Analysis of an AMIP Run with the Super-CAM

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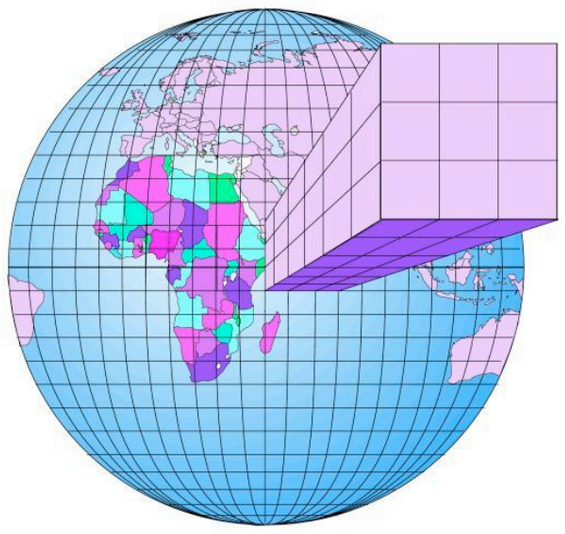
Acknowledgement



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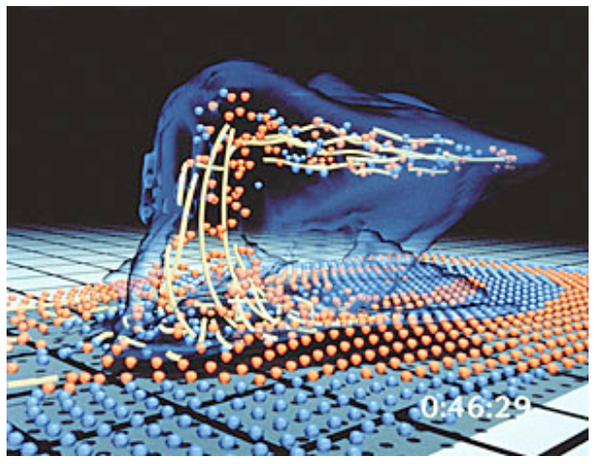
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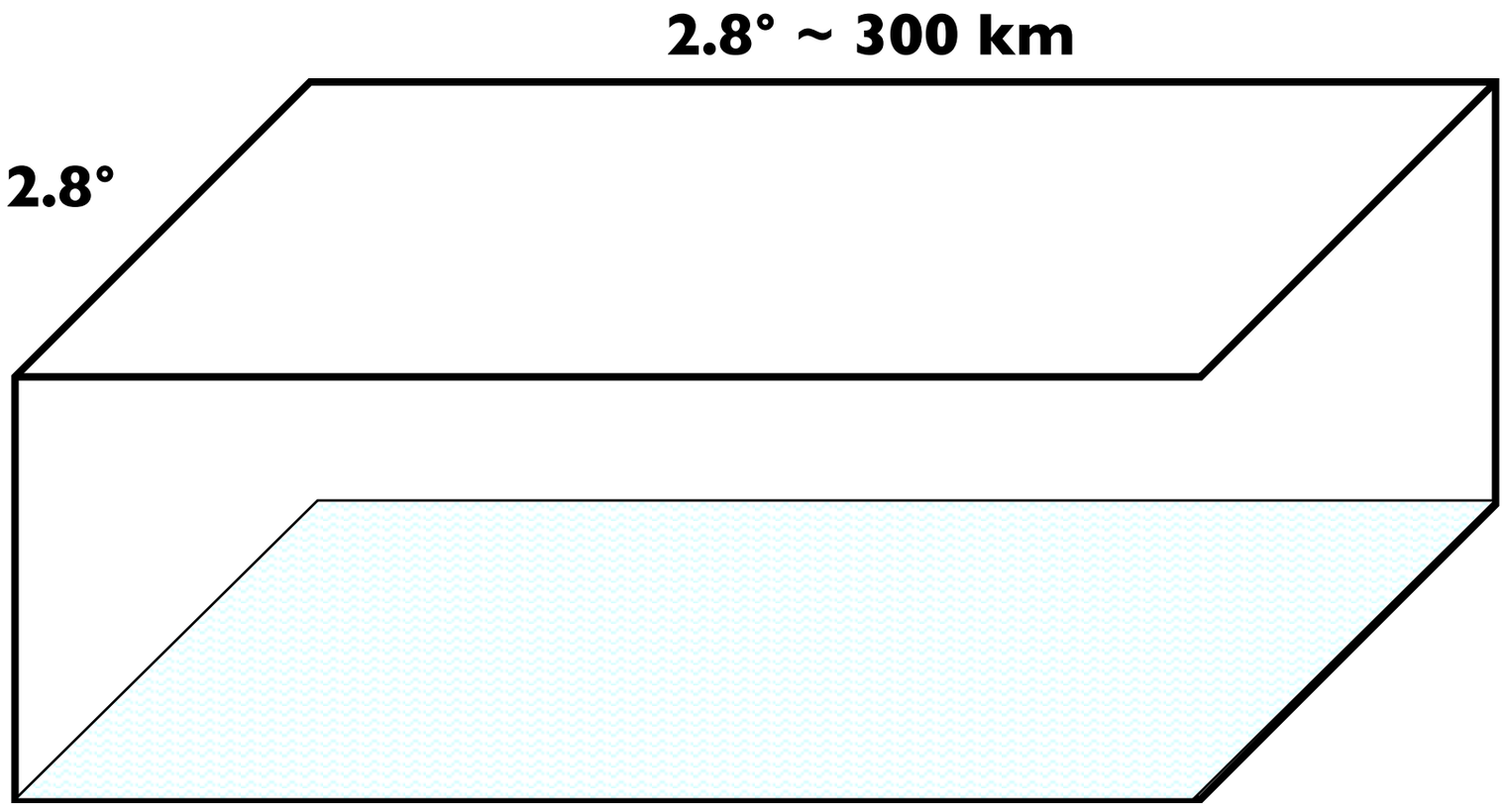
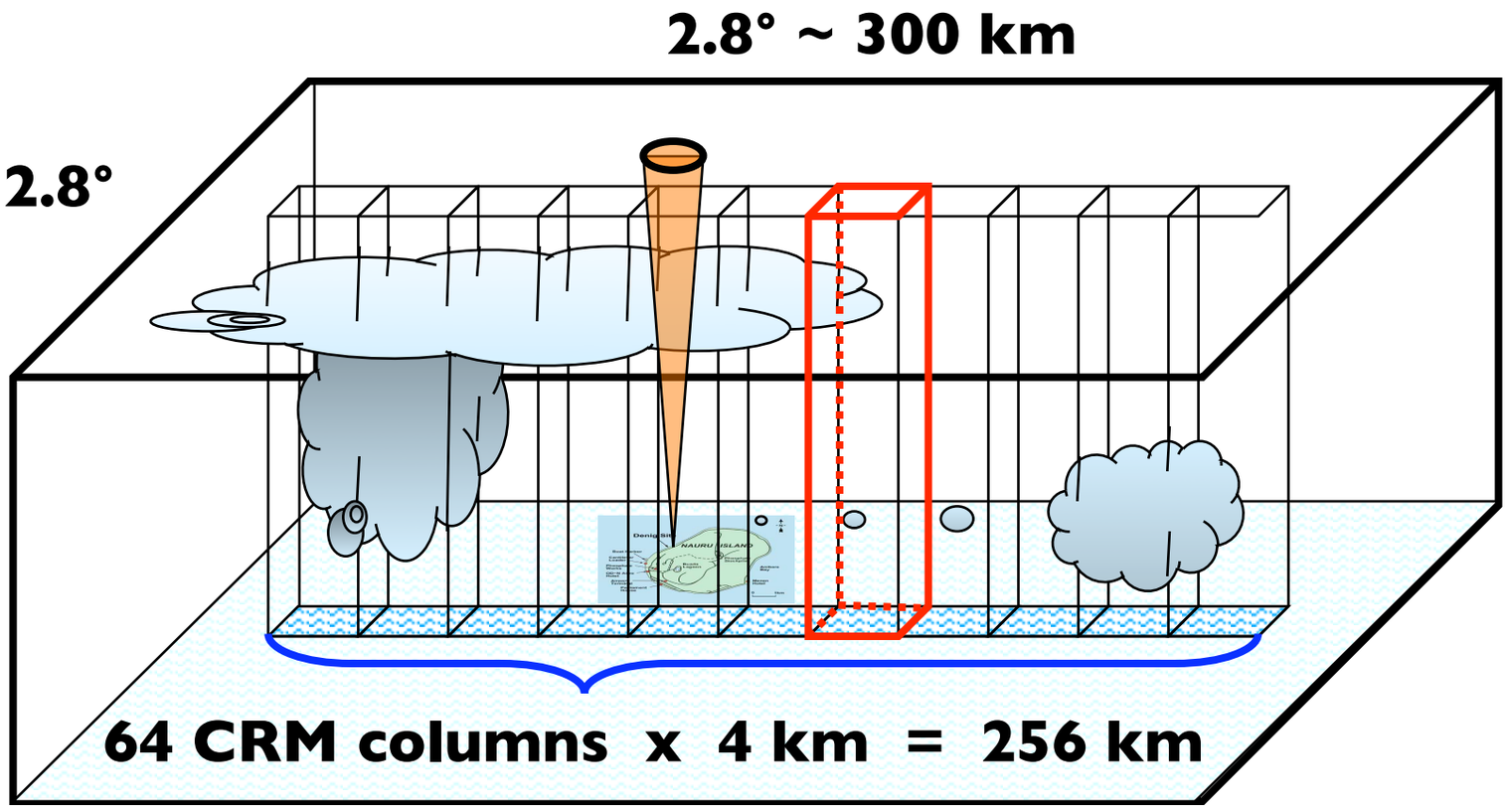
Multi-Scale Modeling Framework (MMF)

GCM grid column



Multi-Scale Modeling Framework (MMF)

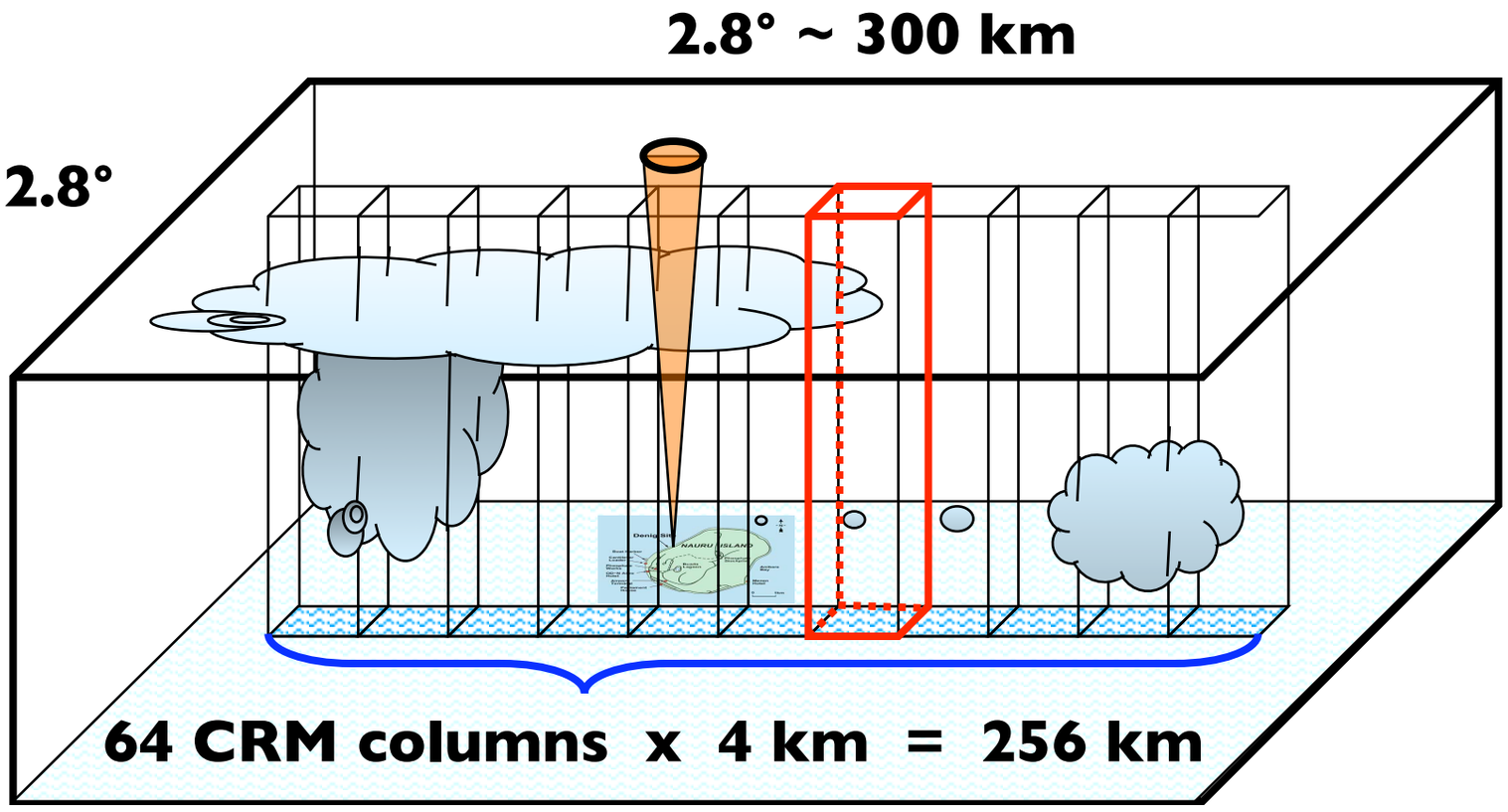
GCM grid column



Periodic lateral boundary conditions

Multi-Scale Modeling Framework (MMF)

GCM grid column



Periodic lateral boundary conditions

This idea was proposed and first tested by Wojciech Grabowski.

GCM

NCAR CAM3 Semi-Lagrangian DyCore

T42 (2.8°x2.8°), L30, dt=1800 sec

ALL cloud, PBL, SGS parameterizations are switched off

Super-Parameterization

CSU SAM Cloud Resolving Model (8192 copies)

- ***Anelastic dynamics***
- ***Prognostic water/ice static energy, total non-precipitating and total precipitating water***
- ***Condensate and hydrometeor partitioning as f(T)***
- ***Smagorinsky SGS closure***

2-D domain (S-N orientation), 32 x 28 grid, dx = 4 km, dt = 20 sec

Radiation transfer for each CRM column (every 900 sec)

Performance

1024 PEs of IBM-SP 'Seaborg' at NERSC

~ 920-fold speedup relative to one processor

~ 10 simulated months per wall-clock day

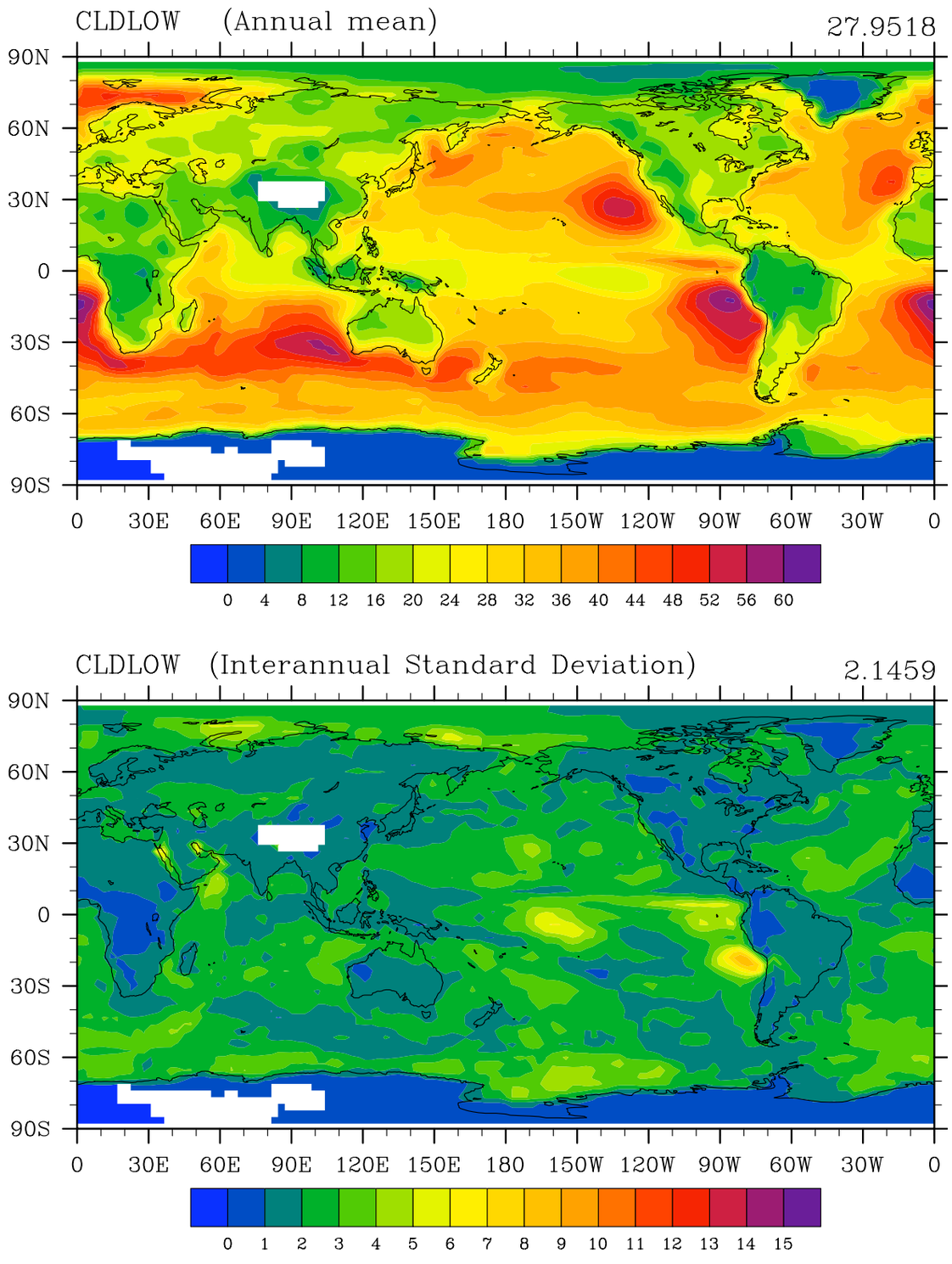
AMIP-style experiment

Prescribed monthly-mean observed SST and ice

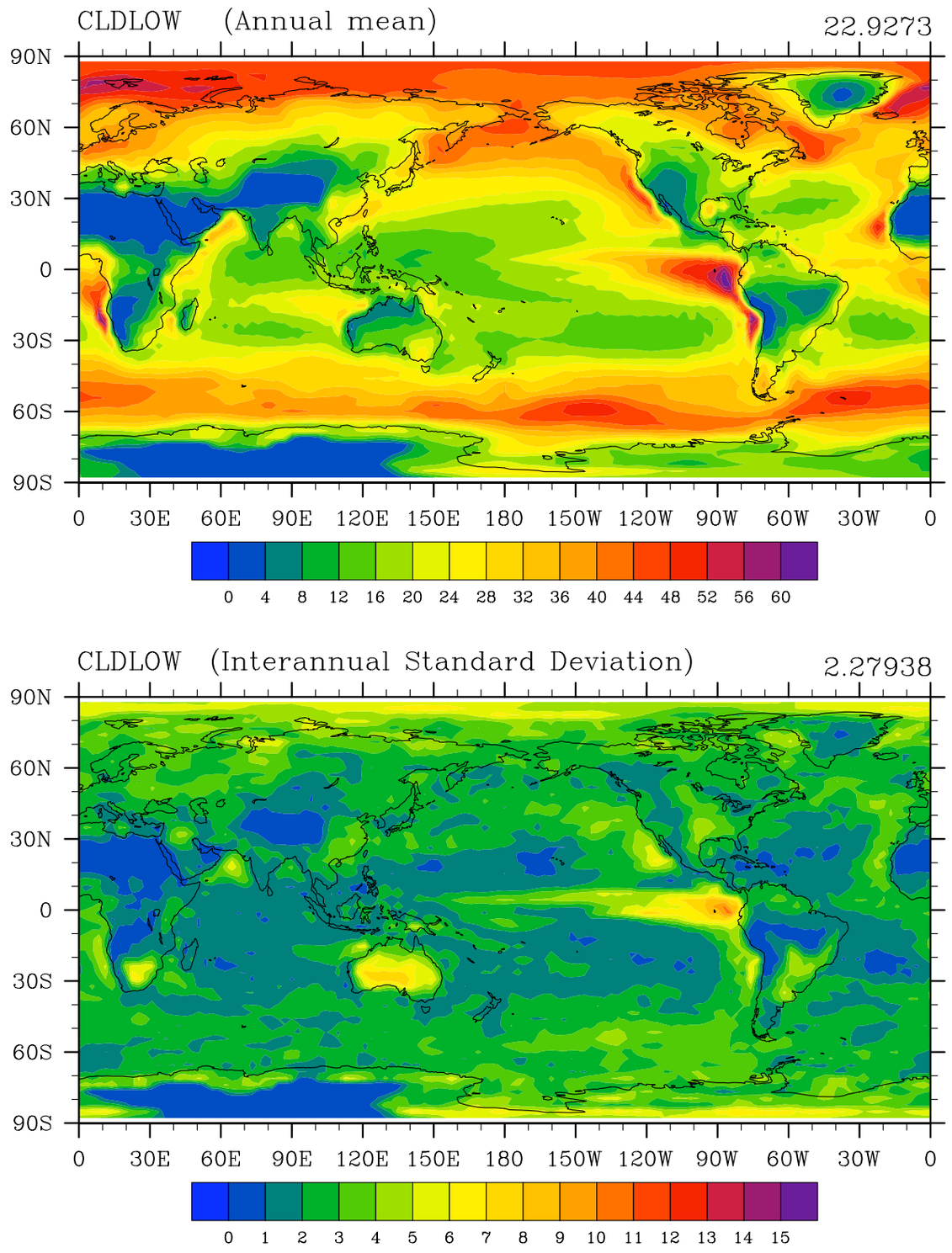
September 1985 to August 2001 (16 years)

Low Clouds

ISCCP (1986-2000)

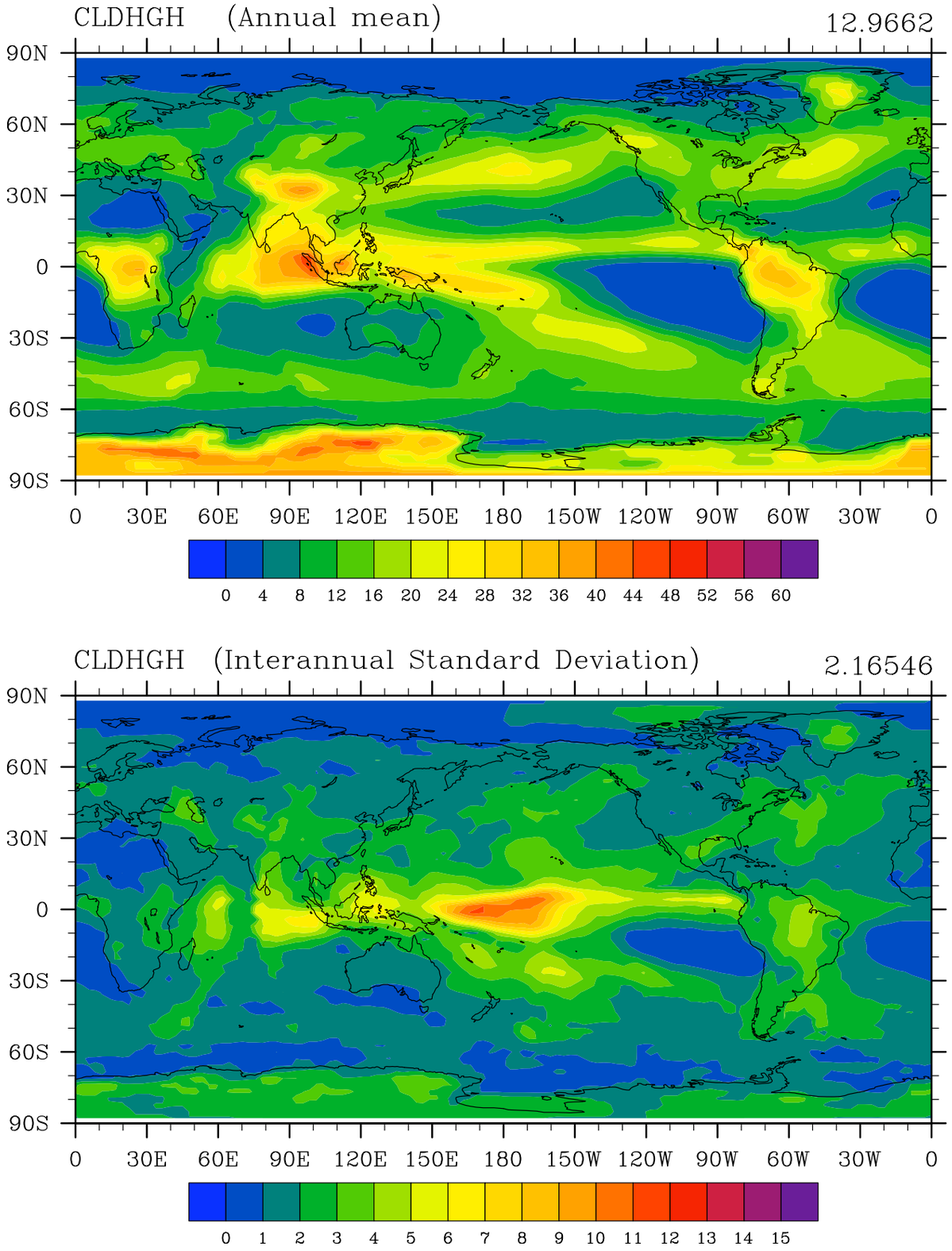


MMF (1986-2000)

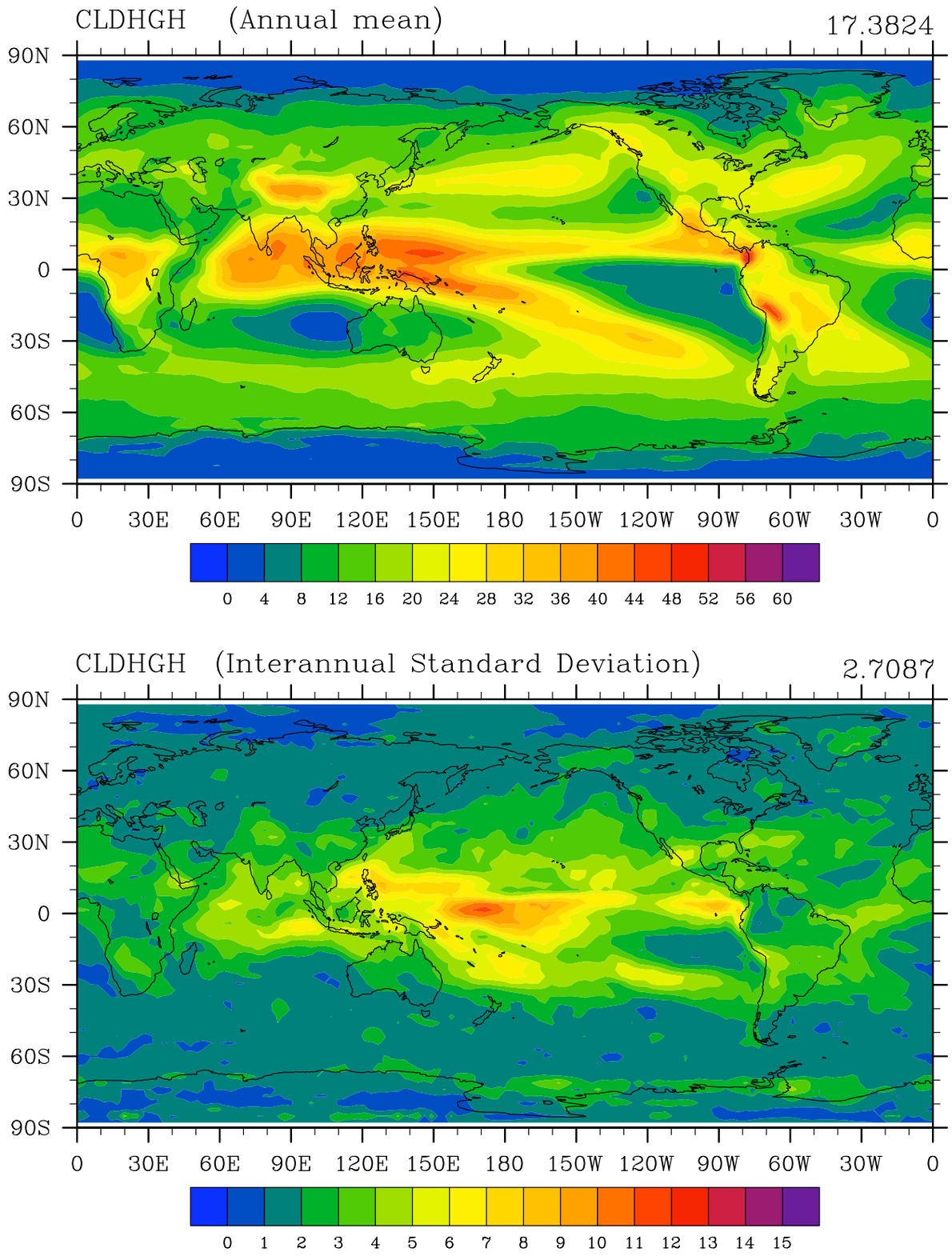


High Clouds

ISCCP (1986-2000)



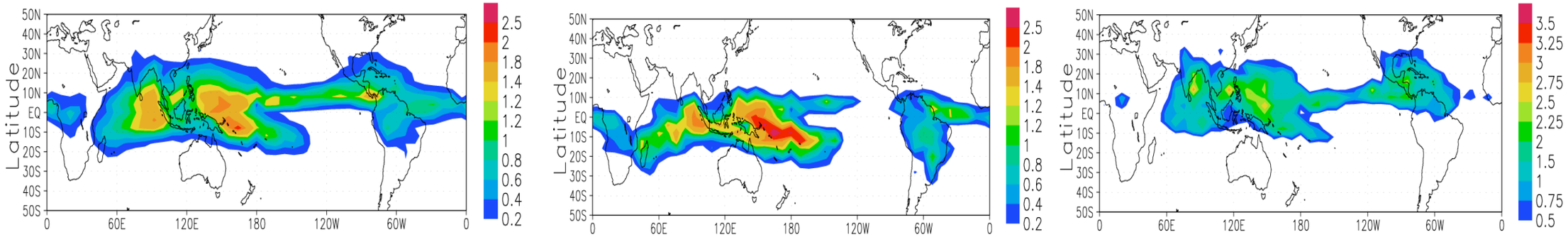
MMF (1986-2000)



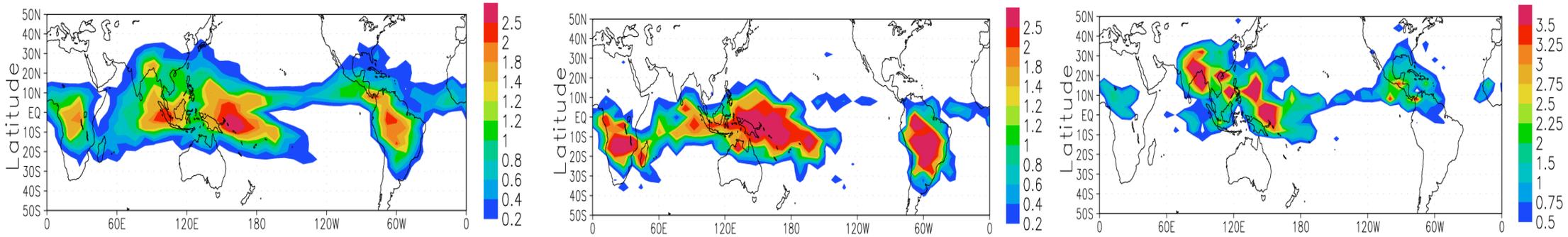
IWC (15 year-mean) @147 hPa

Annual **January** **July**

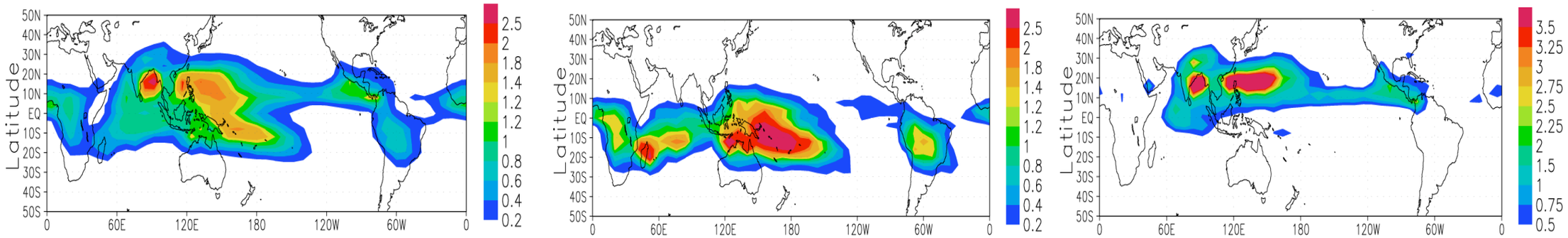
ECMWF



MLS

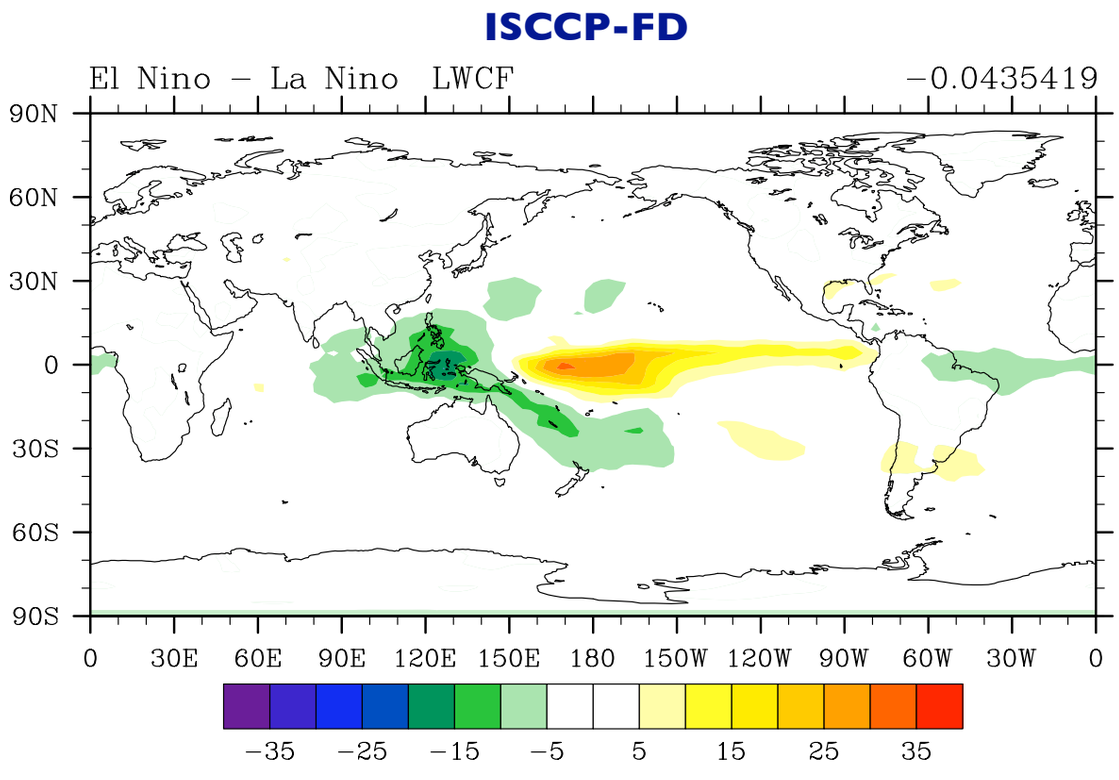


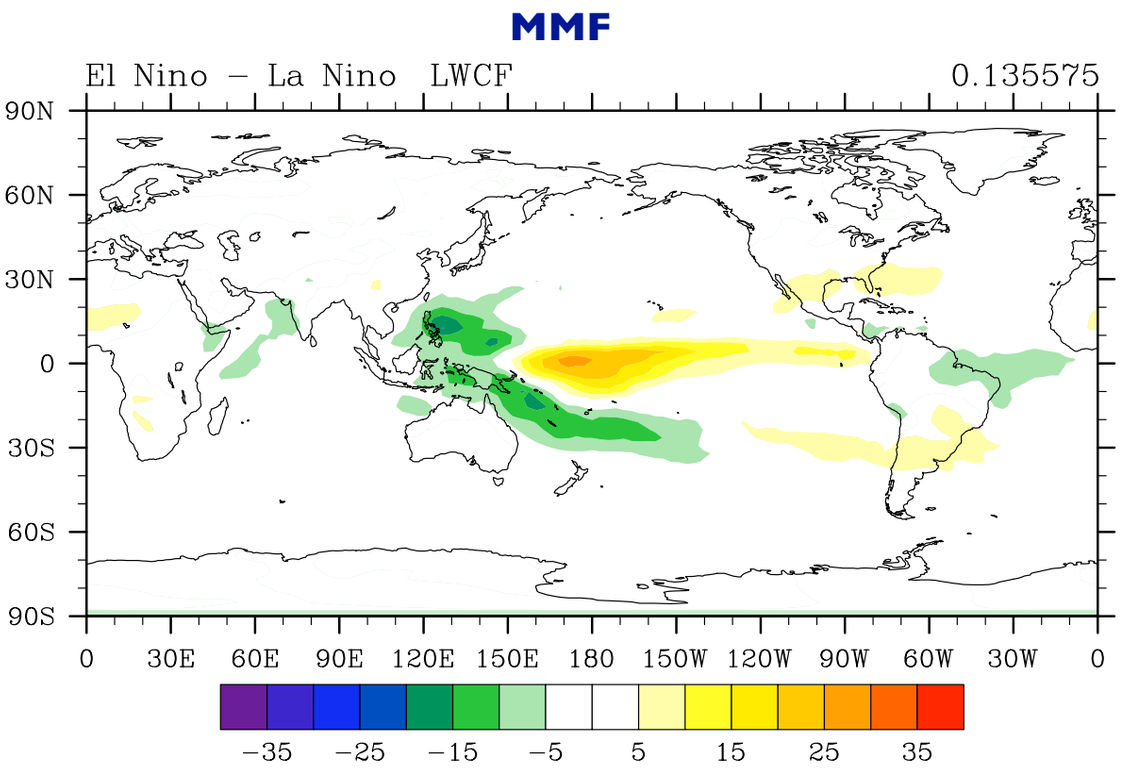
CSUMMF



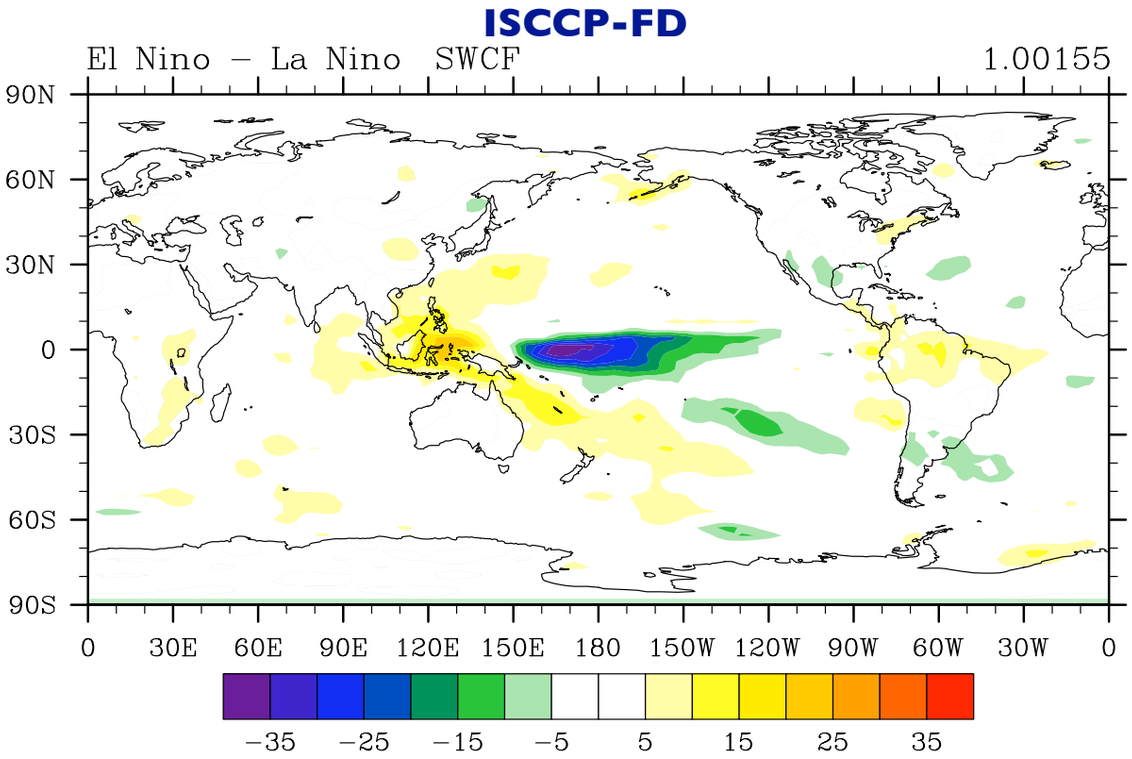
Jui-Lin Li, JPL

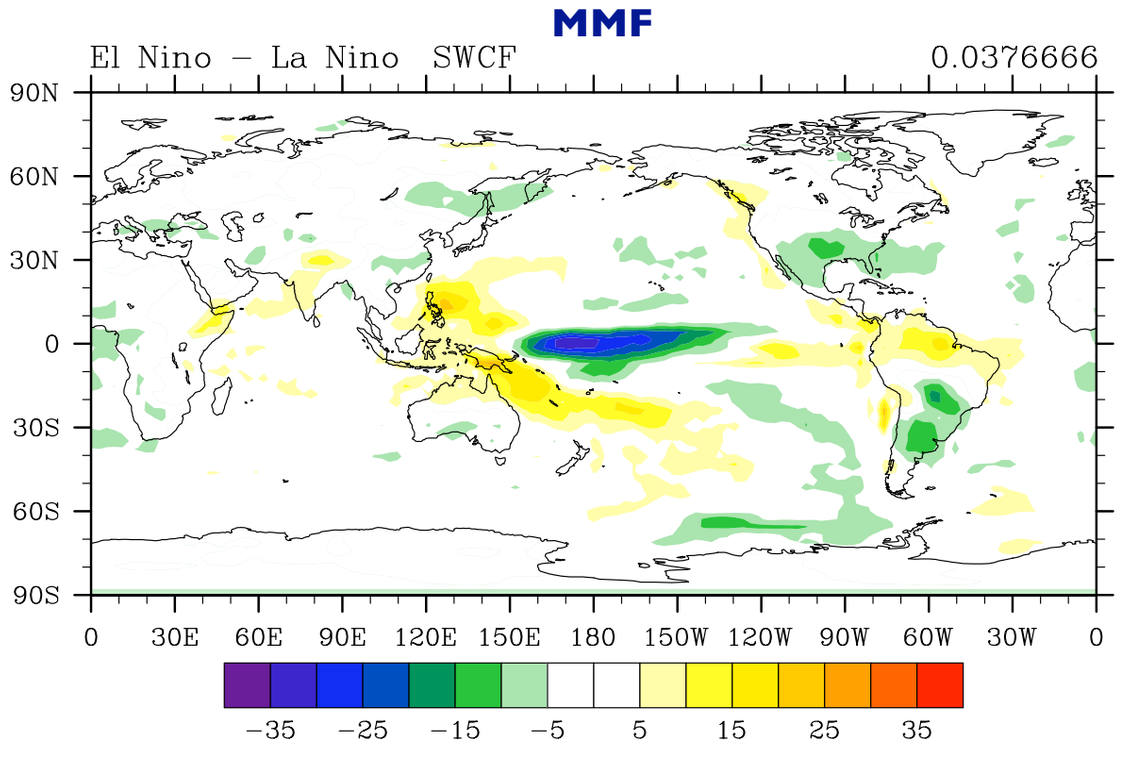
EN-LN Longwave Cloud Effect





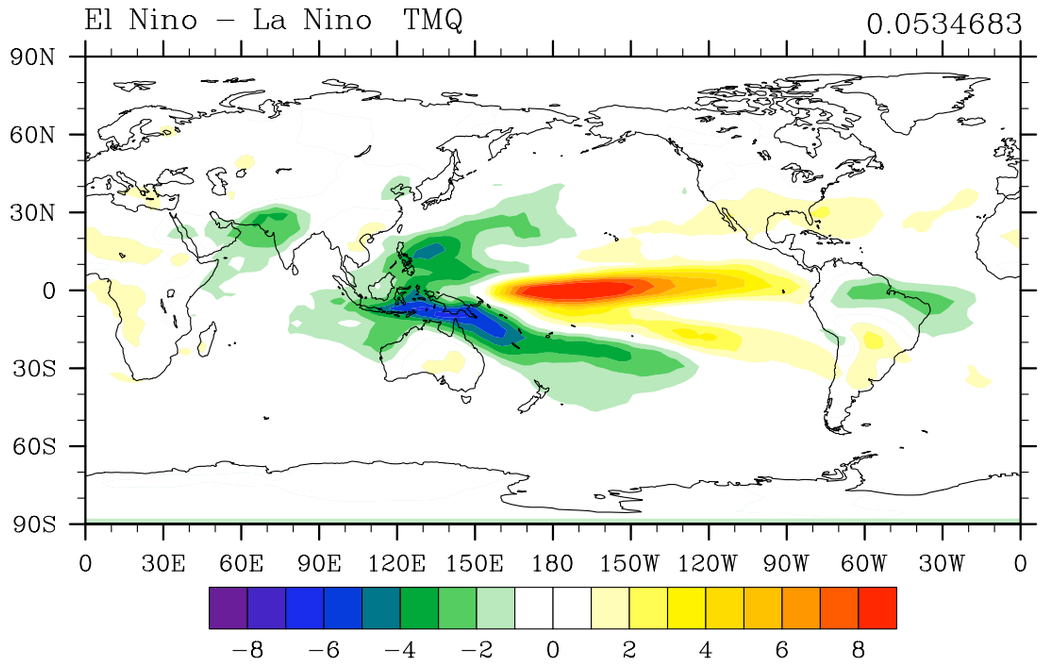
EN-LN Shortwave Cloud Effect



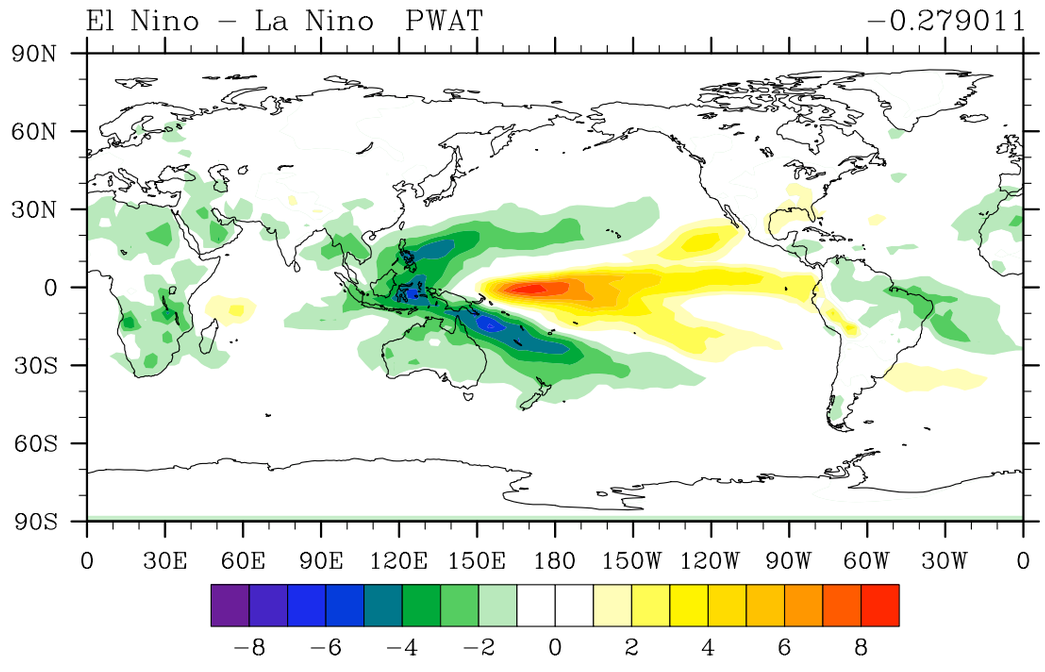


EN-LN Column Water Vapor

NVAP

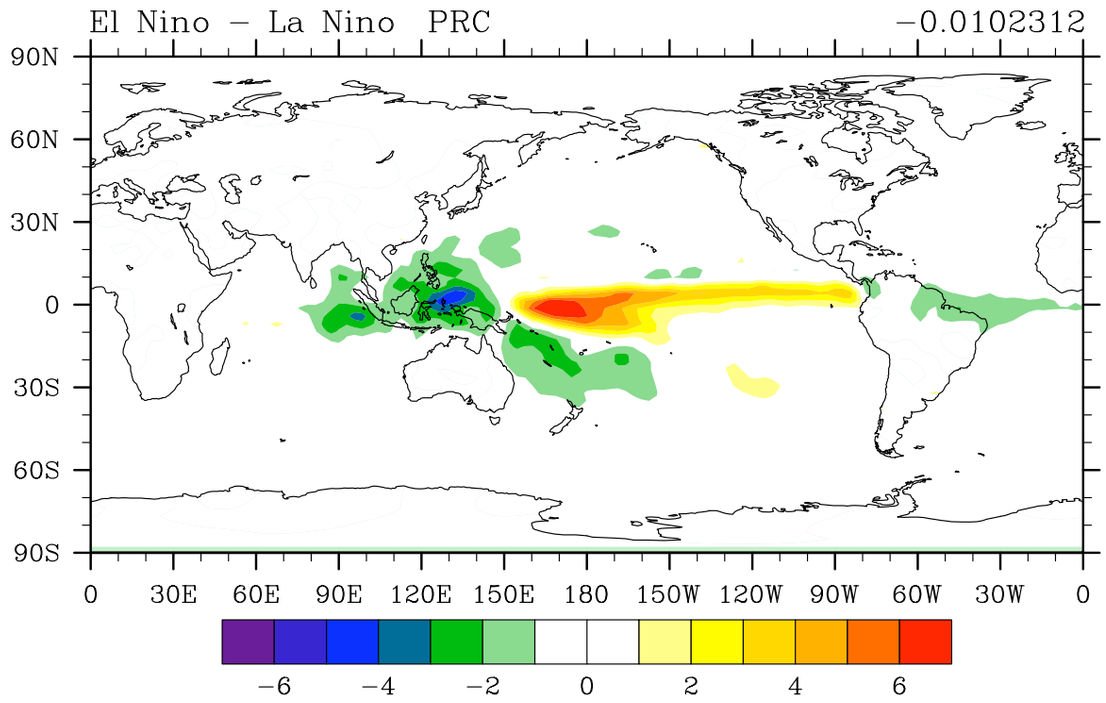


MMF



EN-LN Precipitation

CMAP



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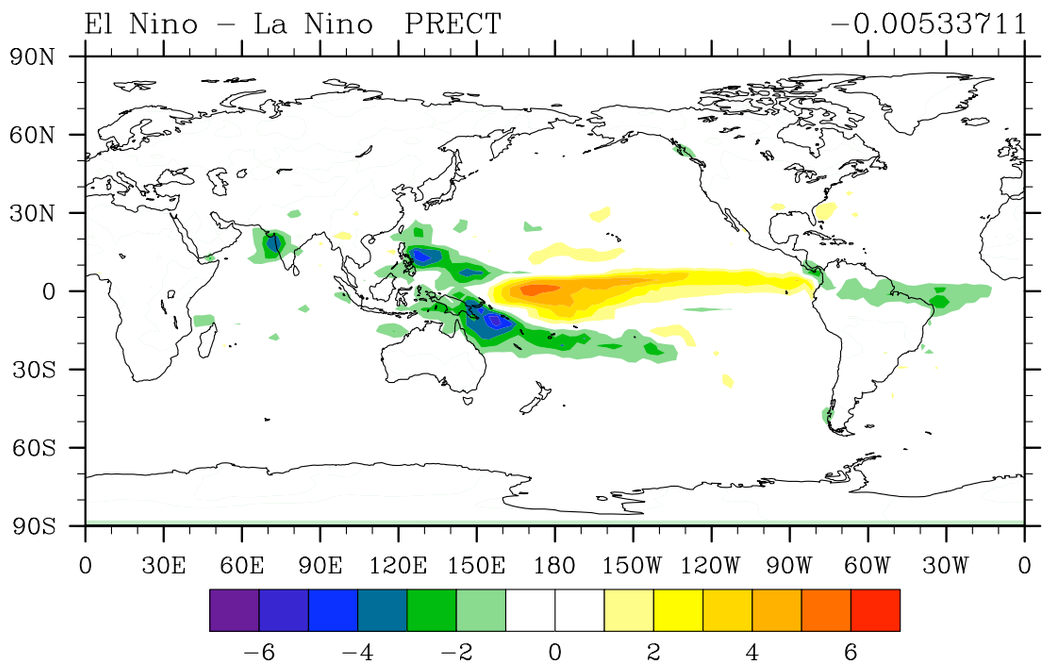
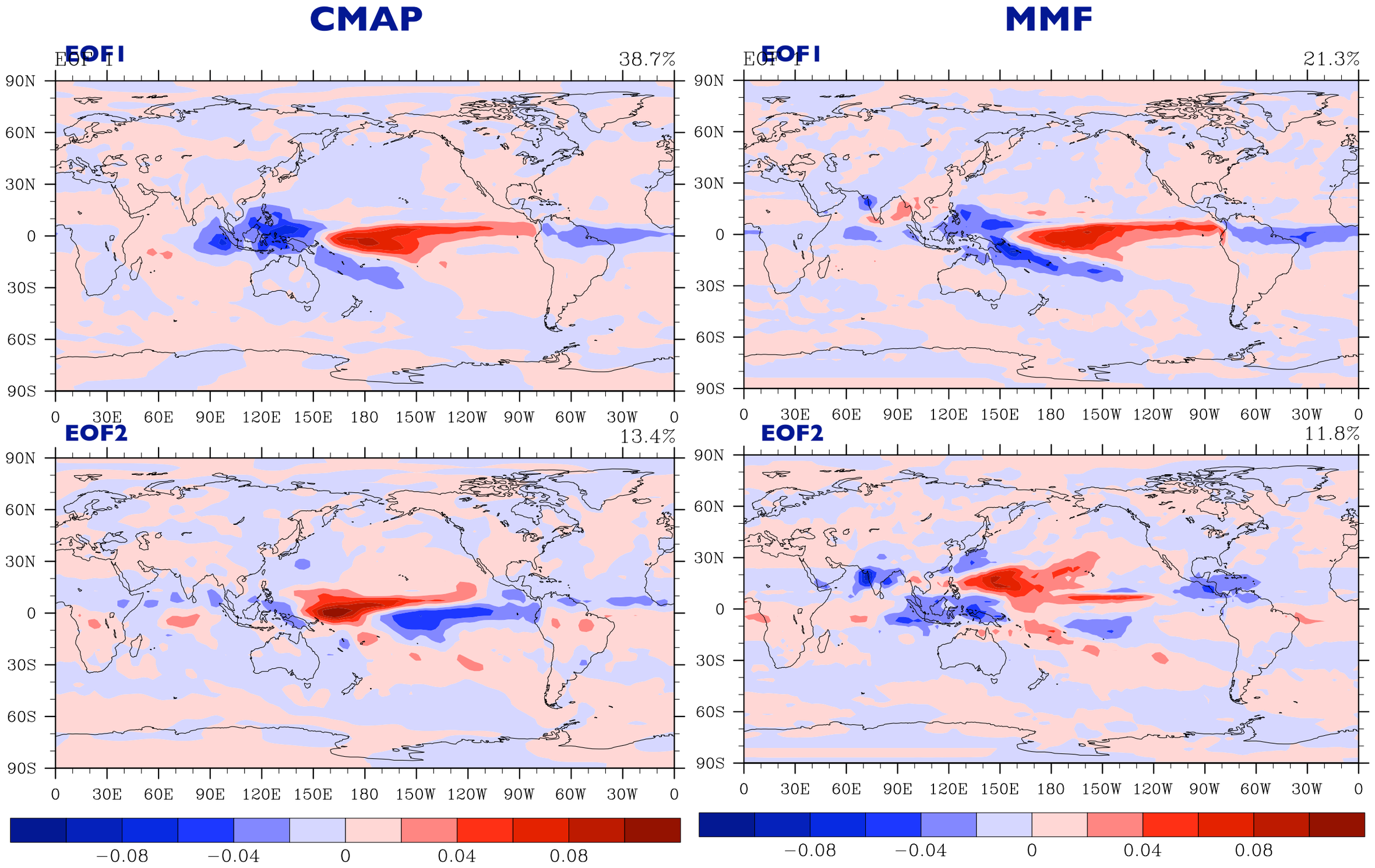
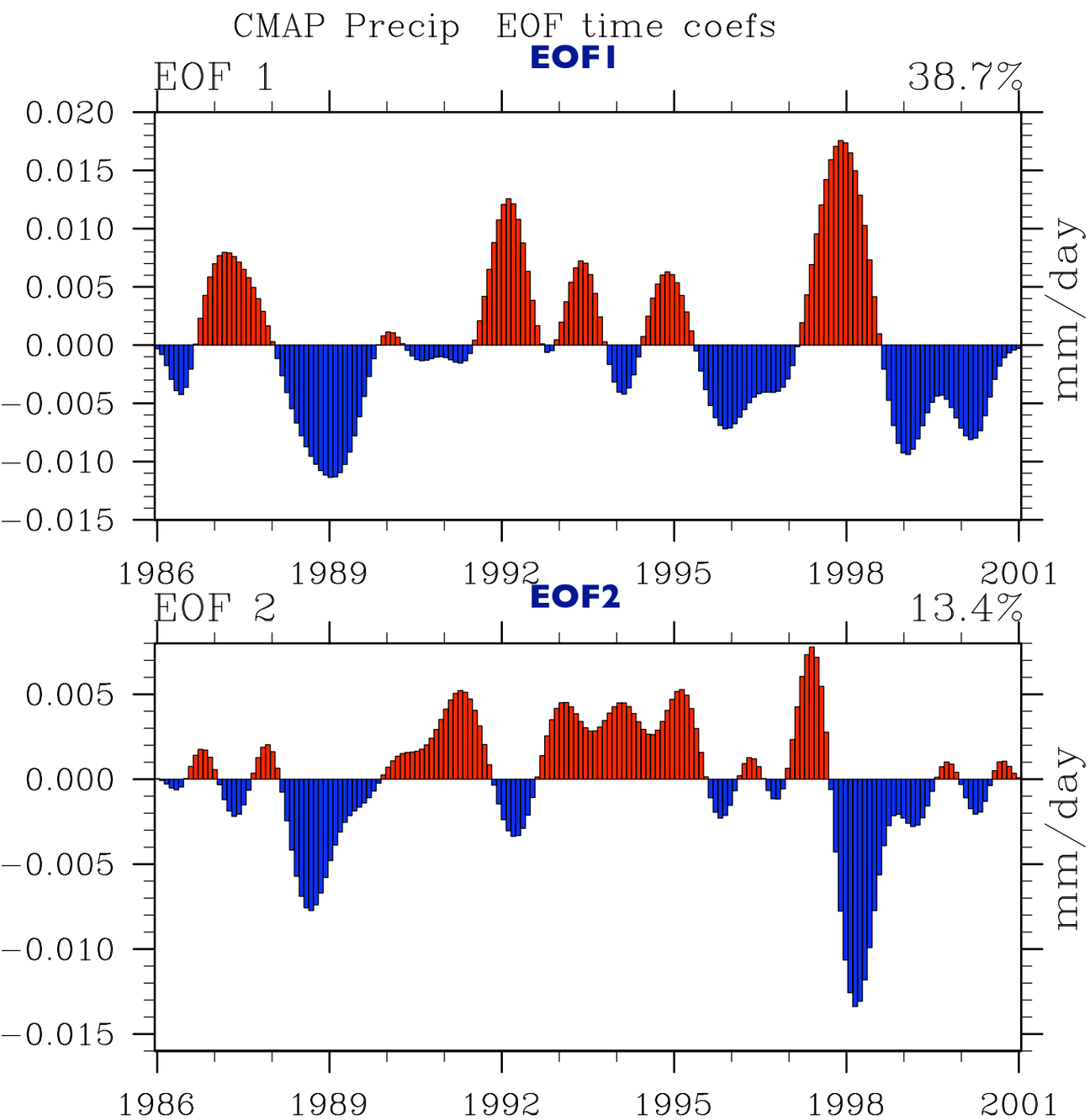


Precipitation EOFs



Precipitation Principal Components

CMAP



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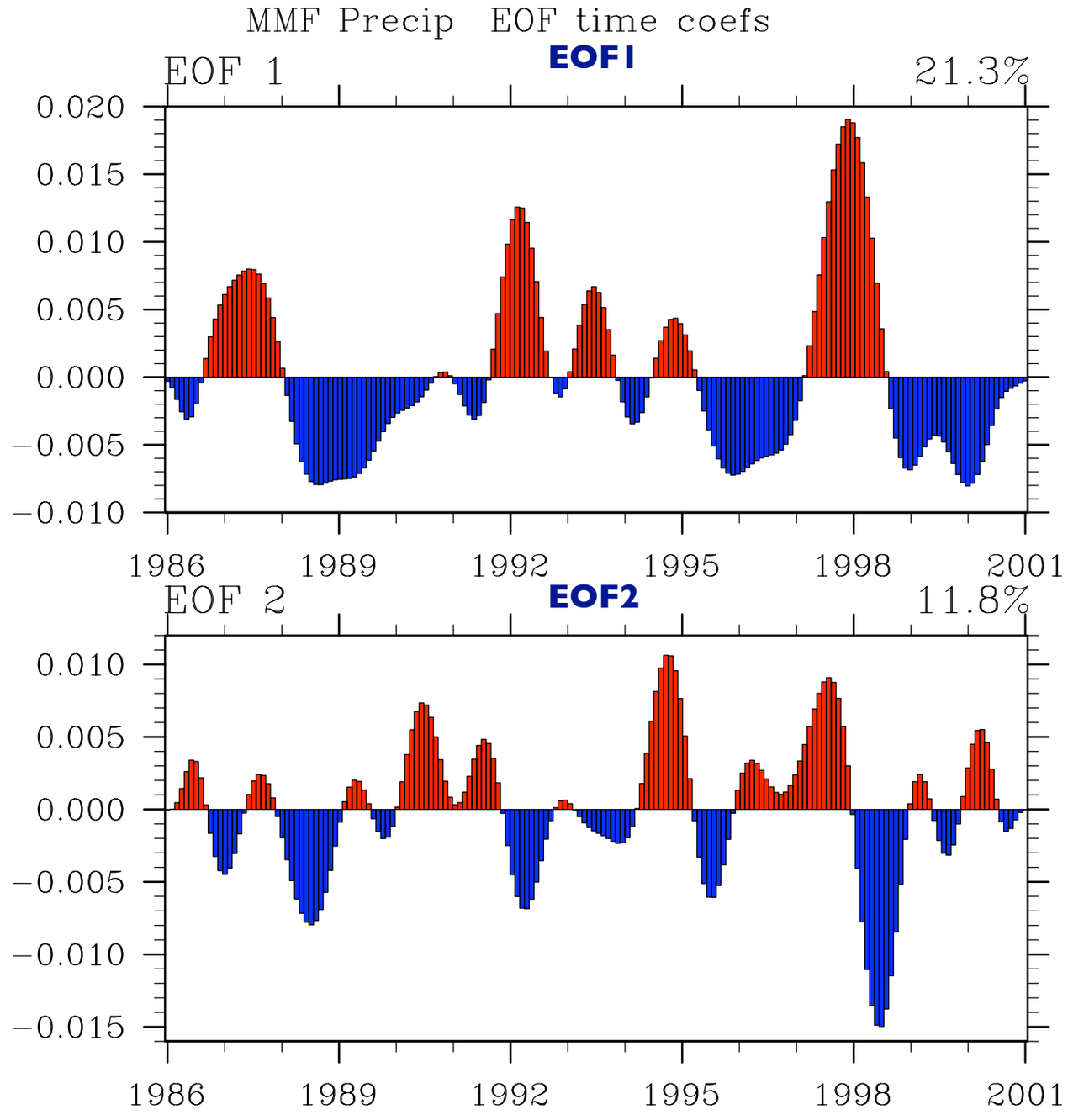


Subseasonal Variability

Wheeler and Kiladis (1999) procedure was followed:

Daily data

96-day long segments, overlapping by 2 months

Annual, seasonal cycles, and mean removed

Detrended, ends of series tapered to zero

Complex FFT applied in time and space for each lat

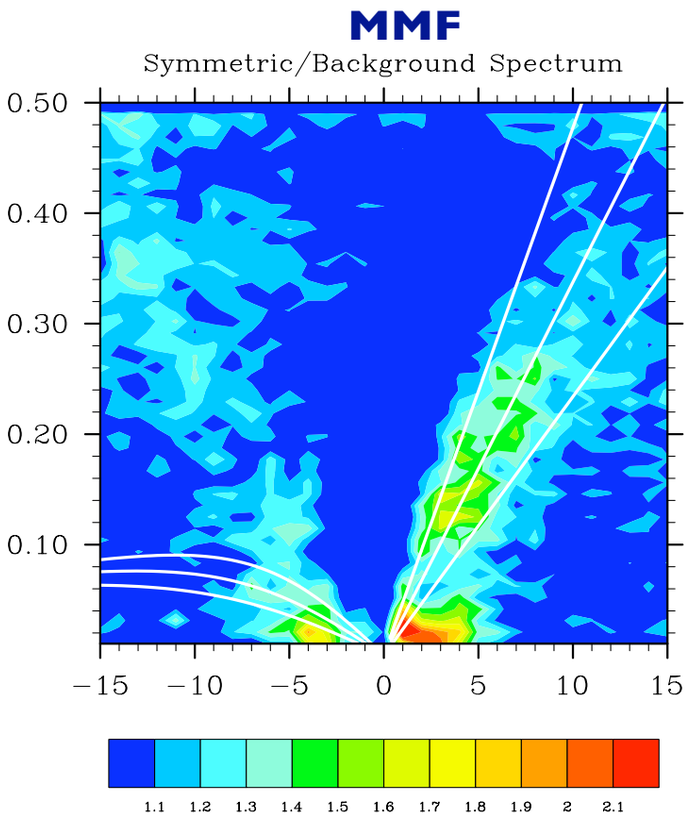
Equatorial belt from 15°S to 15°N

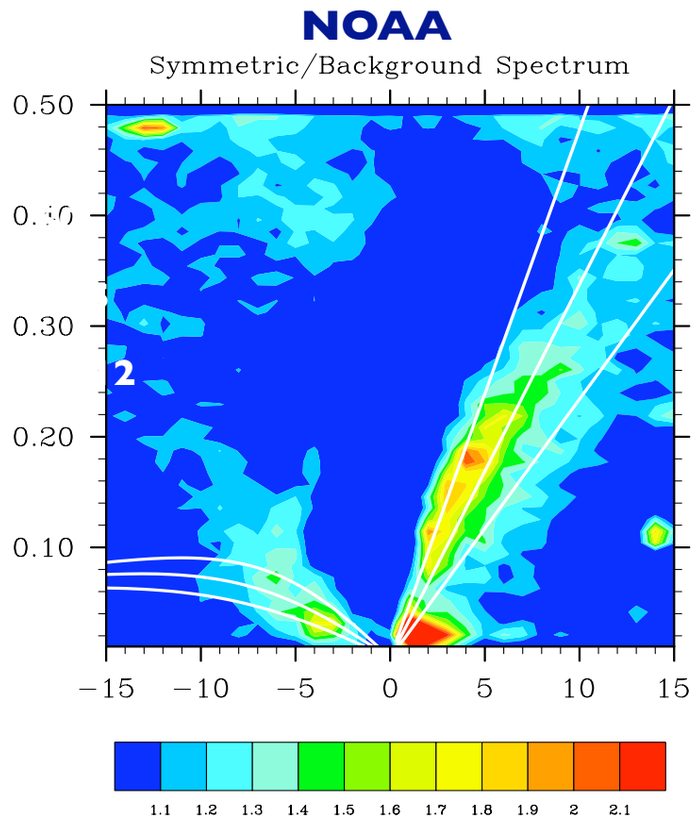
Background spectrum is computed by smoothing

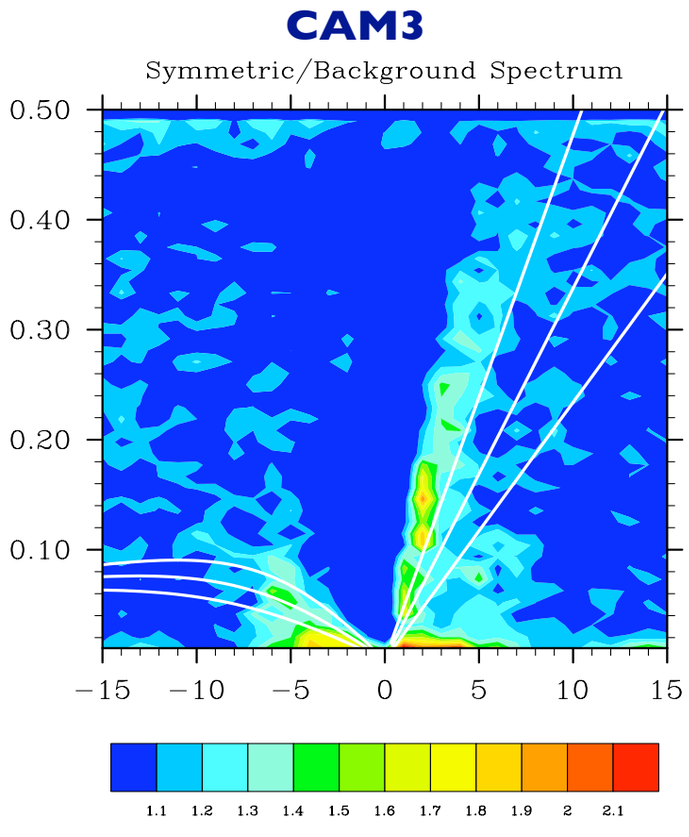
Spectrum/background ratio plotted to reveal disturbances

Analysis applied to OLR, Precip, PW, U200, U850, for both observations and model output

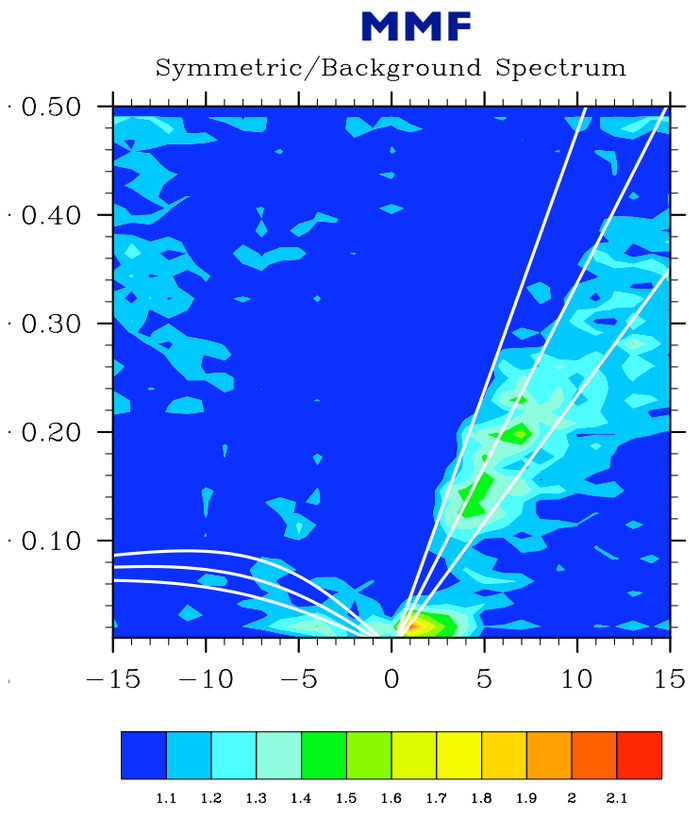
Outgoing Longwave Radiation

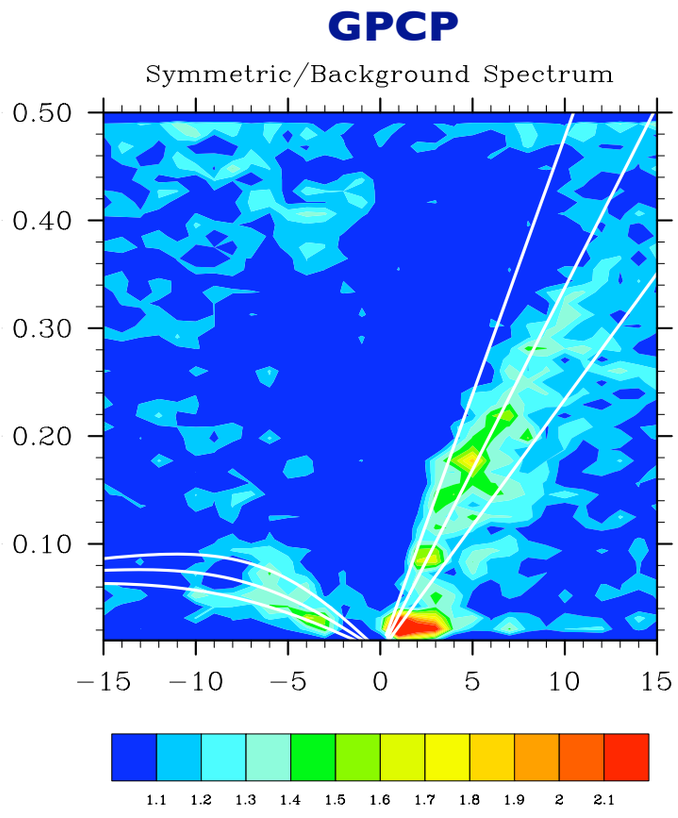


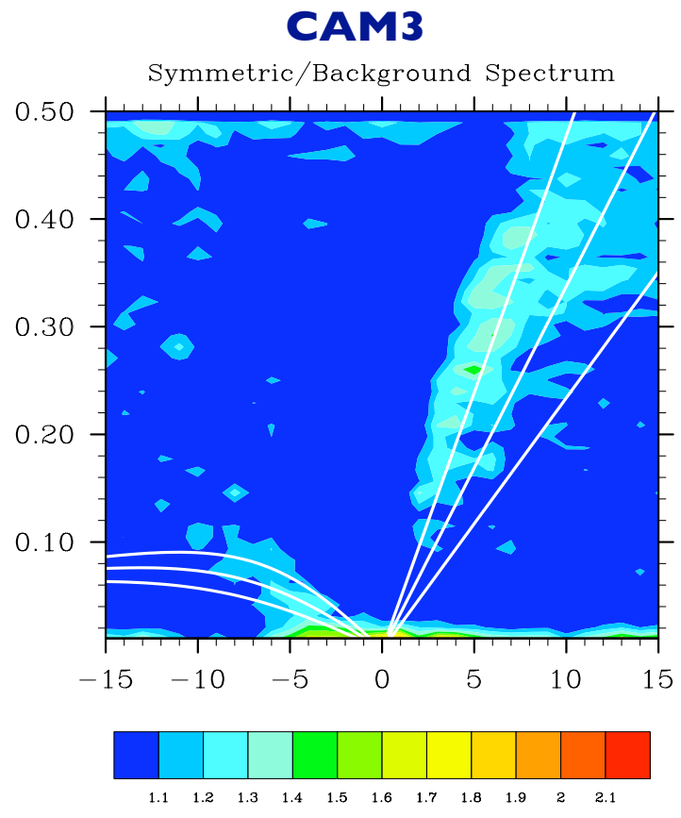




Precipitation

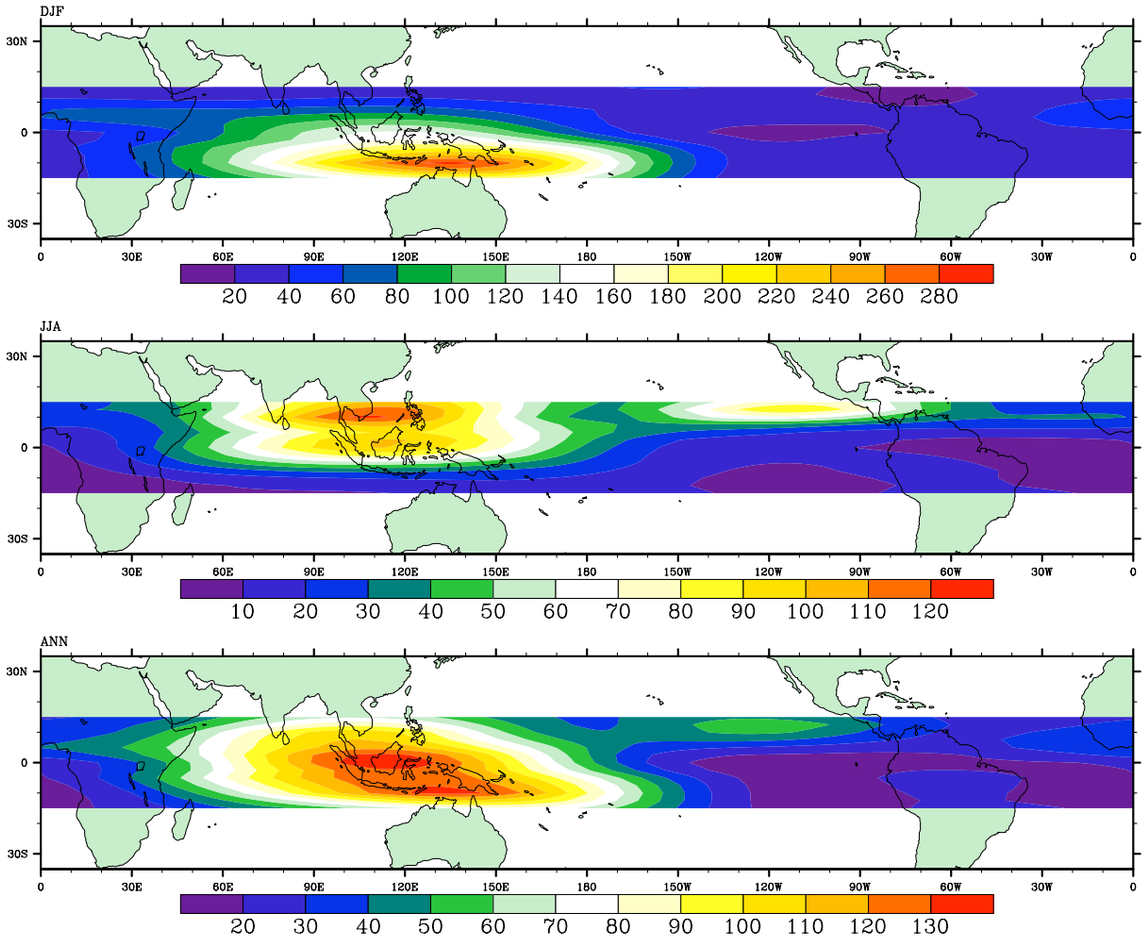






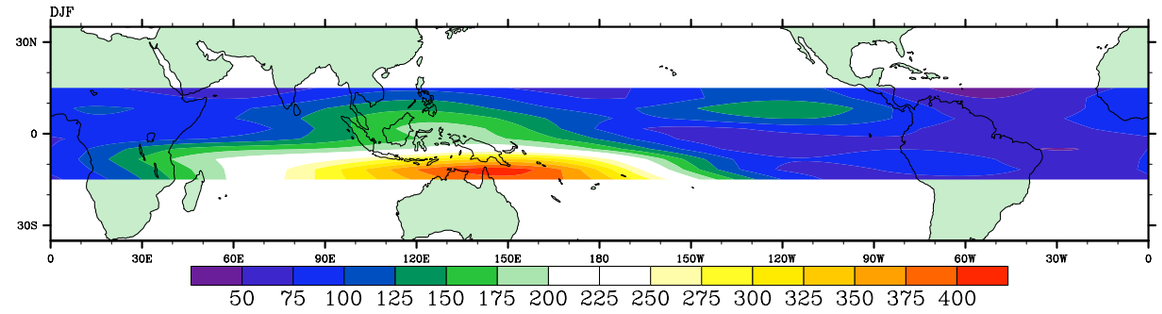
MJO OLR Variance

NOAA

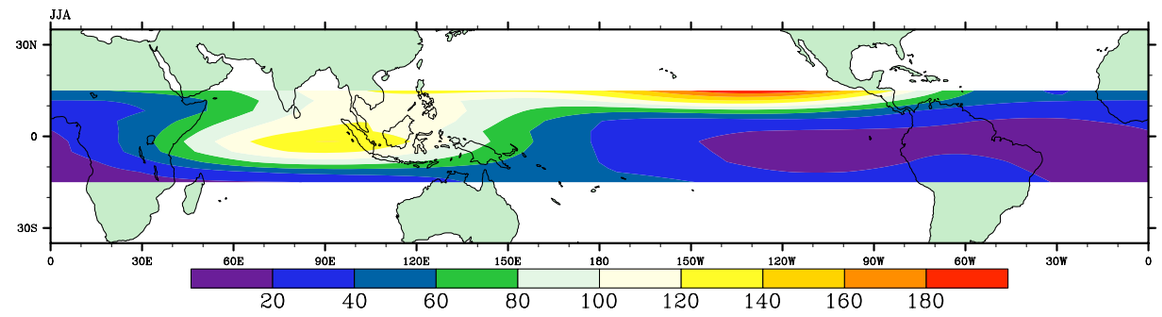


MMF

DJF



JJA



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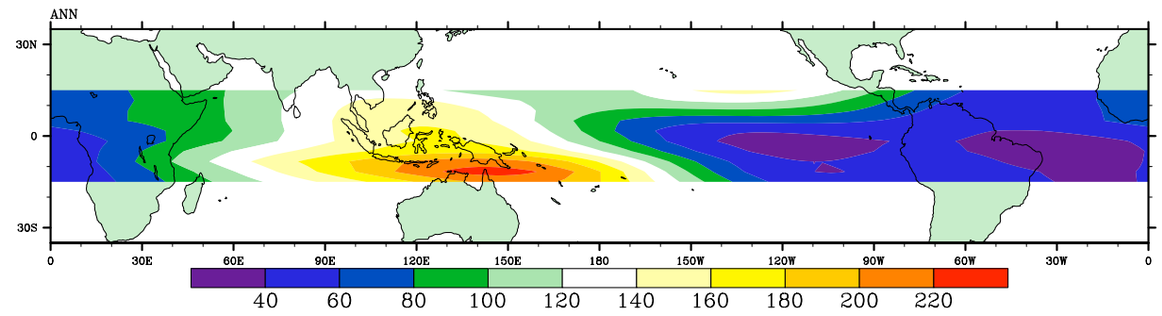
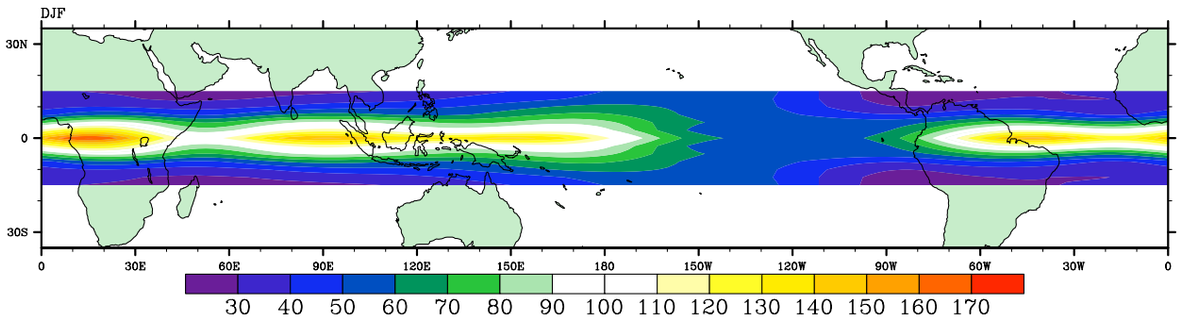
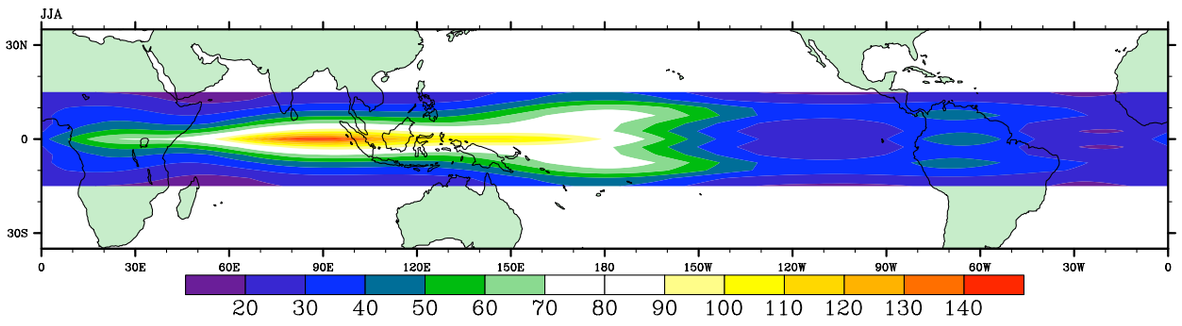
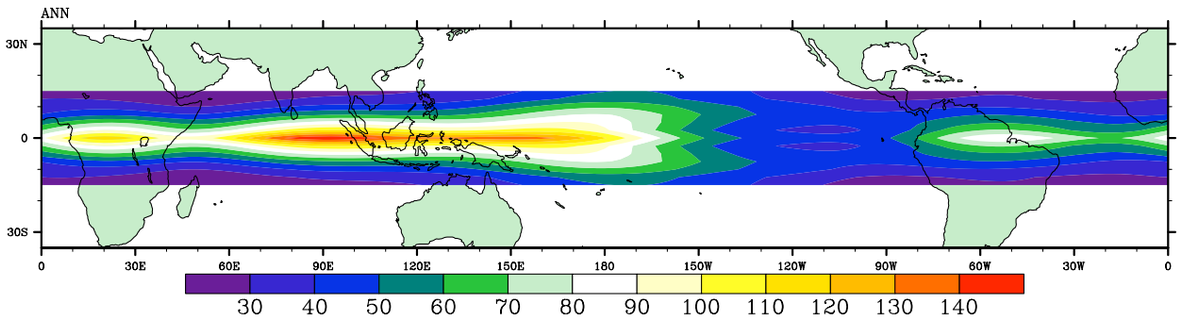


Kelvin-Wave OLR Variance

NOAA

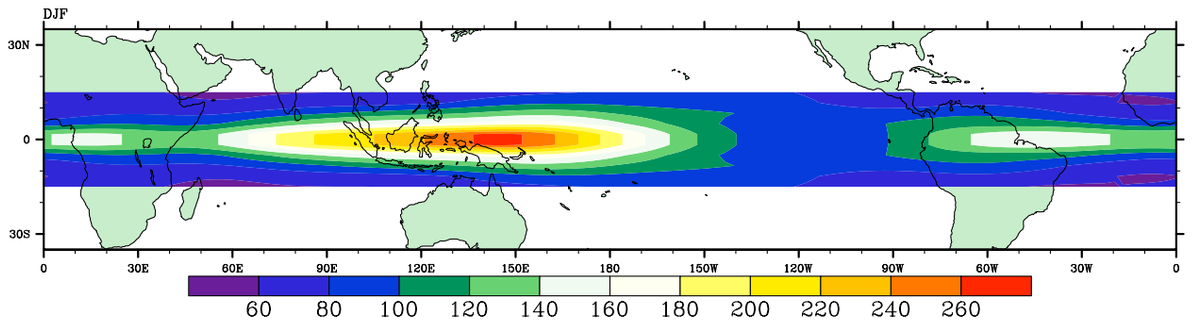






MMF

DJF



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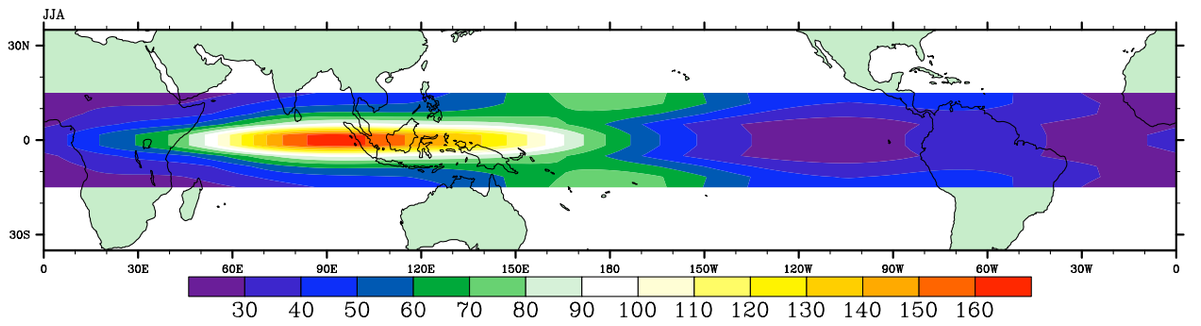

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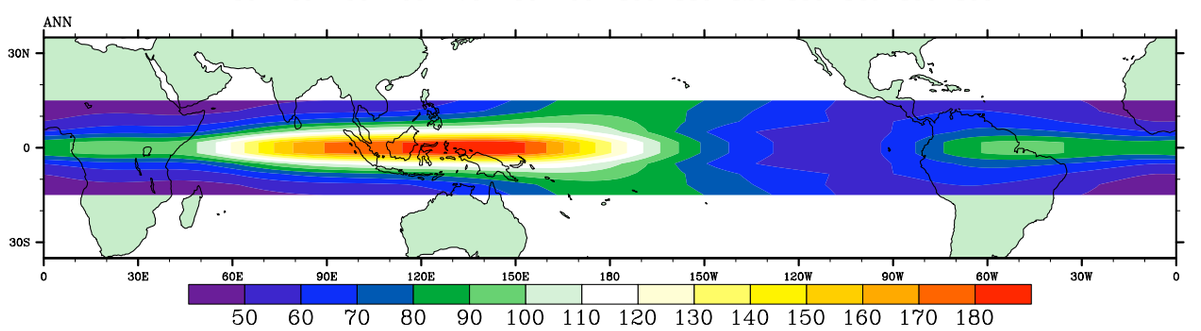
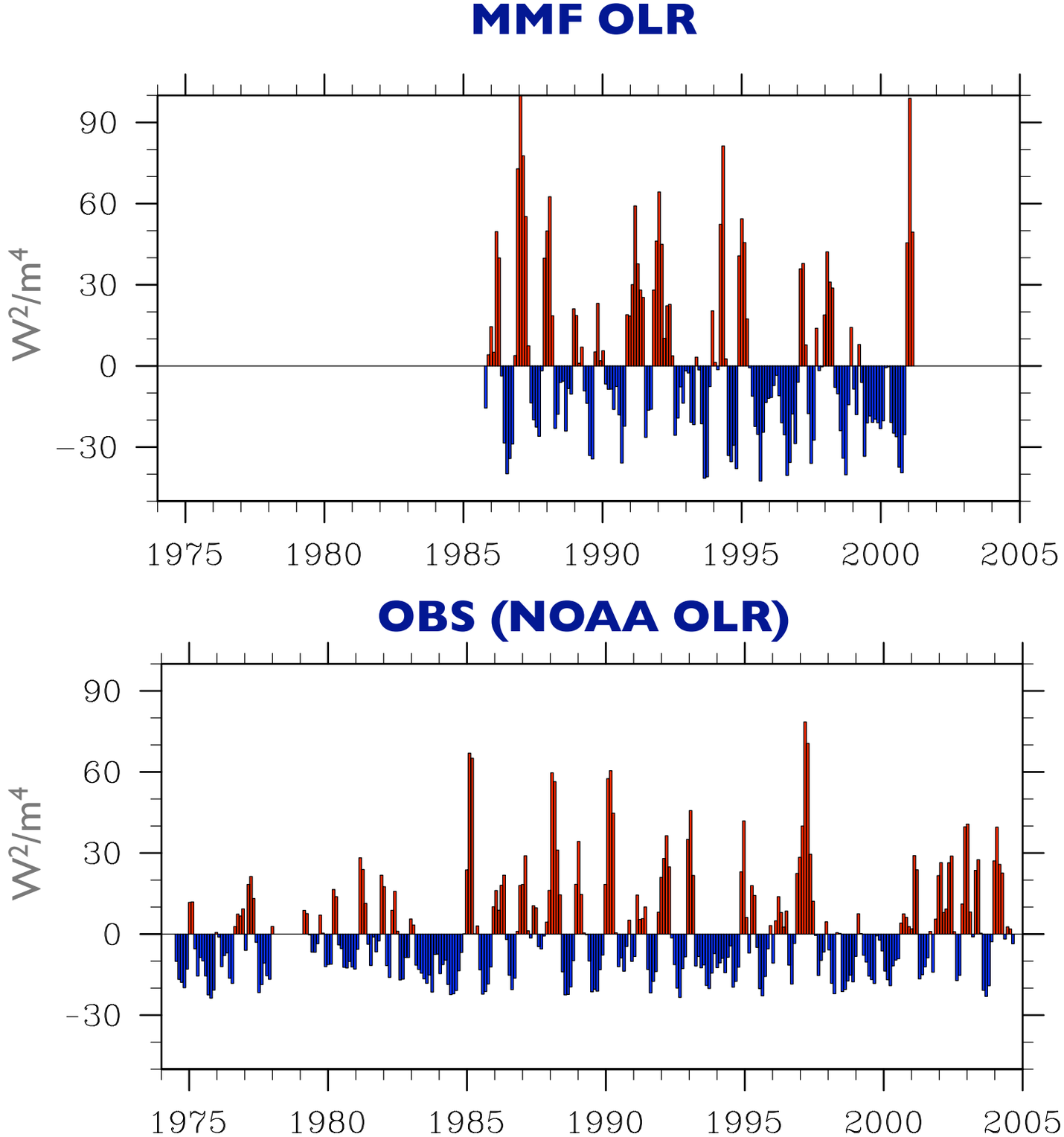
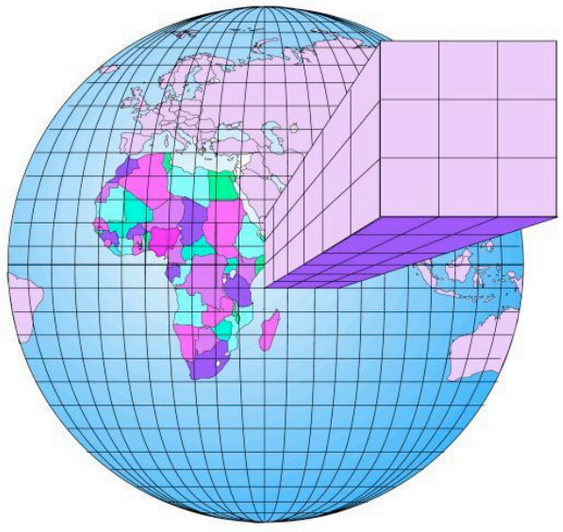


MJO-Filtered OLR Variance





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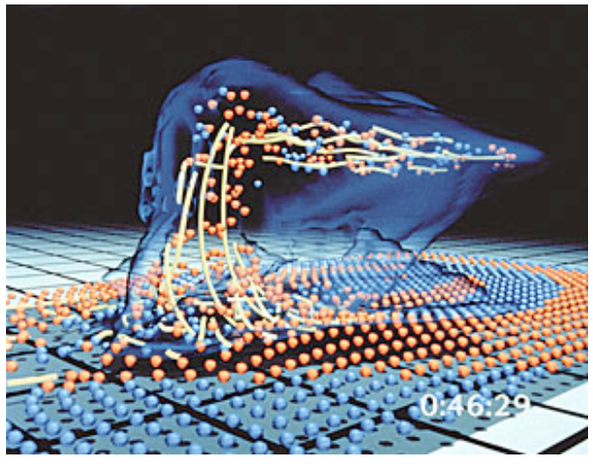
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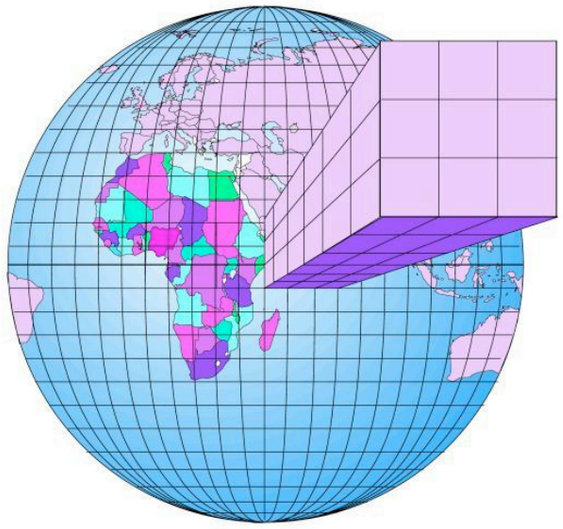

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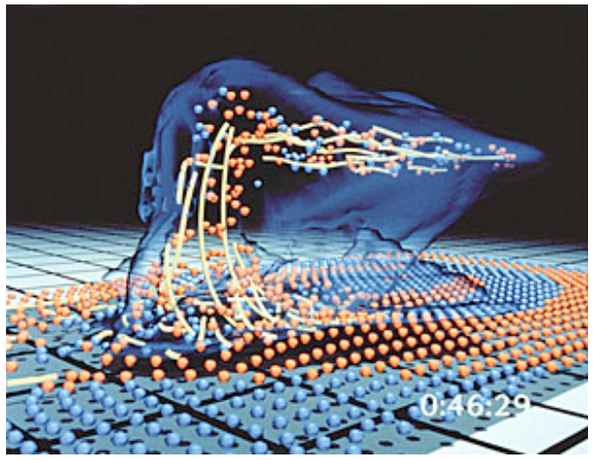

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- **Continue testing prototype MMF**
  - **Analysis of surface energy budget**
  - **Test of mini-LES and other PBL improvements**
  - **Coupled run**
- **Geodesic prototype MMF**
  - **Similar basic design but different dynamical core**
  - **Currently being debugged**
  - **Land-surface model inside cloud model**
- **Second-generation MMF**
  - **Quasi-3D**
  - **Radical design**
  - **Concept being tested in regional framework**
- **Global cloud-resolving model**