Swapna Panickal
Centre for Climate Change Research
Indian Institute of Tropical Meteorology, Pune, India
E-mail: swapna@tropmet.res.in
**GFS (Atmospheric Model) with NOAH Land Model**

AO Coupler

**Fast Loop**

**Slow Loop**

**GFDL MOM4p1 (Ocean Model) & SIS (Ice Model)**

FMS coupler

**Atmosphere**

| T62 (192x94, ~2deg), 64 levels, latlon grid | Tripolar, (360x200, ~1 deg), 50 levels with BGC | T62 (192x94), 4 levels, latlon grid |

**Scalability**: 8 Simulation Year Per Day (SYPD)
### Status of incorporation of forcing fields

<table>
<thead>
<tr>
<th>Forcing Dataset</th>
<th>Will be used (YES/NO)</th>
<th>Pre-industrial</th>
<th>Historical</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLCF Emissions</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biomass Burning</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GHG Emissions</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land-use</td>
<td>yes</td>
<td>testing</td>
<td>testing</td>
</tr>
<tr>
<td>GHG concentrations</td>
<td>Yes</td>
<td>testing</td>
<td>testing</td>
</tr>
<tr>
<td>Ozone concentrations</td>
<td>yes</td>
<td>testing</td>
<td>testing</td>
</tr>
<tr>
<td>Nitrogen deposition</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple plume aerosol</td>
<td>yes</td>
<td>testing</td>
<td>testing</td>
</tr>
<tr>
<td>Solar</td>
<td>yes</td>
<td>testing</td>
<td>testing</td>
</tr>
<tr>
<td>Stratospheric aerosol</td>
<td>yes</td>
<td>testing</td>
<td>testing</td>
</tr>
<tr>
<td>AMIP SST and SIC</td>
<td>yes</td>
<td>testing</td>
<td>testing</td>
</tr>
</tbody>
</table>
PI Control run : Initial Results
Global Mean Features

**Energy Balance**

<table>
<thead>
<tr>
<th></th>
<th>TOA</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surf</td>
<td>1.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

**Air Temp & SST**

<table>
<thead>
<tr>
<th></th>
<th>Temp</th>
<th>SST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13.5</td>
<td>17.5</td>
</tr>
</tbody>
</table>
Land use/land cover changes (LUHv1, Hurtt., 2016)

Pre industrial

Present day

Legend:
- 0: waterbodies
- 1: Evergreen Broad
- 2: Deciduous Broad
- 3: mixed forests
- 4: Evergreen Needle
- 5: Deciduous Needle
- 6: savannas
- 7: grasslands
- 8: shrubs
- 9: openshrubs
- 10: Tundra
- 11: Barren
- 12: crops
- 13: snow ice
Precipitation response to Land use/land cover changes

(Sandeep et al.)
Boreal summer monsoon (JJAS) precipitation (mm day\(^{-1}\))

(a) TRMM

(b) ESMv1 (T126)

(c) ESMv2 (T62)
The linear trend of area averaged land precipitation from 2006 to 2099 for India and eastern China from CMIP5 Models

- Most models show an intensified Asian monsoon rainfall,
- There is substantial model spread.  
  (Li and Ting, 2016)
Mean Summer Monsoon Precipitation and its Variability over India

IITM ESM
ENSO-Monsoon teleconnection in CMIP5 Models
Climate response to naturally occurring tropospheric aerosols simulated by the IITM-ESM

Solar Radiative forcing for clear sky

- TOA direct solar radiative flux for clear sky conditions indicate negative forcing over tropics
- The Surface radiative forcing show considerable decrease over regions with high natural aerosol loading
- The atmospheric radiative forcing show an increase in absorption of solar energy over high aerosol regions
- Surface temperature response indicates cooling over almost entire globe, specially over northern hemispheric continents
- Precipitation anomaly shows a reduction over various tropical regions like South Asia and equatorial Atlantic

(Ayantika et al..)
Thank you