Stratosphere Historical Forecast Project

a WGSIP-SPARC project

Amy Butler, Adam Scaife, Alexander Lawes, Natalia Calvo, Andrew Charlton-Perez + WGSIP members
Stratospheric extension of the CHFP

High Top Hindcasts
Parallel to WGSIP-CHFP
Extended models
Initialising extra atmosphere, better represented stratosphere

Integrations
• 4 month lead times (1st November and 1st May start dates)
• 2 seasons (DJF and JJA)
• Case study years: 1989 onwards
• At least 6 members per year, preferably more
# Participants and Status

<table>
<thead>
<tr>
<th>Institute</th>
<th>Model</th>
<th>Resolution</th>
<th>Reference</th>
<th>Status</th>
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<tr>
<td>UKMO</td>
<td>HadGEM</td>
<td>N96L85, 85km</td>
<td>Martin et al 2006, J. Clim., 19, 1217-1301</td>
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<td><a href="mailto:Adam.scaife@metoffice.gov.uk">Adam.scaife@metoffice.gov.uk</a></td>
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<td>Meteo France</td>
<td>Arpege 4.4 + OPA</td>
<td>L91, 0.01hPa</td>
<td>Gueremy et al, 2005, Tellus, 57A, p308-319</td>
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<td><a href="mailto:Michel.degue@meteo.fr">Michel.degue@meteo.fr</a></td>
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<td>CCCMA</td>
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<td>T63L71,~100km</td>
<td>Scinocca et al 2008, ACP, 8, 7055-7074</td>
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<td>NCEP</td>
<td>CFS v1</td>
<td>L64, 0.2hPa</td>
<td>Saha et al, J.Clim., vol.19, no.15, p3483-3517</td>
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<td><a href="mailto:Amy.Butler@noaa.gov">Amy.Butler@noaa.gov</a></td>
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<td><a href="mailto:Arun.Kumar@noaa.gov">Arun.Kumar@noaa.gov</a></td>
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What are we expecting to see?

Analysis of UKMO stratosphere resolving hindcasts:

Low top and high top models

Possible improvement in ROC scores in winter but not significant

Arribas et al, in preparation
What are we expecting to see?

Analysis of UKMO stratosphere resolving hindcasts:

No change in ENSO skill (as expected)

Little change in ENSO structure (as expected)

Arribas et al, in preparation
What are we expecting to see?
Analysis of UKMO stratosphere resolving hindcasts:

- Sudden stratospheric warmings occur with better frequency in high top hindcasts (red).
- Increase in frequency with El Nino strength.
- Subsequent impact on surface.

Figure 5. Correlation between SSW strength (based on minimum zonal wind at 60N, 10 hPa over the whole winter) and MSLP for L85 hindcasts. White contours show regions where correlation is significant at the 5% level.

Fereday et al, ERL, 2012
What are we expecting to see?
Analysis of UKMO stratosphere resolving hindcasts:

Winter 2009/10: stronger Arctic pressure signal
Significant
High top spans observations but low top doesn’t
Conditional predictability for AO given active stratosphere....

Fereday et al, ERL, 2012
Summary

High top and low top hindcasts now in CHFP database
Multimodel analysis underway
Analysis of individual systems implies no big gains in overall skill
However
Improved representation of stratospheric processes
Clear signatures of stratosphere-troposphere coupling in surface climate
Improved conditional predictability for key events like the record low AO in winter 2009/10