Impact of Land Processes on WRF

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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)**
- Evergreen
- More in Alaska & Canada
- More in SE of US
- Deciduous Broadleaf
- More
- Shrubland
- More

**Table: Classified Scheme vs IGBP vs USGS**

<table>
<thead>
<tr>
<th>Classified Scheme</th>
<th>IGBP</th>
<th>USGS</th>
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</thead>
<tbody>
<tr>
<td>Coastline</td>
<td>detailed</td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>More</td>
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<tr>
<td>Evergreen Broadleaf</td>
<td>More in Alaska &amp; Canada</td>
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<td>Deciduous Broadleaf</td>
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<td>Shrubland</td>
<td>More</td>
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</tbody>
</table>
Change of Vegetation Type ➔ Change of Vegetation Parameters:

1. Roughness Length (Z0)
2. Minimum Stomatal Resistance (RSmin)
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

72 h RH over G236 for 2009051512 to 2009100312

NAM BIASE = 5.58025E+00
N1 BIASE = 2.67388E+00
CN BIASE = 1.91110E+00
NAM RMSE = 2.62563E+01
N1 RMSE = 2.57266E+01
CN RMSE = 2.63620E+01

NAM
IGBP
USGS
Temperature Bias & Root-mean-square Error
Surface Temperature Bias & Root-mean-square Error
Precipitation Score

Precipitation Bias
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
Snow-free Albedo = \frac{\text{Total Outgoing Short Wave}}{\text{Solar Radiation}}
Green Vegetation Fraction “Real Time” $\rightarrow$ LAI, Roughness, Snow-free Albedo, Emissivity

Old Climatology CVF (Gutman)  
April

Mult-Year Mean CVF  
Week 16

Diff. of Two Climatology datasets  
April