Climate Prediction and Applications in New Zealand – An Update

Submitted by: National Institute of Water & Atmospheric Research (NIWA)
Climate prediction and applications in New Zealand – an update

Author: James Renwick

Abstract:

The New Zealand economy is based largely around agriculture and is very sensitive to climate variability. New research is helping to understand relationships between climate variations and effects on different sectors of the economy. This talk will review work in the new EcoClimate consortium, and will touch on new developments in regional seasonal forecasting and climate change scenario development.
Climate prediction and applications in New Zealand – an update

James Renwick
and NCC staff

NIWA

www.niwa.co.nz/ncc/

Outline

• Seasonal forecasts: current status
  – SPCZ
• Predictability and new statistical models
  – Zheng & Frederiksen
• Possibilities for collaboration
• Summary
Seasonal forecasts: NZ

Outlook for August to October 2008

- 7 global model-based products
  - APCC, Europ-SIP, IRI, etc
- 3 statistical downscaling models
  - Synthesis semi-objective
  - Real-time skill monitoring
  - Skill over last 12 months
  - La Niña influence, warm and dry
  - Rainfall: RPSS 9%, Tercile 3 ROC 38%
  - Temperature: RPSS 23%, Tercile 3 ROC 30%

Seasonal forecasts: SW Pacific

- 9 global model-based products
  - APCC, Europ-SIP, IRI, etc
- 2 statistical downscaling models (CCA, SCOPIC)
  - Synthesis subjective
  - Skill over last 12 months
  - La Niña influence, SPCZ displaced southwest
  - Rainfall: Hit rate 60-65%
  - New work on SPCZ location
    - Proxy data, impacts
SPCZ: April 2008

- Much variability accounted for by ENSO
  - El Niño: northeast
  - La Niña: southwest
IPO & SPCZ

• Most SW when La Niña & negative IPO
• Most NE when El Niño & positive IPO

SPCZ – Southern Annular Mode

• SPI correlation map with 500hPa height
  – After linear removal of ENSO effect (SOI regressed out)
• SPCZ linked to the SAM & southern oceans?
Better understand teleconnections
Proxy data – historical variability

Predictability

- Slow modes: Zheng & Frederiksen
  - potentially predictable EOFs
- Statistical prediction of slow mode amplitudes
  - Regression against SST
  - Compare with GCM
  - Optimal combination of both
NCEP 200hPa ht: Fraction of Variance

INTRASeasonAL

SLOW

DJF

SH DJF 500hPa ht

Slow Component
DJF Prediction in training period 1953-1992

<table>
<thead>
<tr>
<th>Predictand</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DJF.pc1</td>
<td>Trend +Nov. SAM index</td>
</tr>
<tr>
<td>DJF.pc2</td>
<td>-SON NINO3 SST</td>
</tr>
<tr>
<td>DJF.pc3</td>
<td>-Nov. Coral Sea SST (150E-180, 15-30S)</td>
</tr>
</tbody>
</table>

New Zealand regional rainfall

- NCEP reanalysis monthly-mean H500
  - Training: 1953-1992
  - Verification: 1993-2000
- HadISST
- Monthly mean 6-regional rainfall anomalies (%)
- SVD of “slow” covariability
**DJF slow component 1**

Correlation between DJF.pc1 and SON.SST

DJF.pc1: -SON NINO3 SST, -Nov. NZ SST

Skill: 20%

**JJA slow component 1**

Correlation between JJA.pc1 and MAM.SST

JJA.pc1: May NINO3 SST

Skill: 17%
Collaborative opportunities

• Regional downscaling for climate change
  – Linking to hydrological models, river flows, snow storage, glacier mass
    • U. Chile Santiago visit, October 2007

• Indigenous knowledge
  – Māori knowledge of local climate & climate change
    • Integrate with Western science
  – Some parallels with South America?

Summary

• Operational forecast skill enhanced during last La Niña
  – Still a need for objective combination of guidance

• New studies of SPCZ variability and effects
  – SPICE, paleoclimate elements

• Predictability studies
  – Identify forced variability
  – Useful for statistical forecasting

• Collaboration possibilities on the above, and
  – Regional climate modelling and linked modelling
  – Indigenous climate knowledge