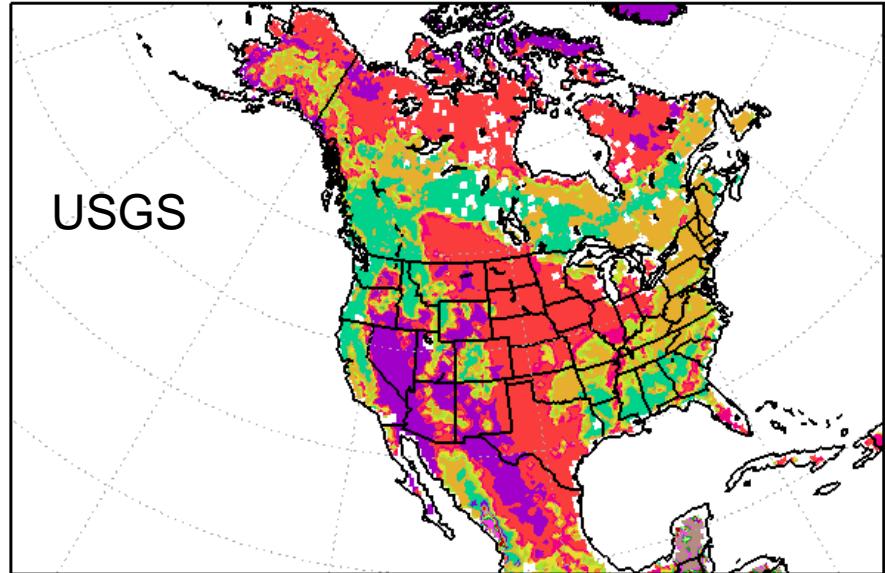
**Vegetation Type (USGS LU)**



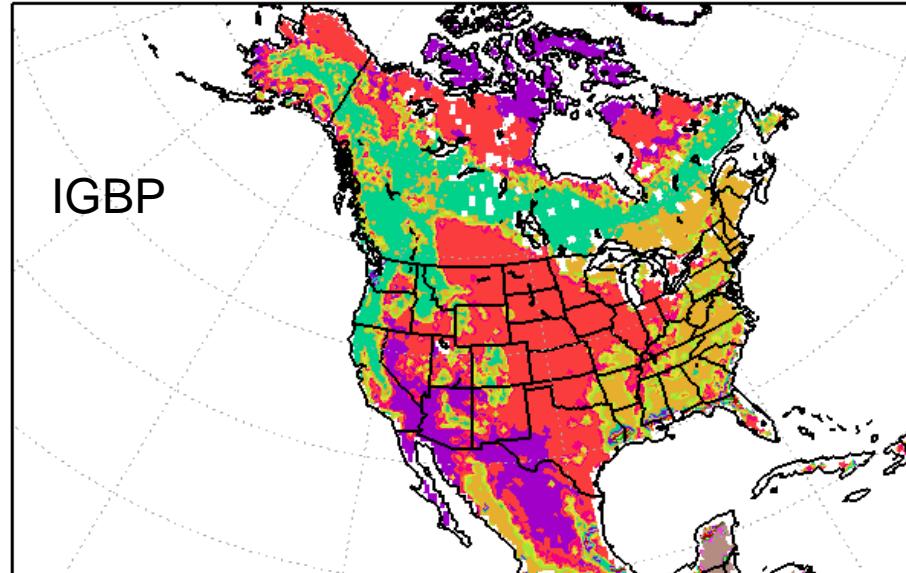
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Classified Scheme	IGBP	USGS
Satellite Instr.	MODIS 2001- 2005	AVHRR 1992- 1993
Coastline	detailed	
Urban	More	
Evergreen	More in Alaska & Canada	More in SE of US
Deciduous Broadleaf		More
Shrubland	More	

SINGLE\_DOMAIN ROUGHNESS LENGTH NAM 00H  
FCST VALID 12Z 20 APR 2010



SINGLE\_DOMAIN ROUGHNESS LENGTH NA12AQ 00H  
FCST VALID 12Z 20 APR 2010



Change of Vegetation Type → Change of Vegetation Parameters:

1. Roughness Length ( $Z_0$ )
2. Minimum Stomatal Resistance ( $R_{Smin}$ )
3. Radiation Stress Function (RGL)
4. Root Depth (NRoot)
5. Threshold Snow Depth that implies 100% Snow Cover(SNUP)
6. etc.

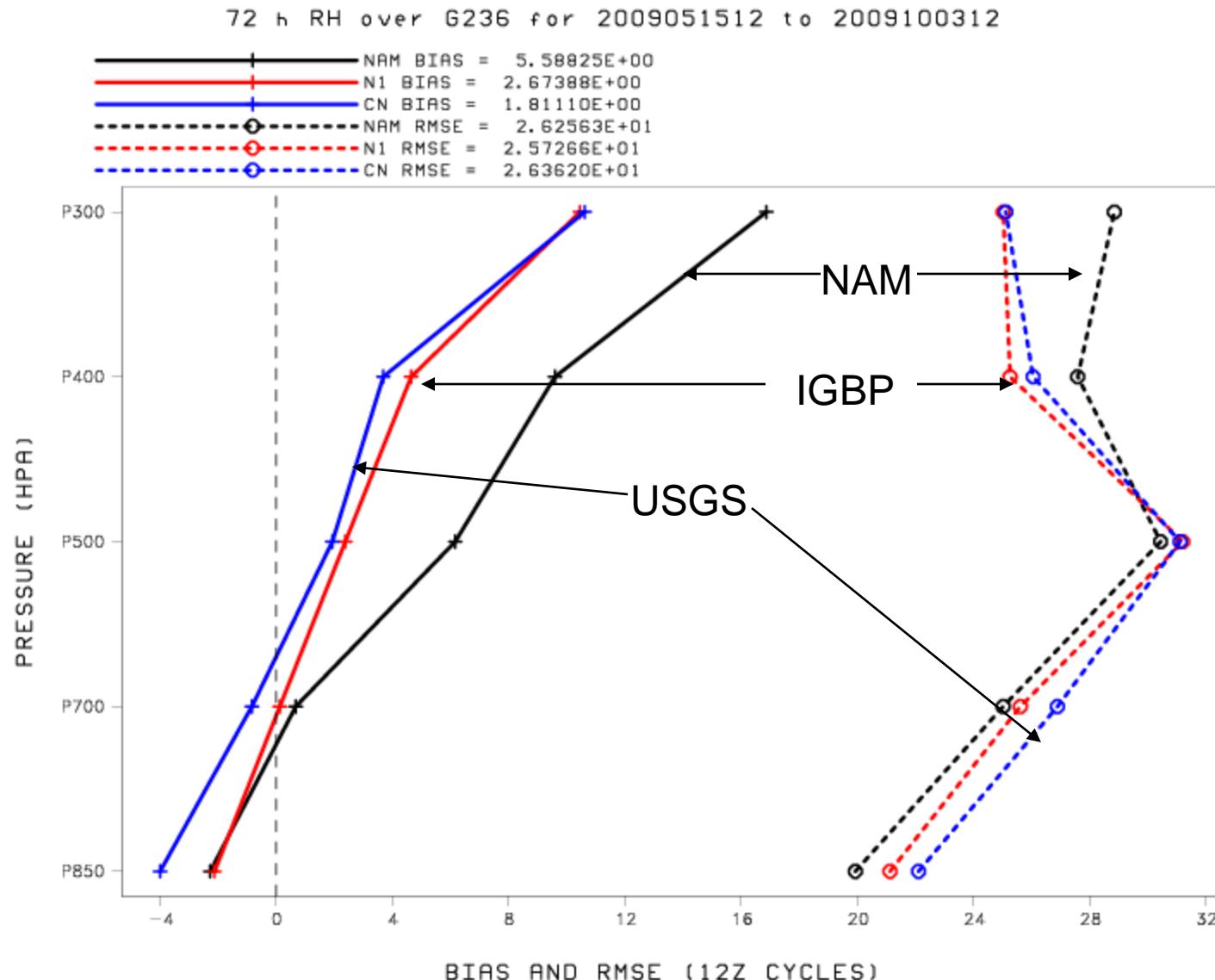
# Comparison between N1 & CN Runs for 10 cases

N1: IGBP (Parallel Testing with Operational Model since last August)

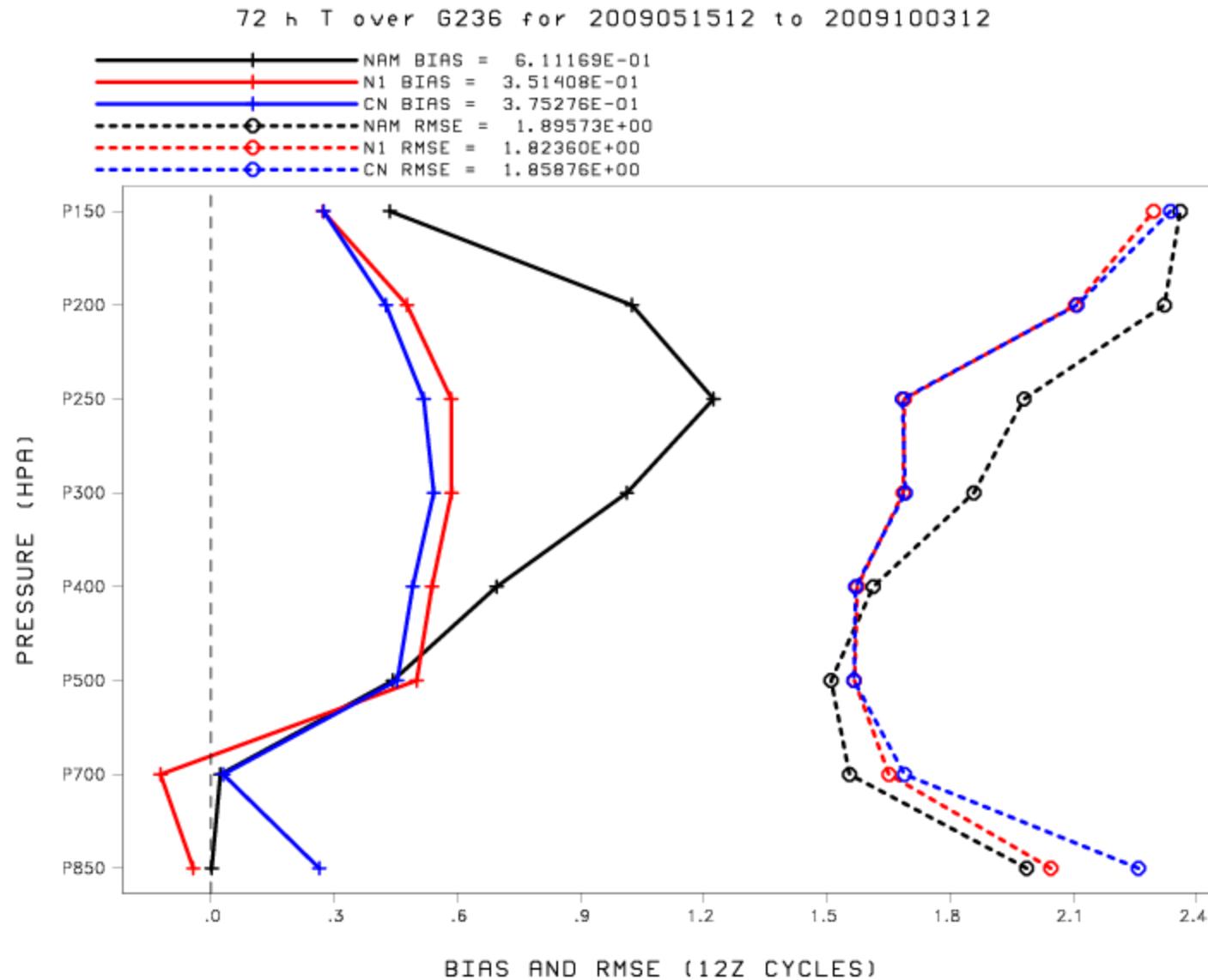
CN: Same as N1 except using USGS vegetation map

NAM: present mesoscale operational model

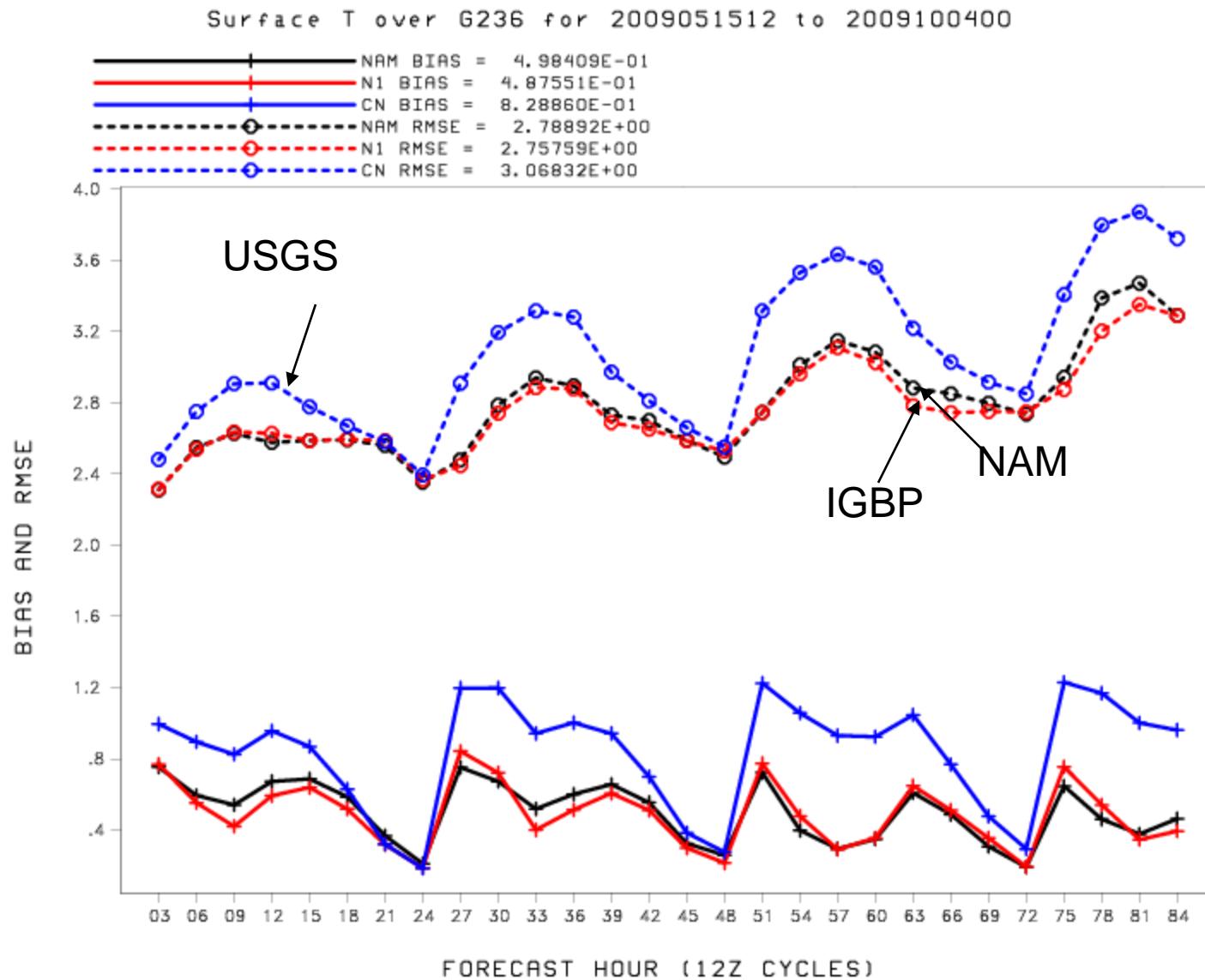
# Relative Humidity Bias & Root-mean-square Error



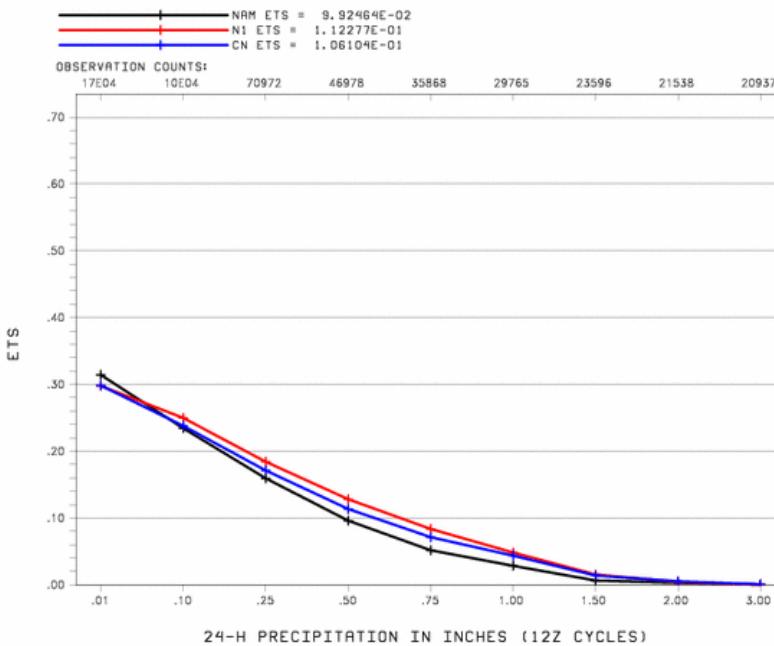
# Temperature Bias & Root-mean-square Error



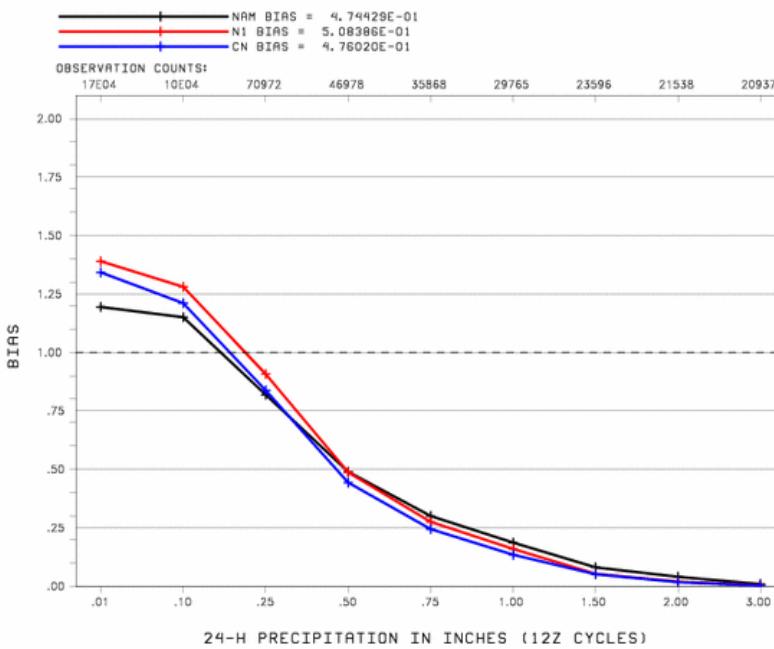
# Surface Temperature Bias & Root-mean-square Error



48 - 72 h QPF over G218/RFC for 2009051512 to 2009100312



48 - 72 h QPF over G218/RFC for 2009051512 to 2009100312



## Precipitation Score

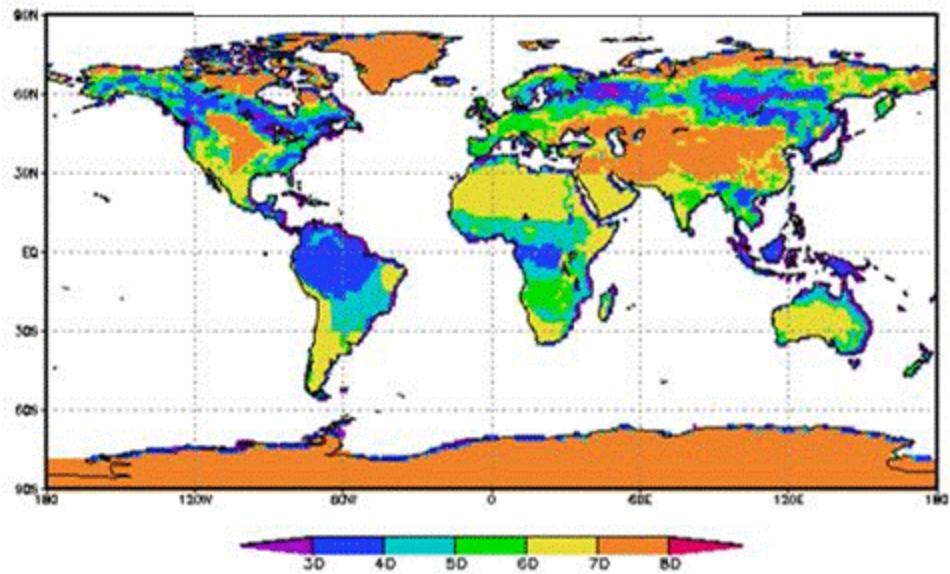
# MODIS Max Albedo & Snow-free Albedo

- Visible Direct Albedo (Solar zenith angle dependent)
- Visible Diffuse Albedo
- Near Infrared Direct Albedo  
(Solar Zenith angle dependent)
- Near Infrared Diffuse Albedo
- ~1km Resolution over the Globe
- Monthly Averaged

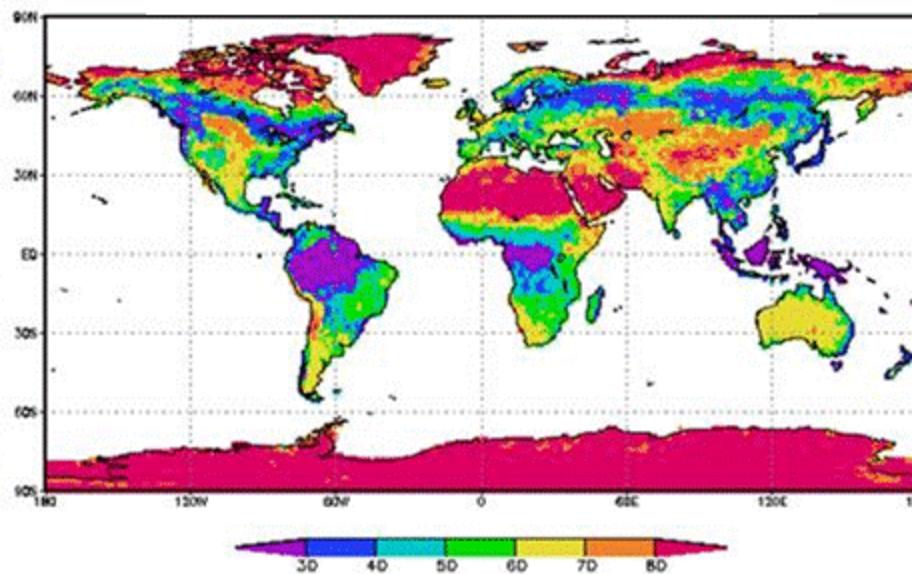
# Max

# Albedo

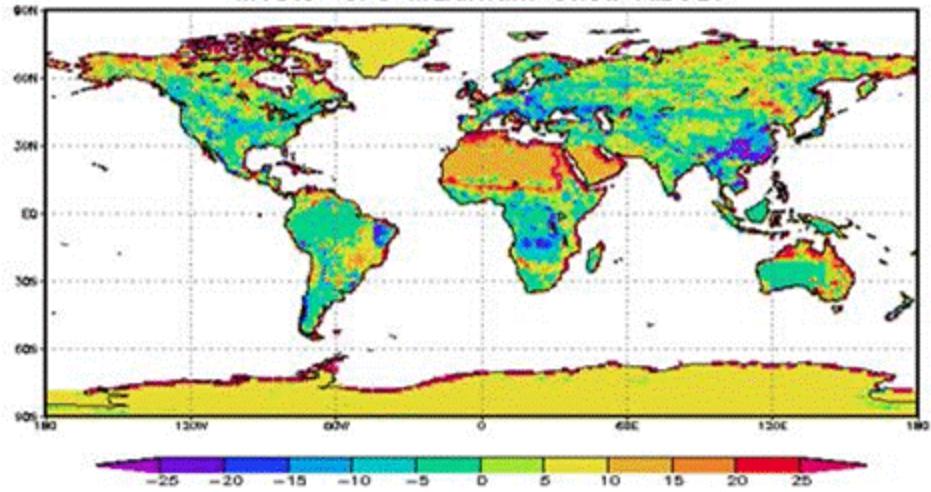
Operational GFS



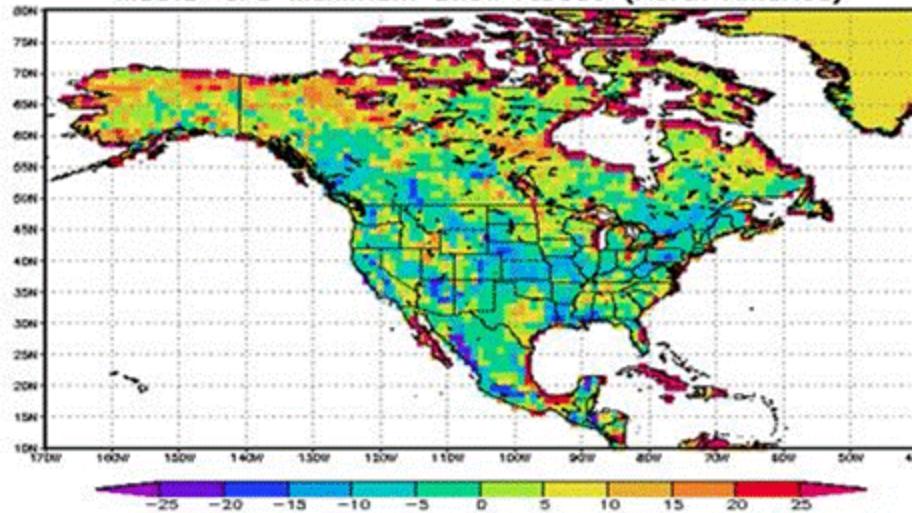
MODIS



MODIS-GFS Maximum Snow Albedo



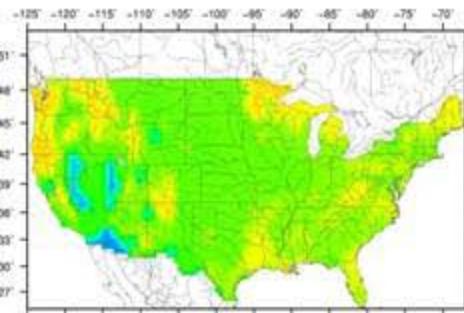
MODIS-GFS Maximum Snow Albedo (North America)



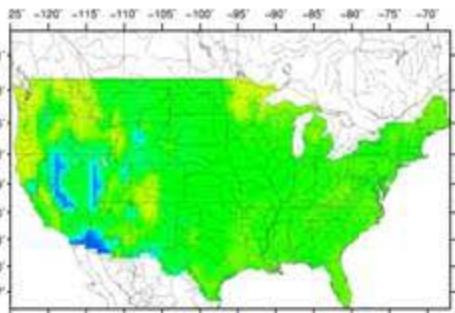
Snow-free Albedo = Total Outgoing Short Wave / Solar Radiation

**ORIGINAL**

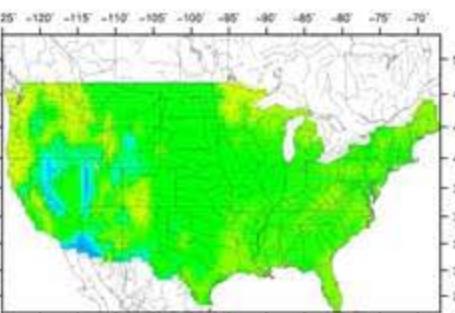
MARCH



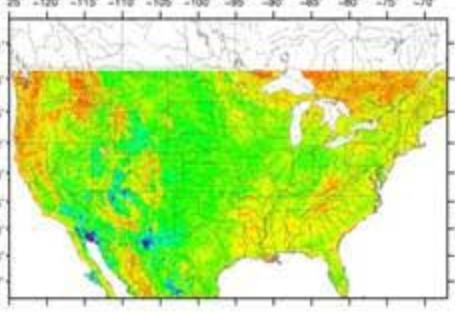
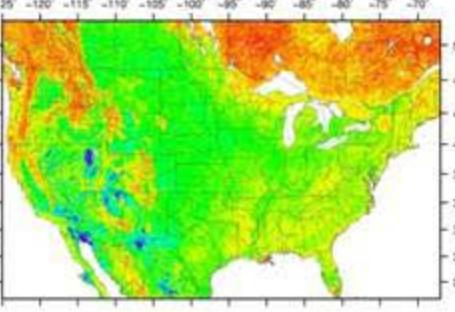
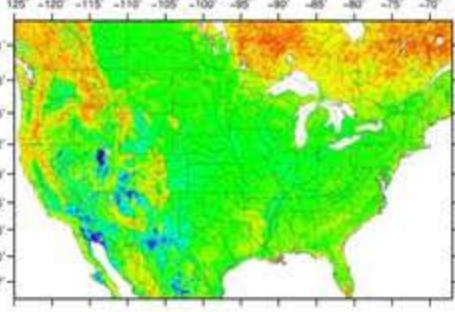
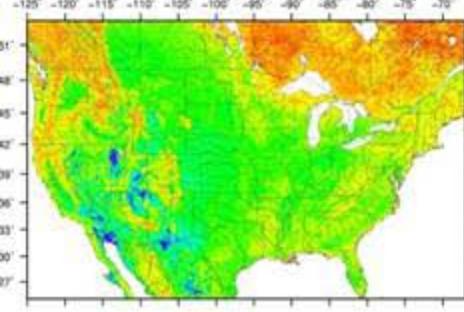
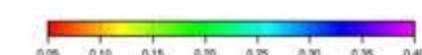
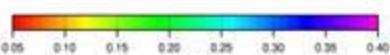
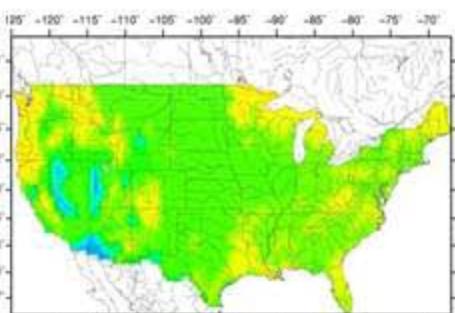
JUNE



SEPTEMBER

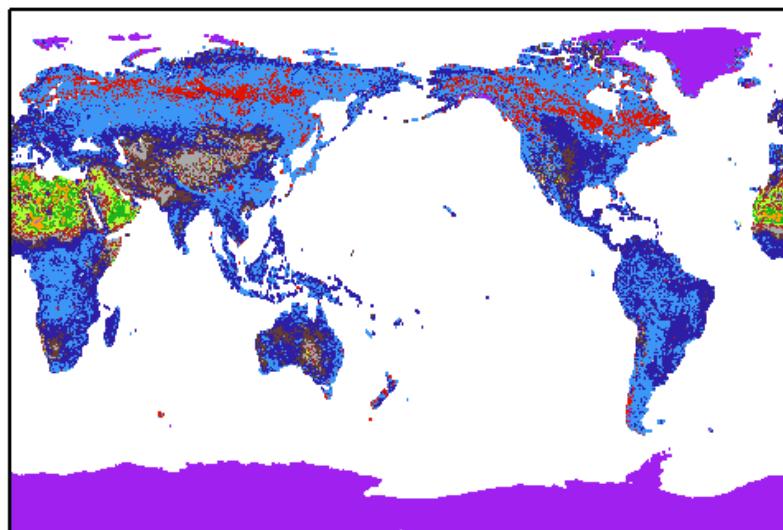


DECEMBER

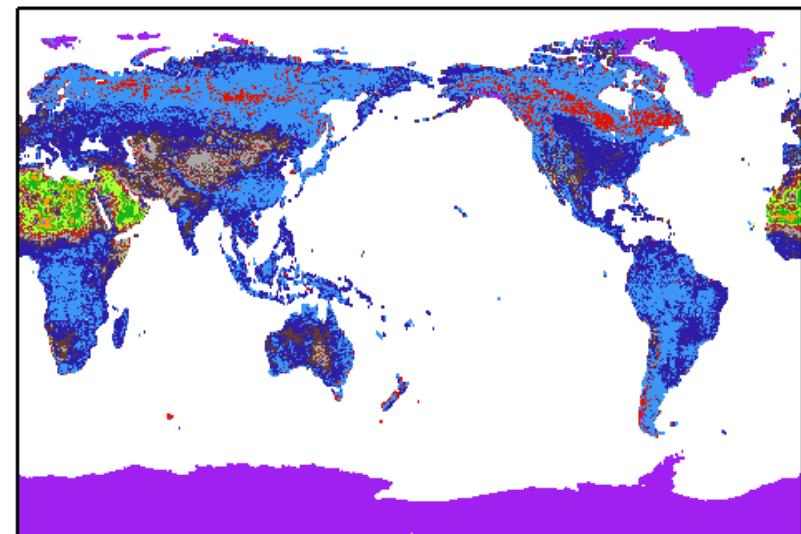


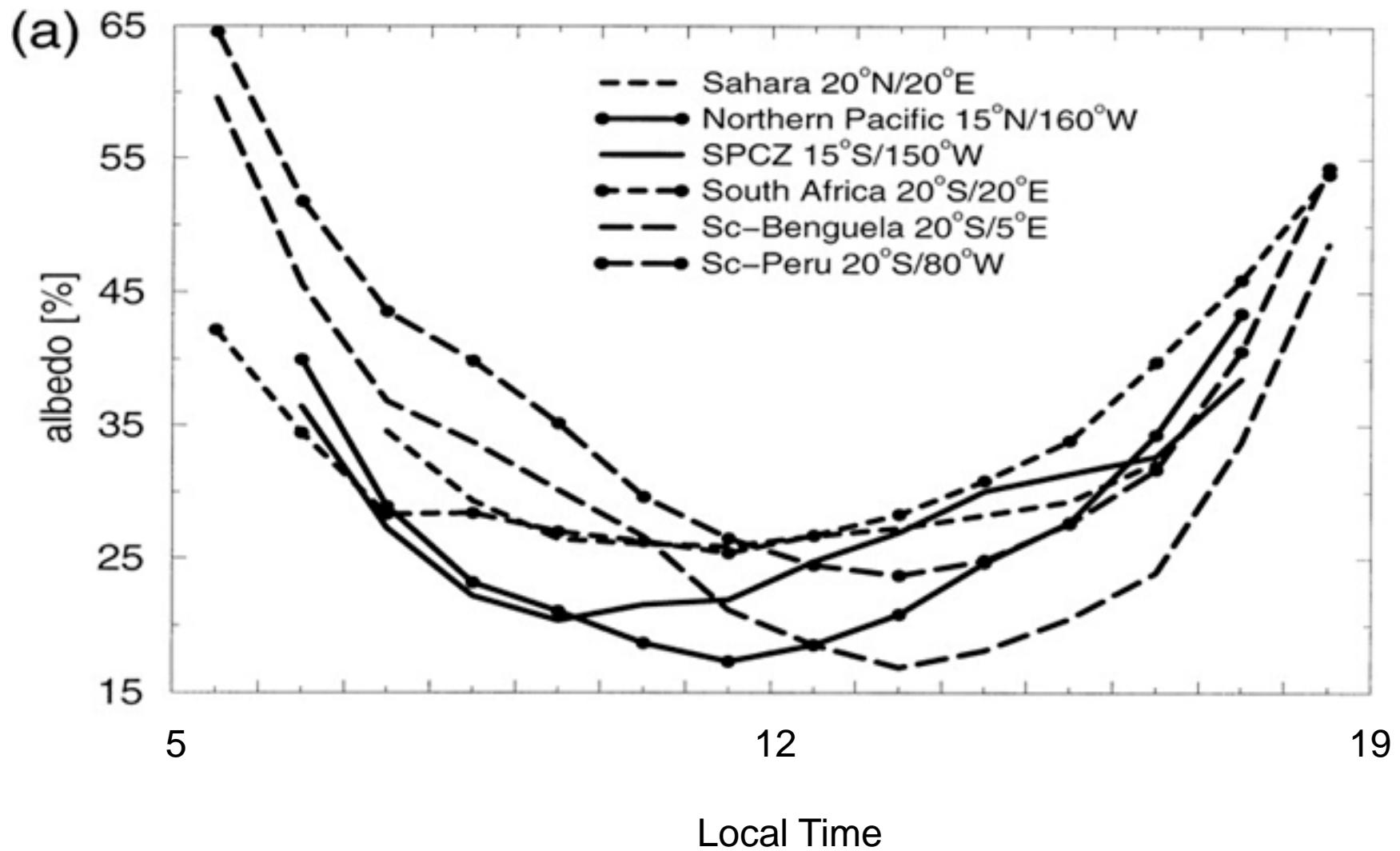
**MODIS**

April Broadband Direct Albedos

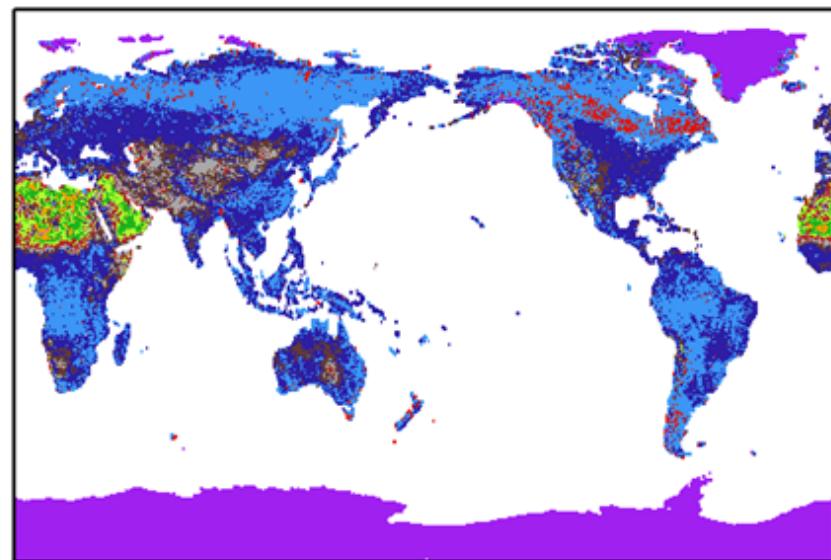


May Broadband Direct Albedos



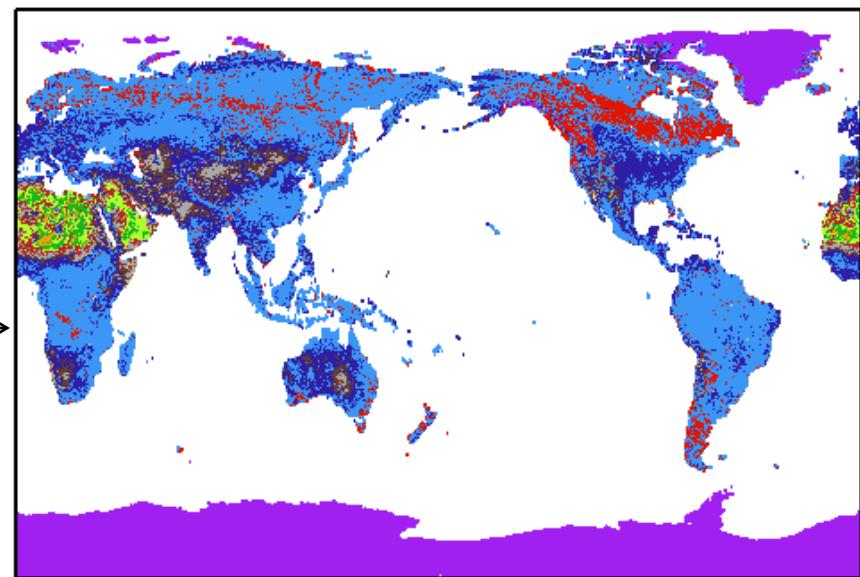


June Broadband Direct Albedos



Zenith Angle=60°

June Broadband Direct Albedo3



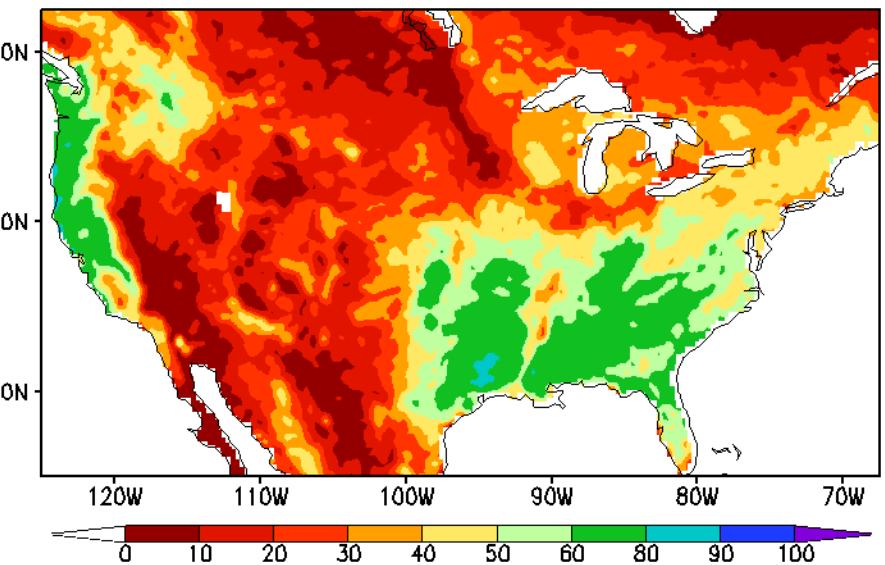
Zenith Angle=30°



# Green Vegetation Fraction “Real Time” → LAI, Roughness, Snow-free Albedo. Emissivity

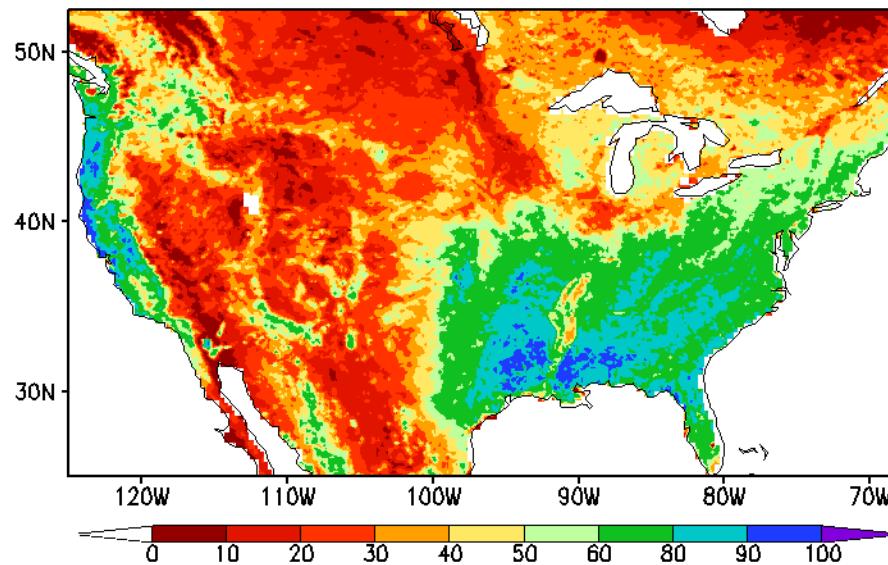
Old Climatology GVF (Gutman)

April



Mult-Year Mean GVF

Week 16



Diff. of Two Climatology datasets

April

