Diversity of ENSO in the North American Multi-Model Ensemble (NMME)

Equatorial SSTA

SSTA Celsius

0.5T JFM1995
Outline: NMME Captures Diversity of ENSO?

• Very Brief Description of NMME System
• Diversity of ENSO in NMME
  – “Agnostic” view
  – Event Based: SST, Precipitation
    • Pattern Correlation
    • Lead Time
• Forecast
• Conclusions
<table>
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<tr>
<th>Model</th>
<th>Hindcast Period</th>
<th>Ensemble Size</th>
<th>Lead Times</th>
<th>Arrangement of Ensemble Members</th>
<th>Contact and reference</th>
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<tbody>
<tr>
<td>CFSv1</td>
<td>1981-2009</td>
<td>15</td>
<td>0.5-8.5 Months</td>
<td>1st 0Z +/- 2 days, 21^st 0Z +/-2d, 11^th 0Z +/- 2d</td>
<td>Saha (Saha et al. 2006)</td>
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<tr>
<td>CFSv2</td>
<td>1982-2010</td>
<td>24(28)</td>
<td>0.5-9.5 Months</td>
<td>4 members (0,6,12,18Z) every 5^th day</td>
<td>Saha (Saha et al. 2010)</td>
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<tr>
<td>GFDL-CM2.2</td>
<td>1982-2010</td>
<td>10</td>
<td>0.5-11.5 Months</td>
<td>All 1^st of the month 0Z</td>
<td>Rosati (Zhang et al. 2007)</td>
</tr>
<tr>
<td>IRI-ECHAM4-f^I</td>
<td>1982-2010</td>
<td>12</td>
<td>0.5-7.5 Months</td>
<td>All 1^st of the month 0Z</td>
<td>DeWitt (DeWitt 2005)</td>
</tr>
<tr>
<td>IRI-ECHAM4-a^2</td>
<td>1982-2010</td>
<td>12</td>
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<td>All 1^st of the Month 0Z</td>
<td>DeWitt (DeWitt 2005)</td>
</tr>
<tr>
<td>CCSM3.0</td>
<td>1982-2010</td>
<td>6</td>
<td>0.5-11.5 Months</td>
<td>All 1^st of the Month 0Z</td>
<td>Kirtman (Kirtman and Min 2009)</td>
</tr>
<tr>
<td>GEOS5</td>
<td>1981-2010</td>
<td>11^2</td>
<td>0.5-9.5 Months</td>
<td>1 Member every 5^th day</td>
<td>Schubert (Vernieres et al. 2011)</td>
</tr>
<tr>
<td>CMC1-CanCM3</td>
<td>1981-2010</td>
<td>10</td>
<td>0.5-11.5</td>
<td>All 1^st of the month 0Z</td>
<td>Merryfield Merryfield et al. (2013)</td>
</tr>
<tr>
<td>CMC2-CanCM4</td>
<td>1981-2010</td>
<td>10</td>
<td>0.5-11.5</td>
<td>ALL 1^st of the month 0Z</td>
<td>Merryfield Merryfield et al. (2013)</td>
</tr>
</tbody>
</table>
6-month Lead
July 1 start
DJF SST
forecast
RPSS

NMME

CFSv2
Kug et al. (2009, J. Climate)
OBS SSTA JFM95

NMME SSTA JFM95

0.5 LEAD MEAN
Kug et al. (2009, J. Climate)
Equatorial SSTA

Pattern Correlation

Ensemble Member

Equatorial SSTA

SSTA Celsius

0.5LT JFM1998

NMME

OBS
Patern Correlation

SSTA Celsius

Ensemble Member

Equatorial SSTA

OBS

NMME

3.5LT JFM1998
NINO3 vs. NINO4 SSTA

Observational Estimate

NMME Hindcast
Equatorial SSTA

Pattern Correlation

Ensemble Member

0.5LT JFM1992

OBS

NMME
OBS PRECIP JFM95

NMME PRECIP JFM95
0.5 LEAD MEAN
Pattern Correlation

Ensemble Member

Equatorial Precip

Mm/day

OBS

NMME

0.5LT JFM1995
CURRENT NMME FORECAST
NMME prob fcst SST IC=201301 for lead 1 2013 FMA
Concluding Remarks

• NMME Captures Some Aspects of the Diversity of ENSO
  – SSTA and Rainfall at Short Leads
  – Longer Leads NMME Does Not Capture Diversity of ENSO

• East Pacific SSTA “Better” Predicted than East or Central Pacific

• Very Short Leads (0.5 Months) East vs. West Contrasts Not Captured
  – Warms too Readily in the East