



**Status / Progress Report for
GPC-Montreal
ET-ELRF meeting
March 2012, Geneva**

**Bertrand Denis *and colleagues at CMC and
CCCma***



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Introducing...

**Canadian Seasonal to Interannual
Prediction System - CanSIPS**

**Systeme de Prévision
Interannuelle et Saisonnière
Canadien - SPISCan**

Operational 1 Dec 2011



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CanSIPS Models

10 members

10 members

CanCM3

CanCM4

CanAM3 *Atmospheric model*

- T63/L31 ($\approx 2.8^\circ$ spectral grid)
- Deep convection scheme of Zhang & McFarlane (1995)
- No shallow conv scheme
- Also called AGCM3

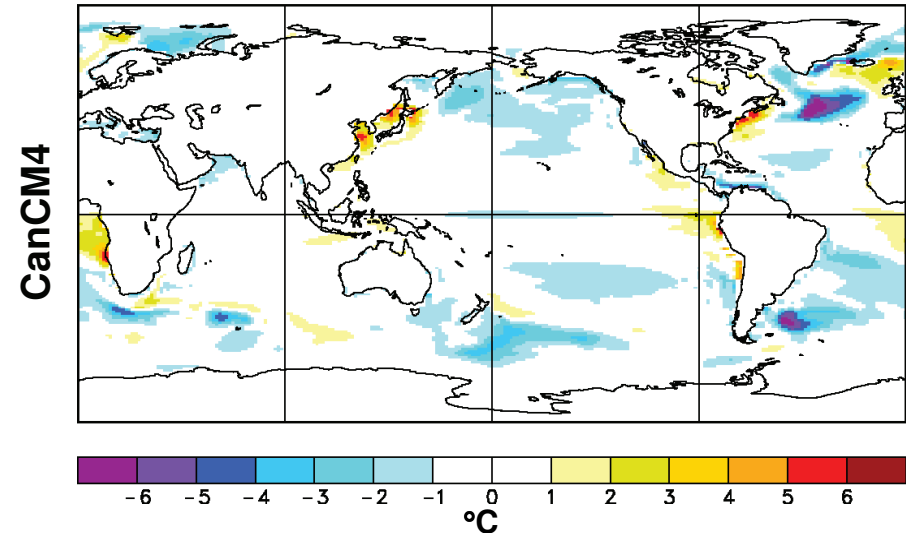
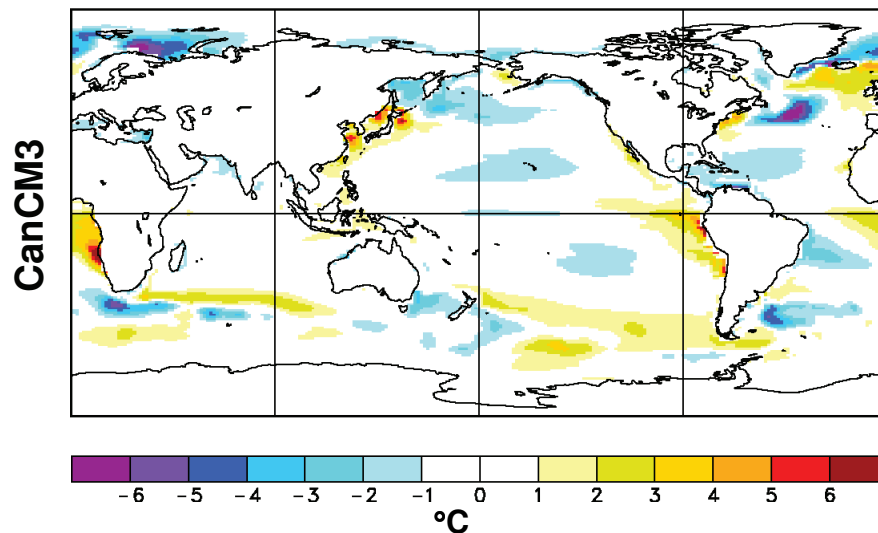
CanOM4 *Ocean model*

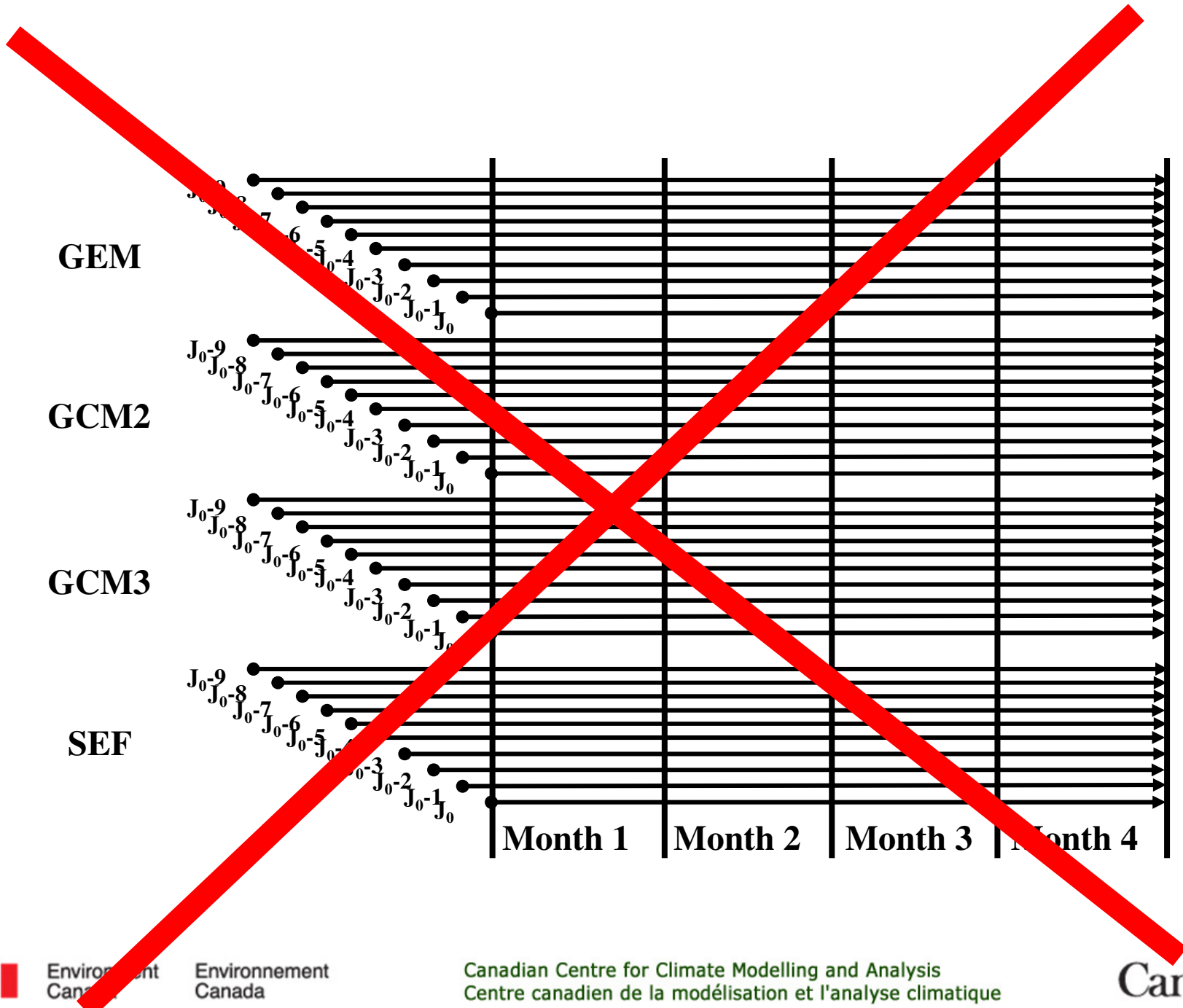
- $1.41^\circ \times 0.94^\circ \times L40$
- GM stirring, aniso visc
- KPP+tidal mixing
- Subsurface solar heating climatological chlorophyll

CanAM4 *Atmospheric model*

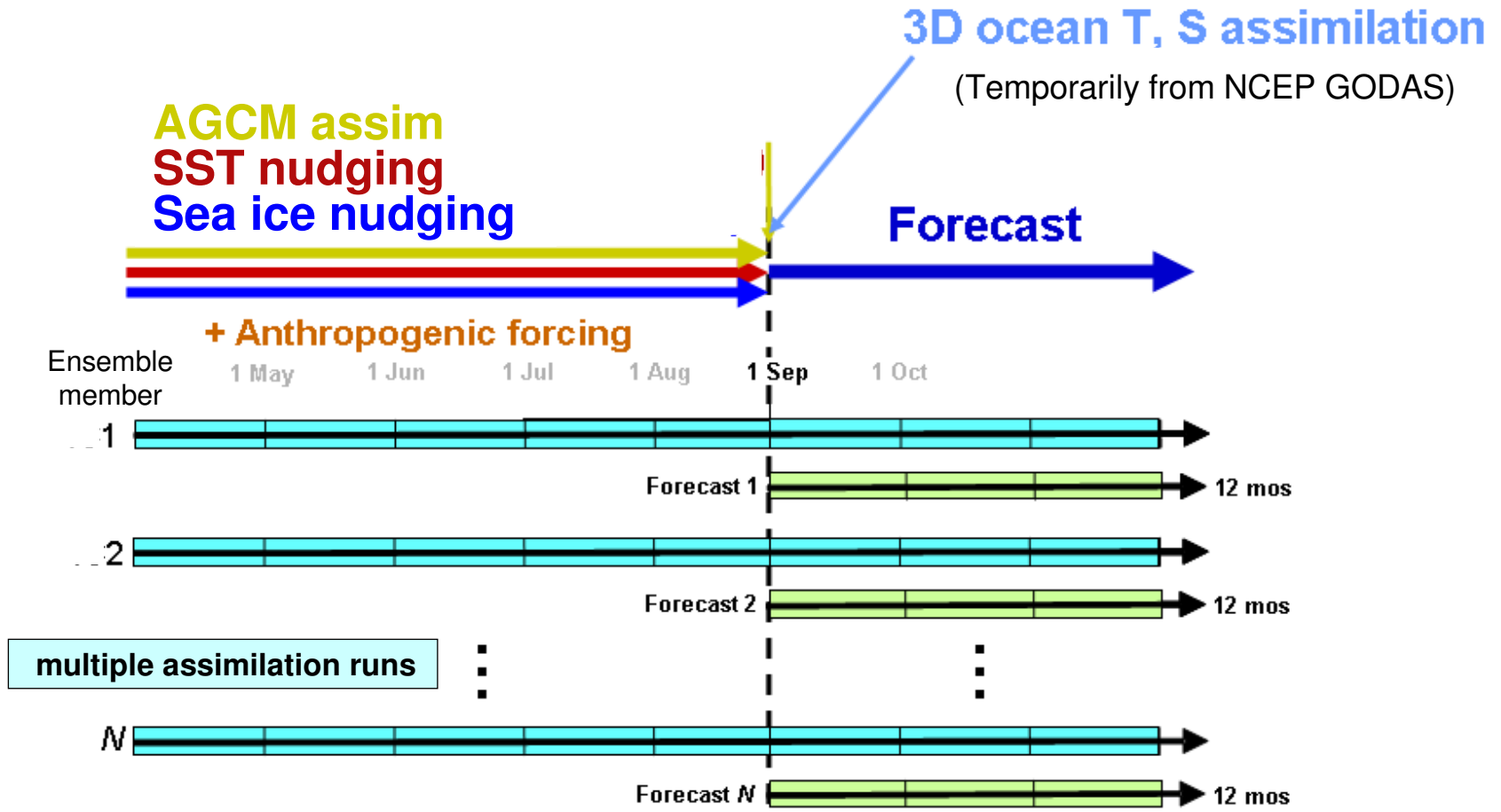
- T63/L35 ($\approx 2.8^\circ$ spectral grid)
- Deep conv as in CanCM3
- Shallow conv as per von Salzen & McFarlane (2002)
- Improved radiation, aerosols

SST bias vs obs (OISST 1982-2009)





CanSIPS initialization



$N = 20$ as of December 2011



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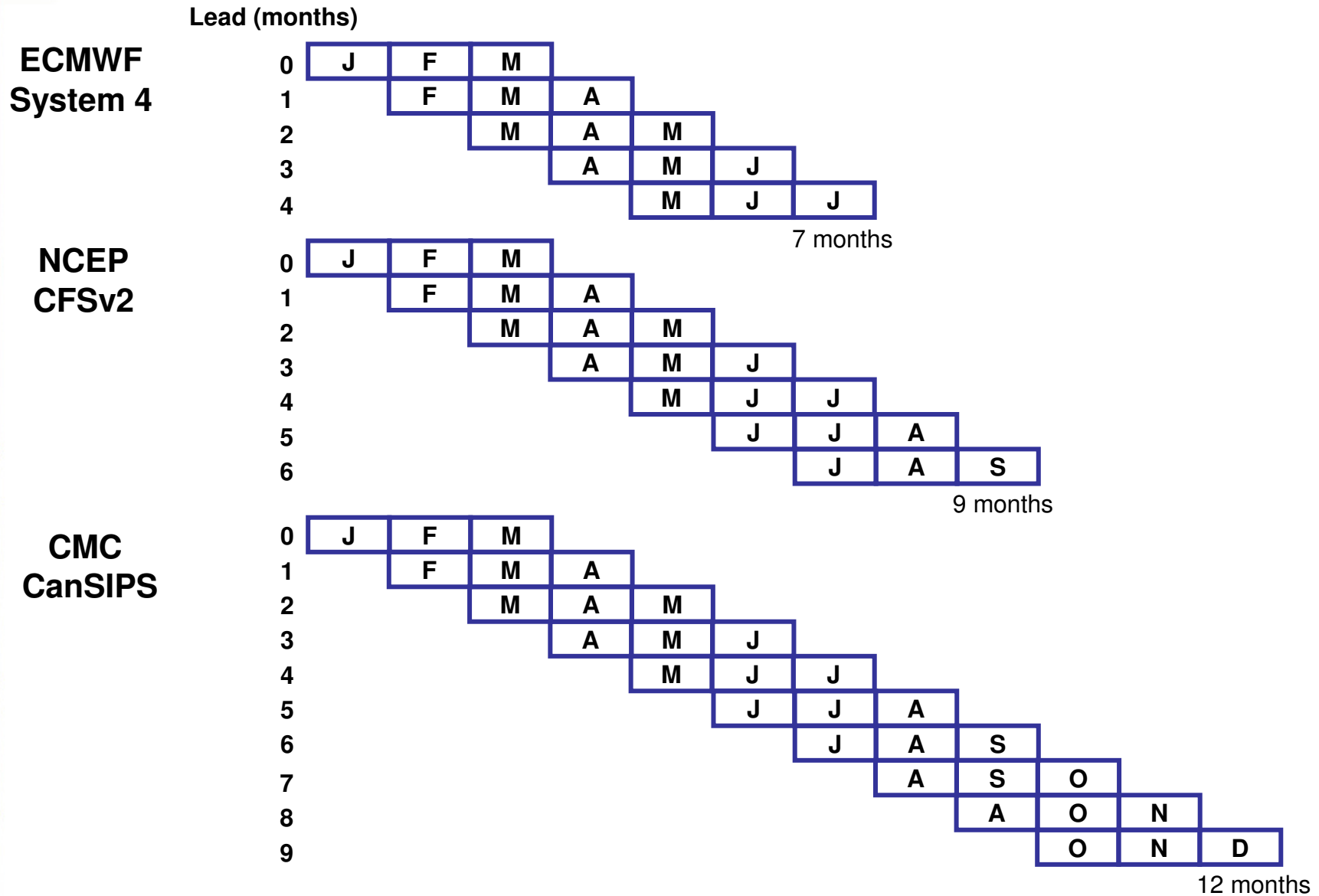
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Operational Multi-Seasonal Forecast Ranges

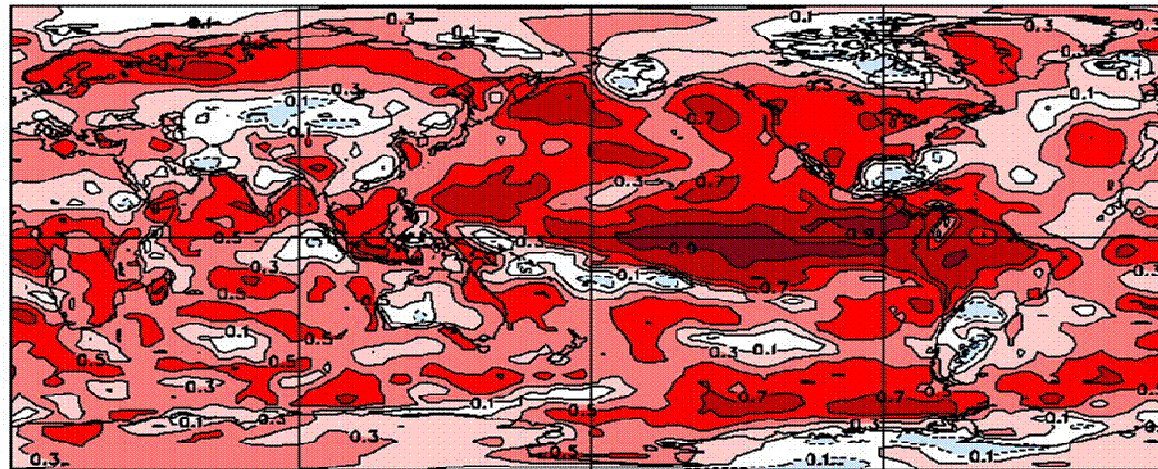
Example: 1 January start



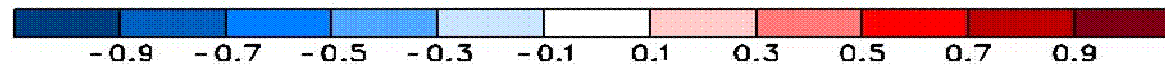
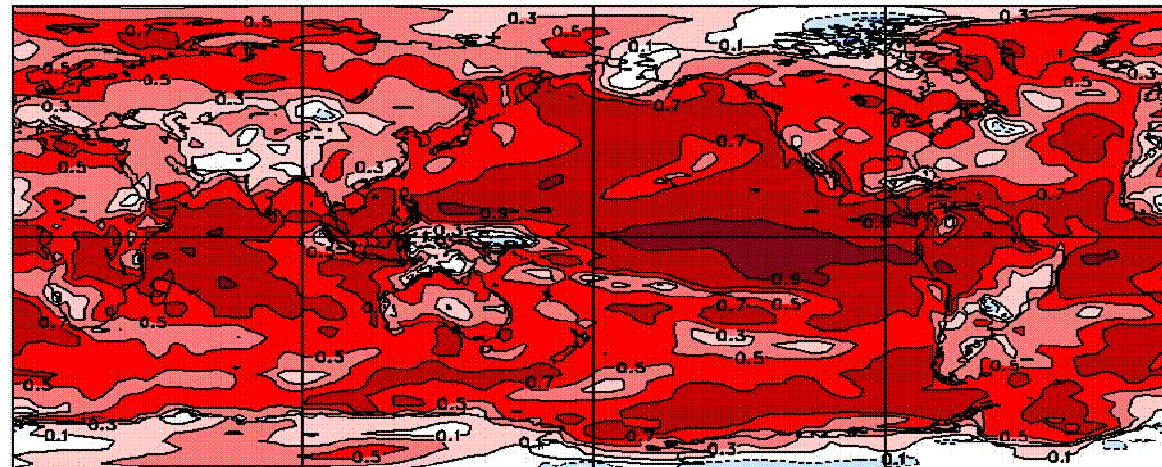
Anomaly correlation skill 2-tier vs CanSIPS

JFM near-surface temperature Lead 0 1979-2001

2-tier



CanSIPS



Anomaly correlation



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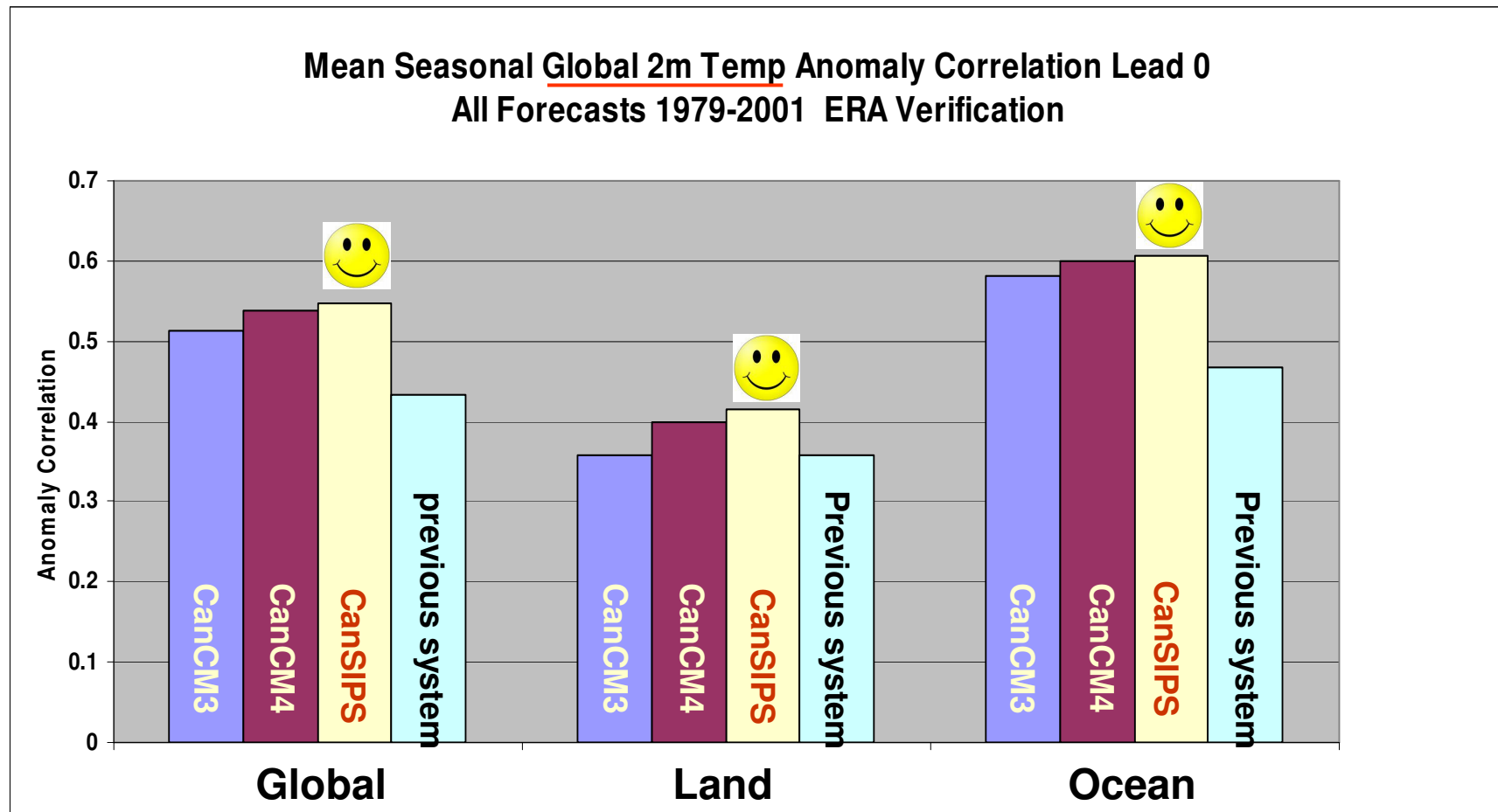
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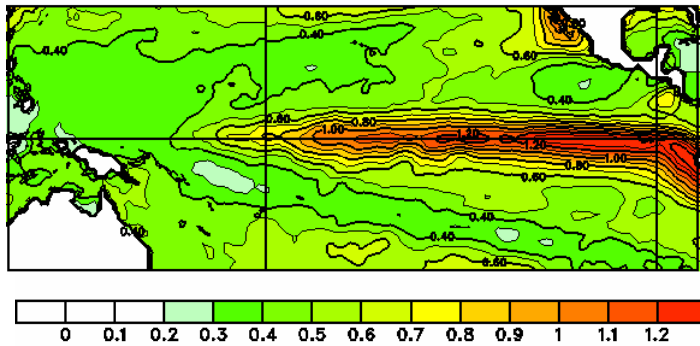
Skill comparison: Previous 2-tier vs CanSIPS



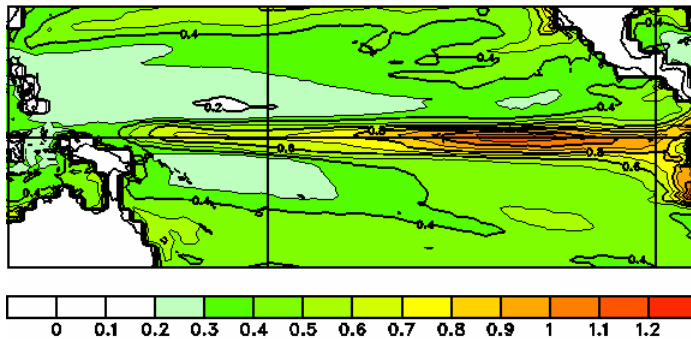
ENSO variability in models

Monthly SSTA standard deviation

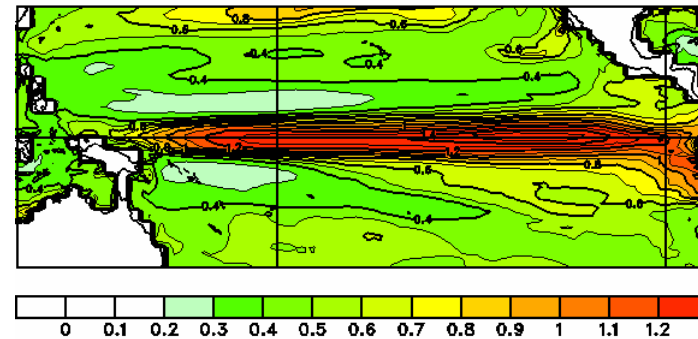
HadISST 1970-99



CanSIPS / CanCM3



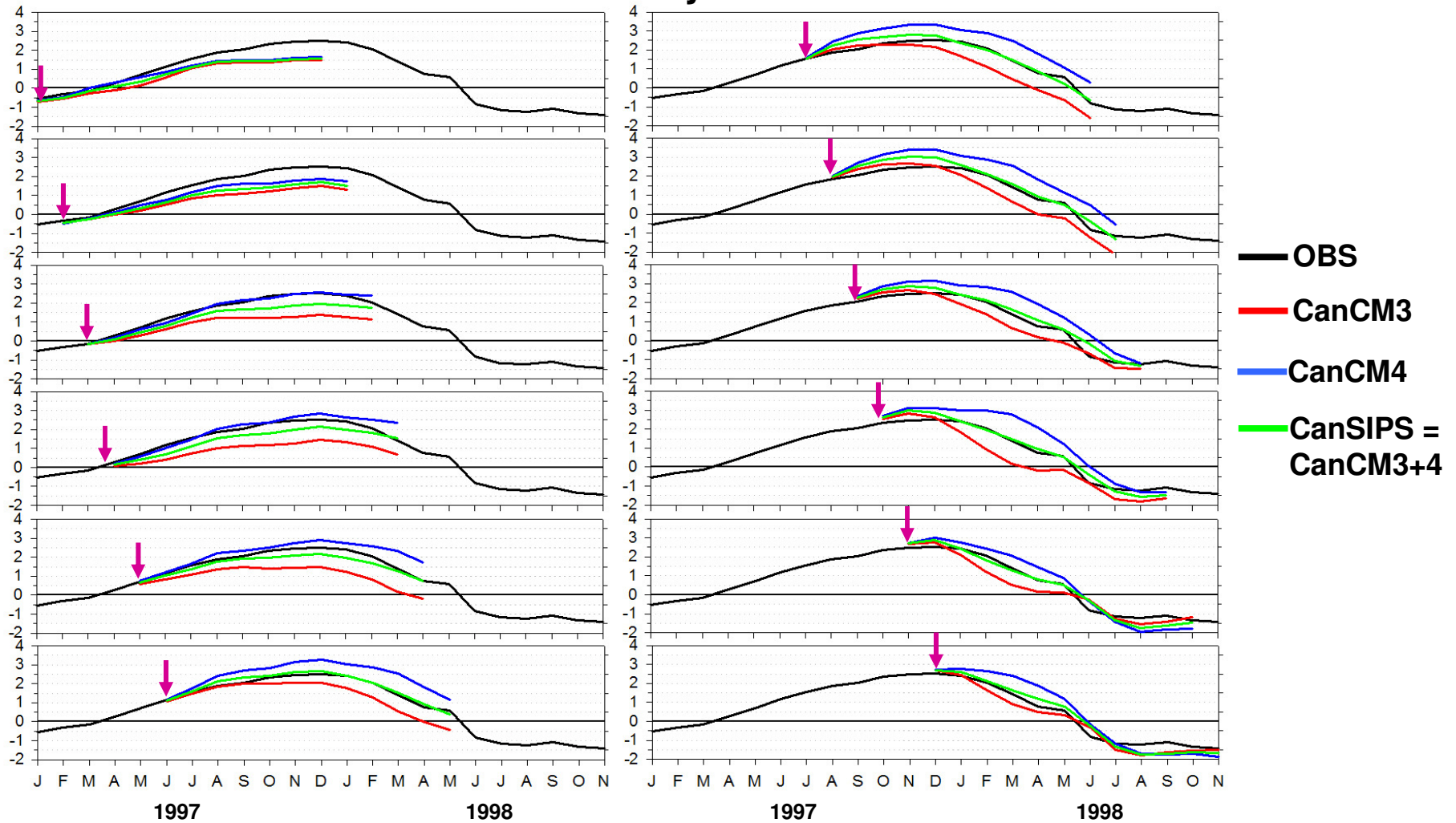
CanSIPS / CanCM4



ENSO Prediction Skill

Case Study: 1997-98 El Niño

Niño3.4 hindcasts initialized monthly from 1 Jan 1997 to 1 Dec 1997



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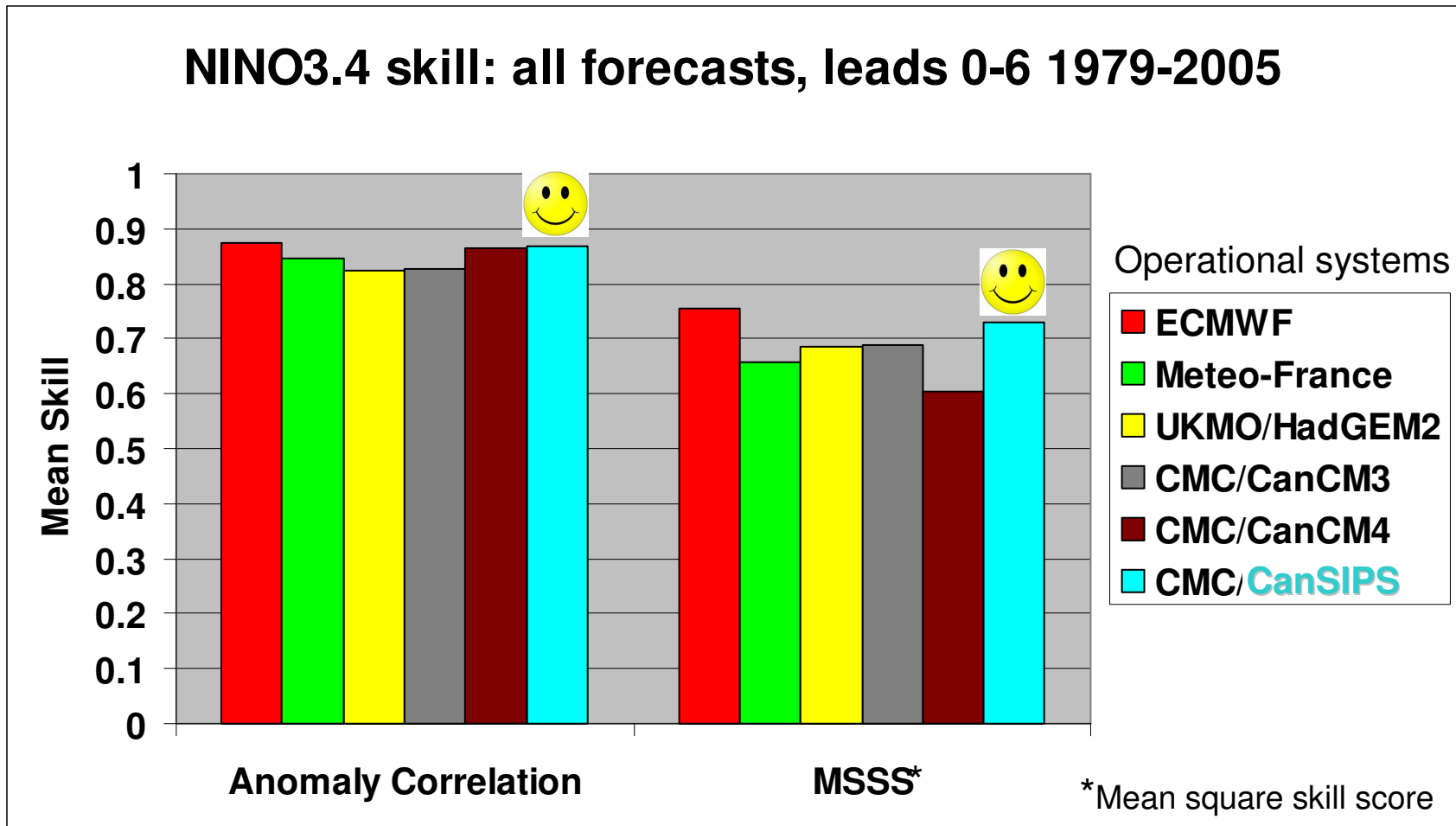
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ENSO Skill Comparison with EU ENSEMBLES

NINO3.4 skill: all forecasts, leads 0-6 1979-2005

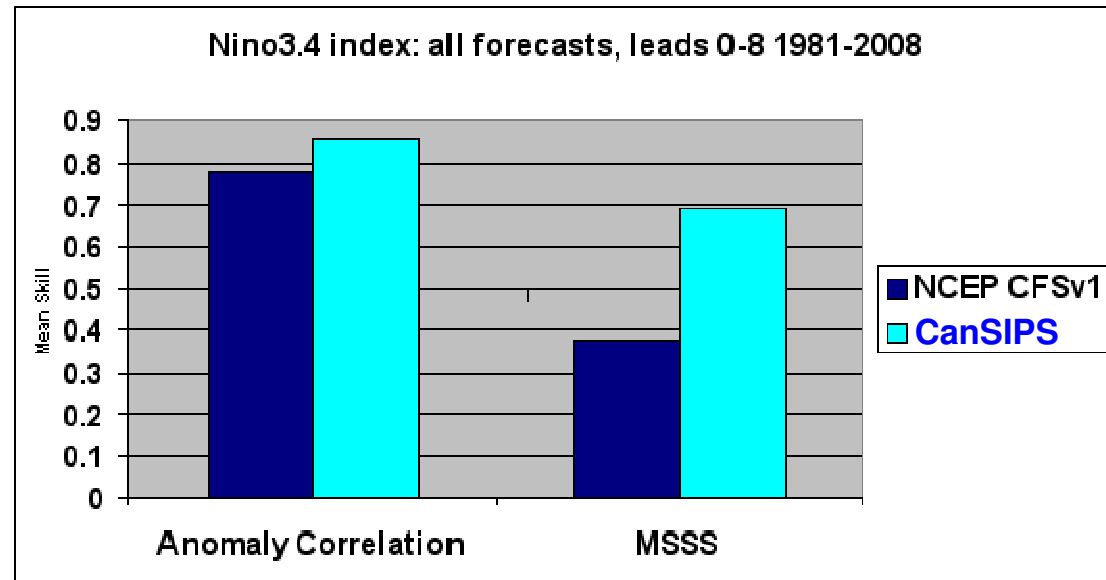


Comparison of **individual model forecasts** (ENSEMBLES forecasts use ensemble size 9, CCCma ensemble size 10), with CanSIPS skills shown for comparison

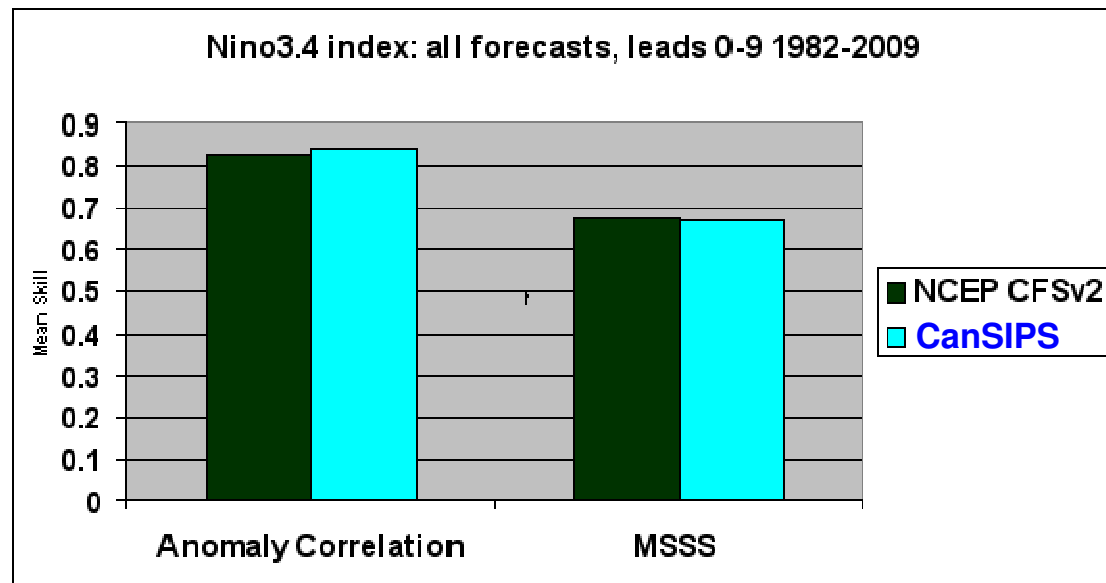


ENSO Skill Comparison with NCEP CFS

CanSIPS
VS
CFSv1

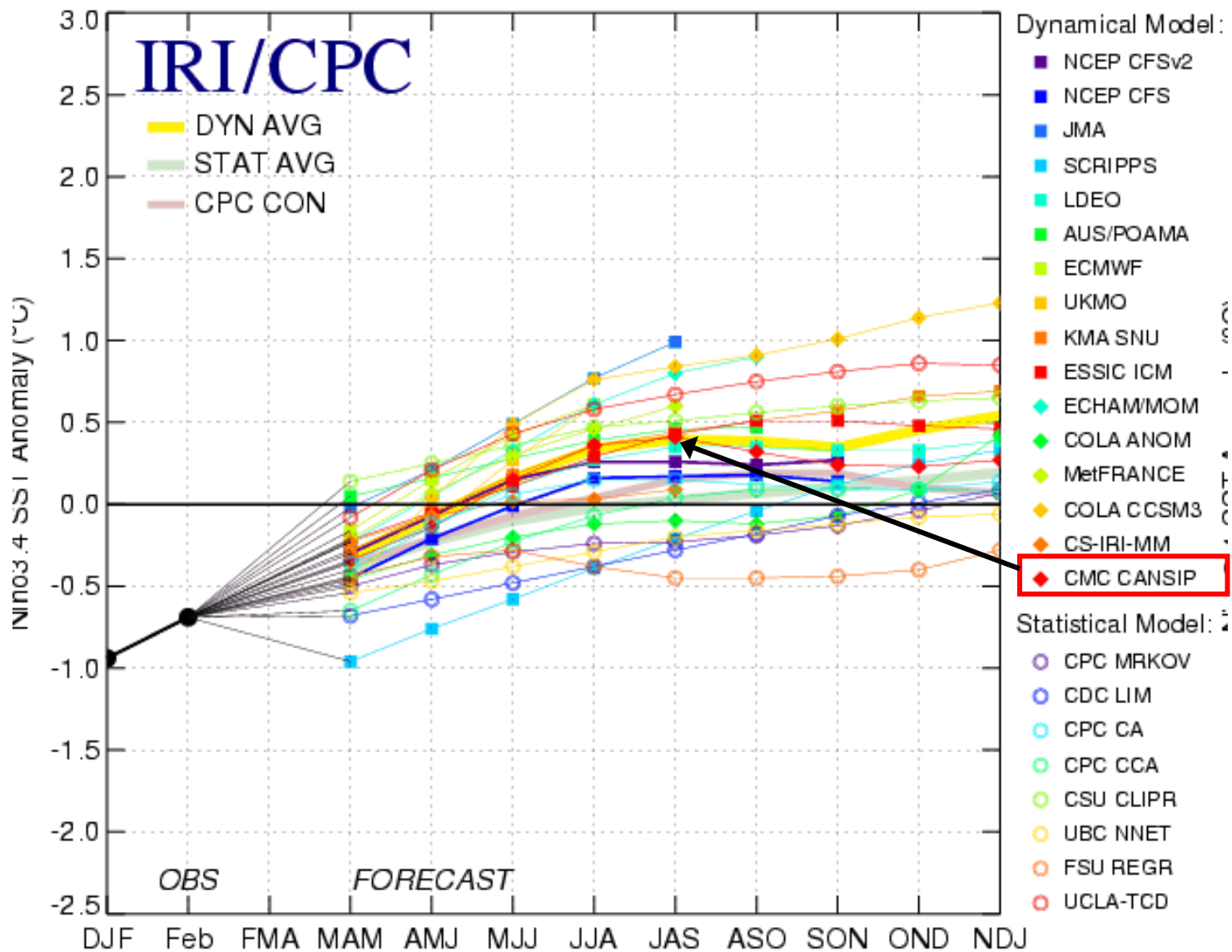


CanSIPS
VS
CFSv2



Nino 3.4 plumes

Mid-Mar 2012 Plume of Model ENSO Predictions



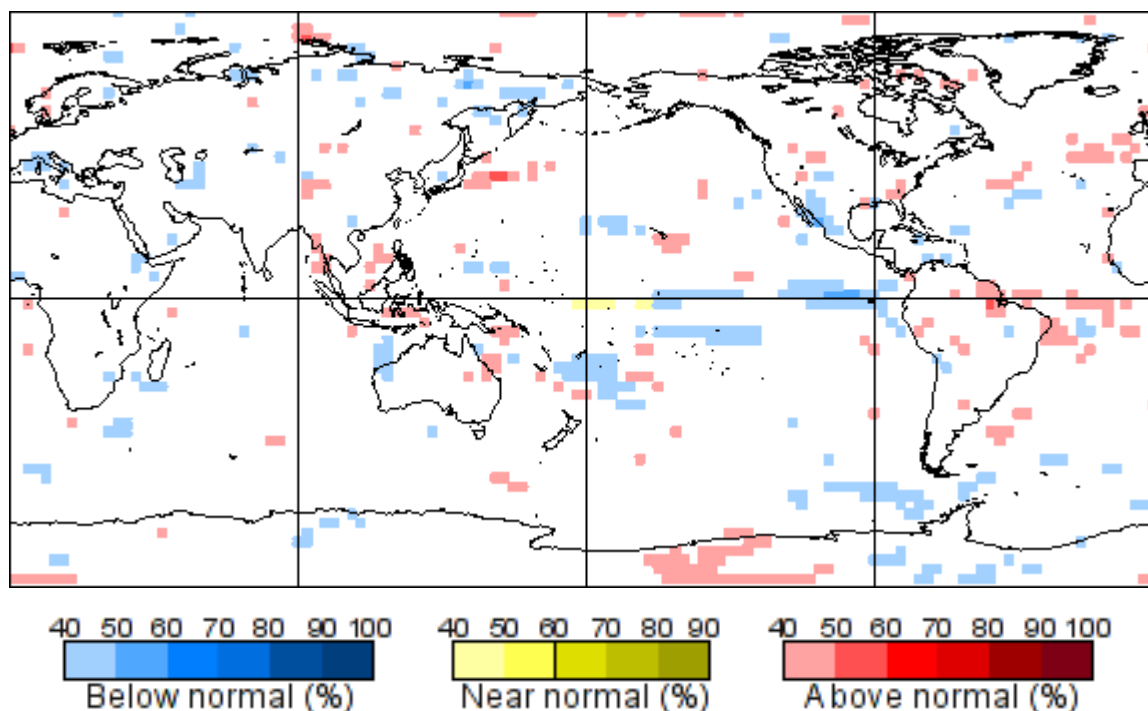
“Pushing the Envelope”

Examine forecasts of seasonal precip at *lead 9 months*

Neutral ENSO conditions predicted

MJJ 2006

Forecast issued 1 Aug 2005



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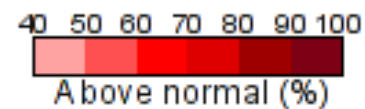
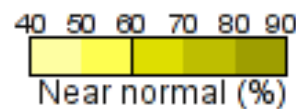
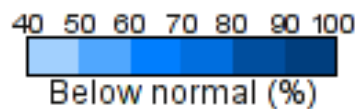
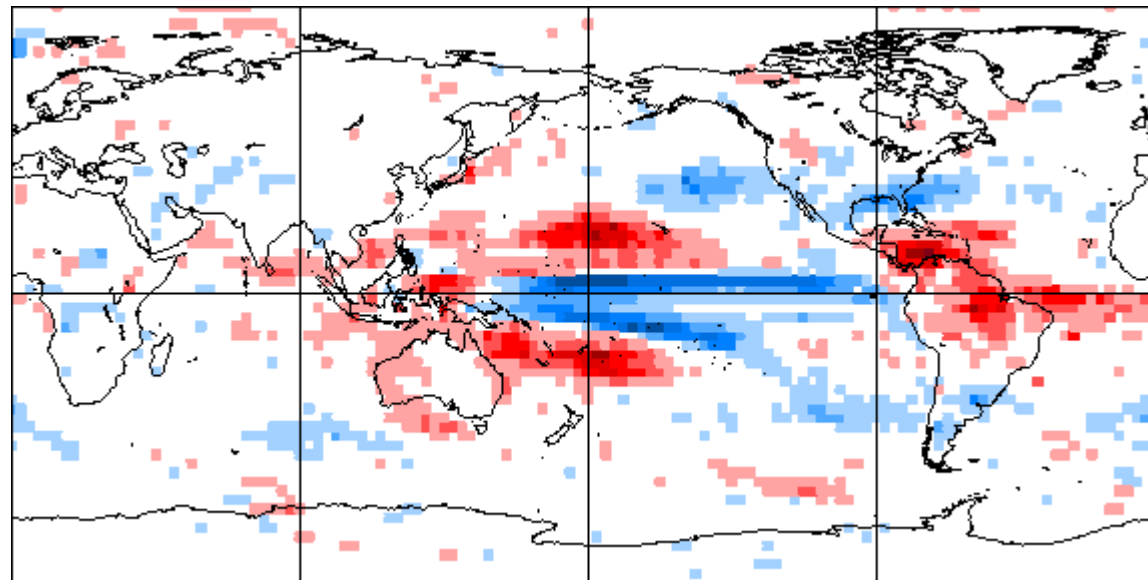
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“Pushing the Envelope”

Examine forecasts of seasonal precip at *lead 9 months*

La Niña predicted

NDJ 2010/11 Forecast issued 1 Feb 2010



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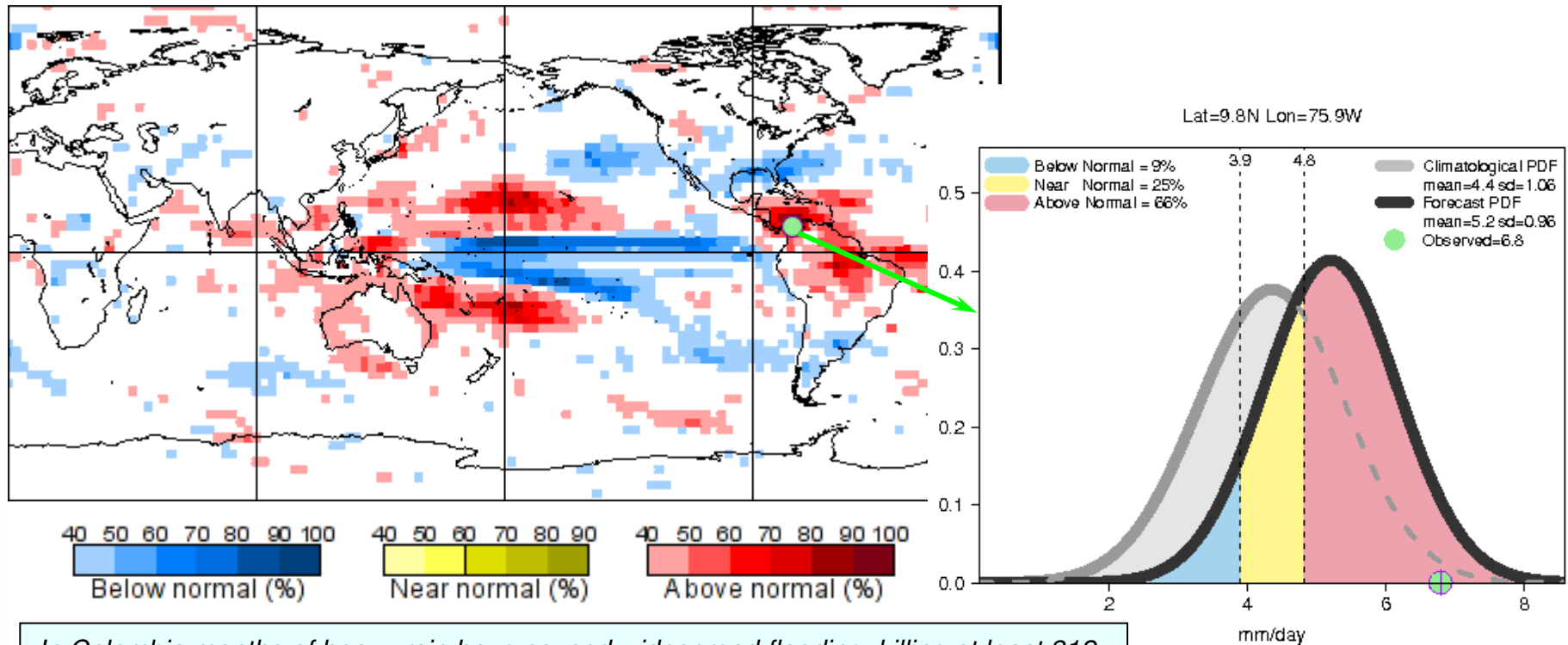
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NDJ 2010-11

Issued 1 Feb 2010



In Colombia months of heavy rain have caused widespread flooding, killing at least 312 people in the worst natural disaster in the country's history. Hundreds of thousands are homeless and some 2.2m have suffered damage to their homes or property. Many main roads are in ruins, bridges and dykes have collapsed and some of the country's most productive agricultural areas have become marshland. The government reckons that aiding the victims and rebuilding will cost about \$6.6 billion.

The Economist, 13 January 2011

Colombia is battling the country's worst natural disaster on record due to virtually unending rains this year, triggered by the La Niña ocean-cooling phenomenon in the tropical Pacific. "It is as if our territory has been struck by a hurricane that arrived last year and does not want to leave," President Juan Manuel Santos said in an address to the nation.

Earthweek, 29 April 2011



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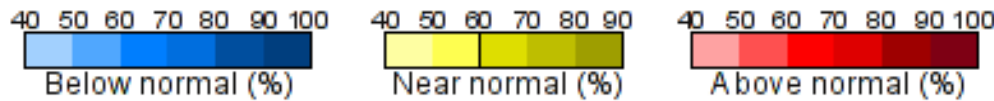
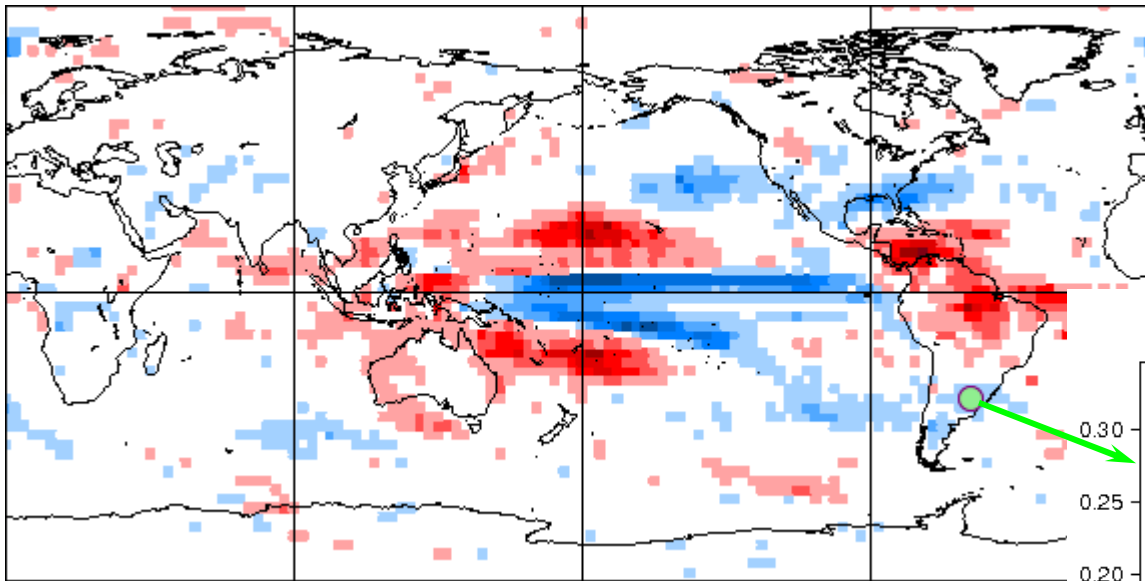
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NDJ 2010-11

Issued 1 Feb 2010



Friday, December 24th 2010 - 08:06 UTC

Uruguay under agriculture "state of emergency" because of lack of rains

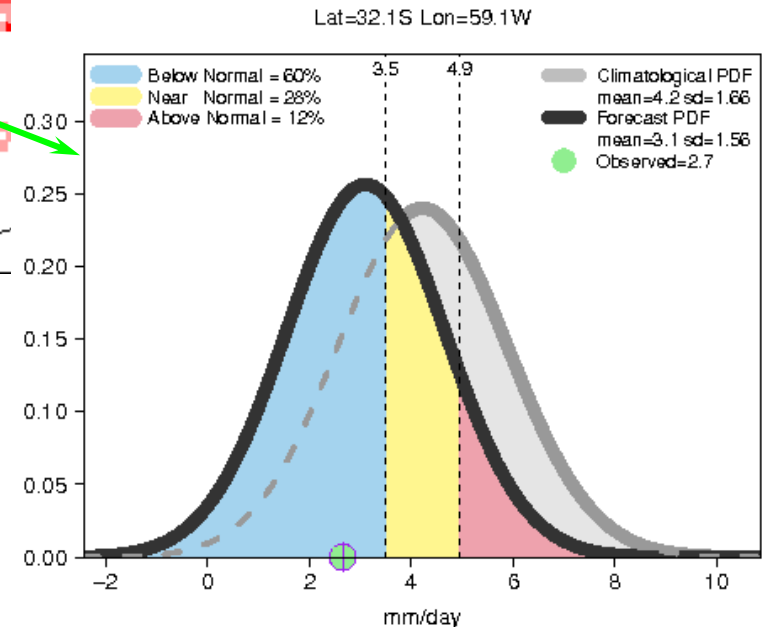
The Uruguayan government declared Thursday an "agriculture state of emergency" because of the drought situation to the north of the country.

Bloomberg

Argentina's Corn Crop Forecast Cut 4.9% on Drought

January 20, 2011, 2:11 PM EST

"La Nina, a weather event that forms in the Pacific Ocean and affects climates worldwide, has pared planting since November in Argentina..."



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Towards CanSIPSv2

- More ensemble members?
- Higher resolution?
- Improved ocean data assimilation in CanCM3/4?
- Add coupled GEM-NEMO? (GEM=NWP model)
- Land surface data assimilation?

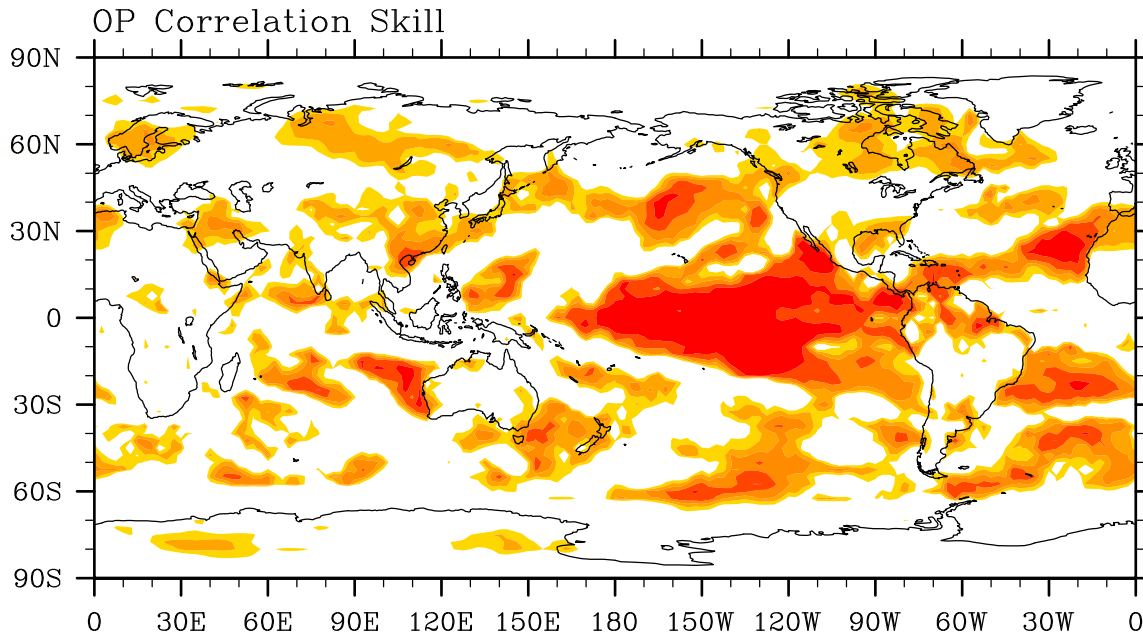


Implementation of new monthly forecast system

- Extension of the global medium-range CMC EPS to 32 days
 - 21 member
 - IC from Kalman filter assimilation system
- 66 km / L40
- Perturbed physics
- Persistent SST anomaly with time-evolving boundary condition

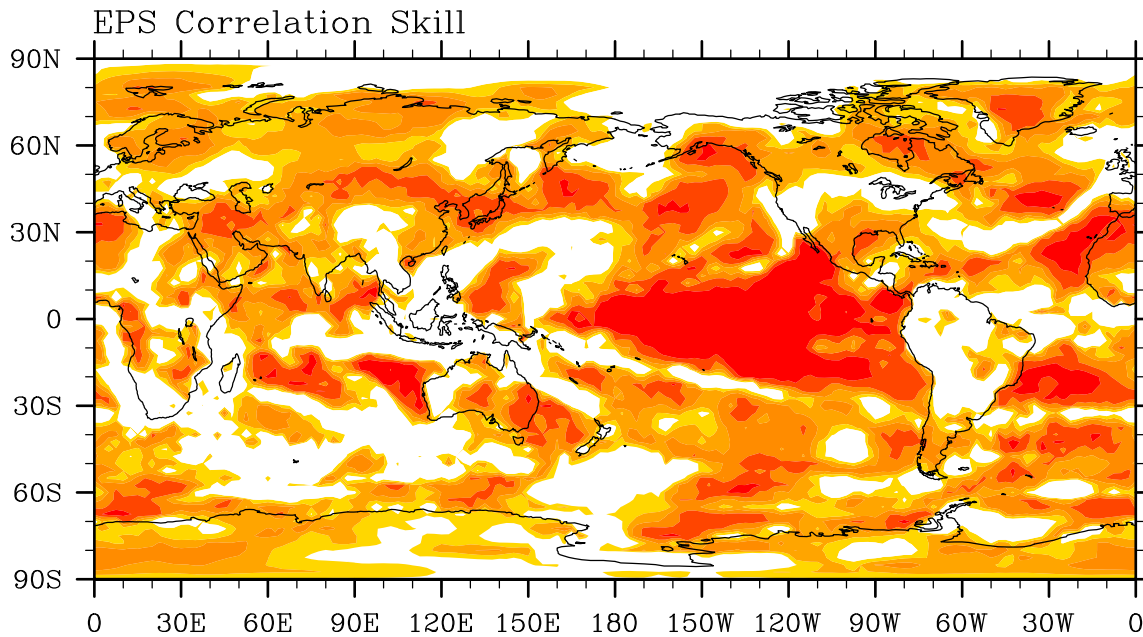


Correlation skill



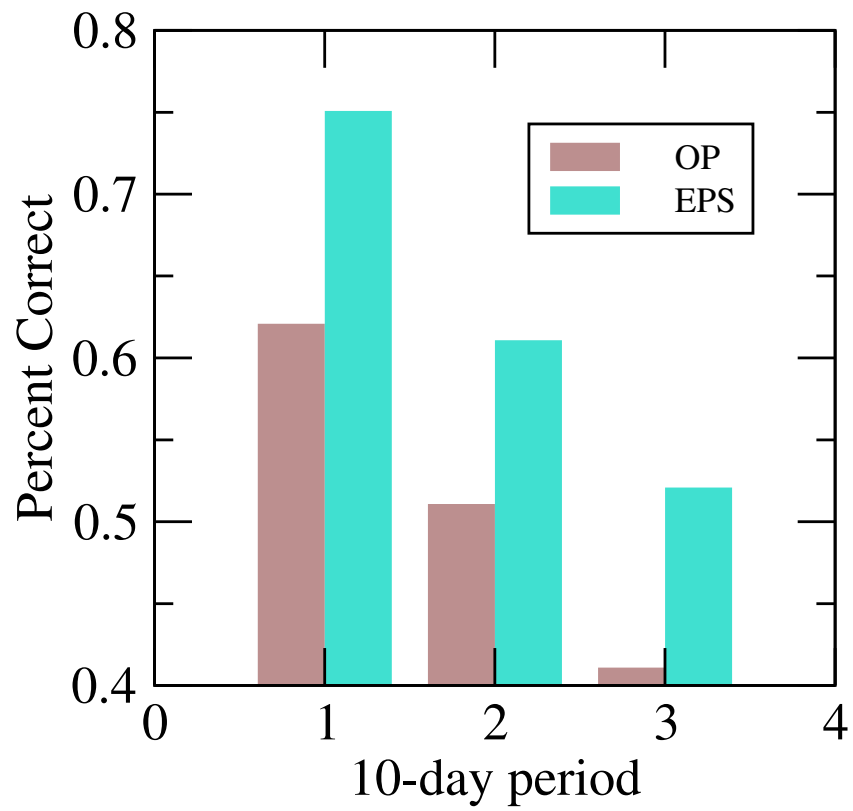
Winter T2m

30-day average

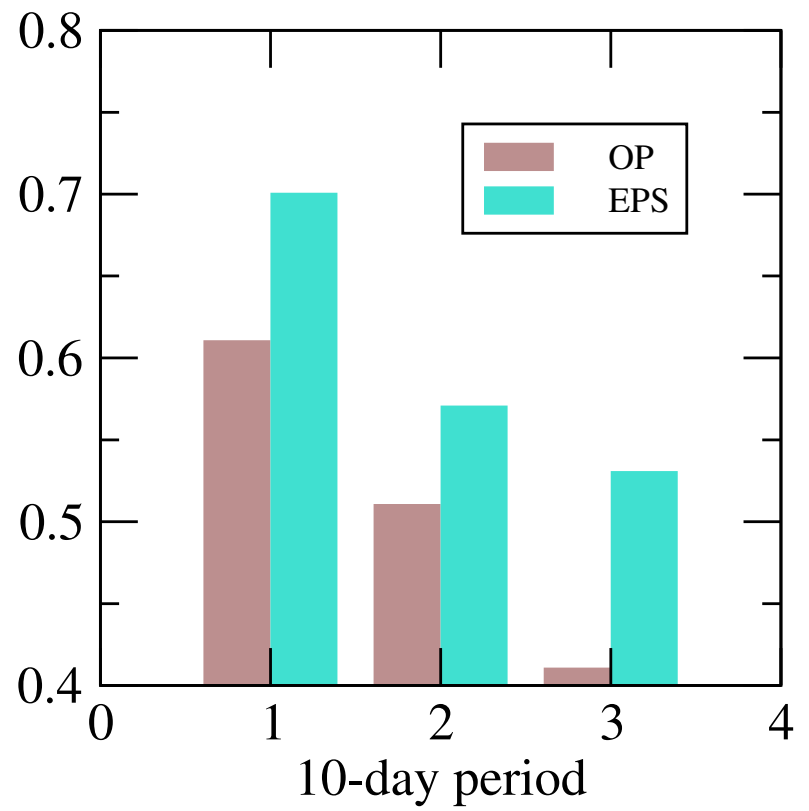




Winter



Summer



Various

- Need to update the SVSLRF LVL1&2 scores
 - CCCma Experimental forecast and verification web page:
http://www.cccma.ec.gc.ca/cgi-bin/data/seasonal_forecast/sf2
Password available on request: bertrand.denis@ec.gc.ca
- Not much capacity building yet but Environment Canada is restructuring it's Climate Services (*Water availability and Climate Services Signature Project*)
- Contribute to WMO, APCC and US National MME

