Extratropical source of interannual rainfall variability in central Chile during winter

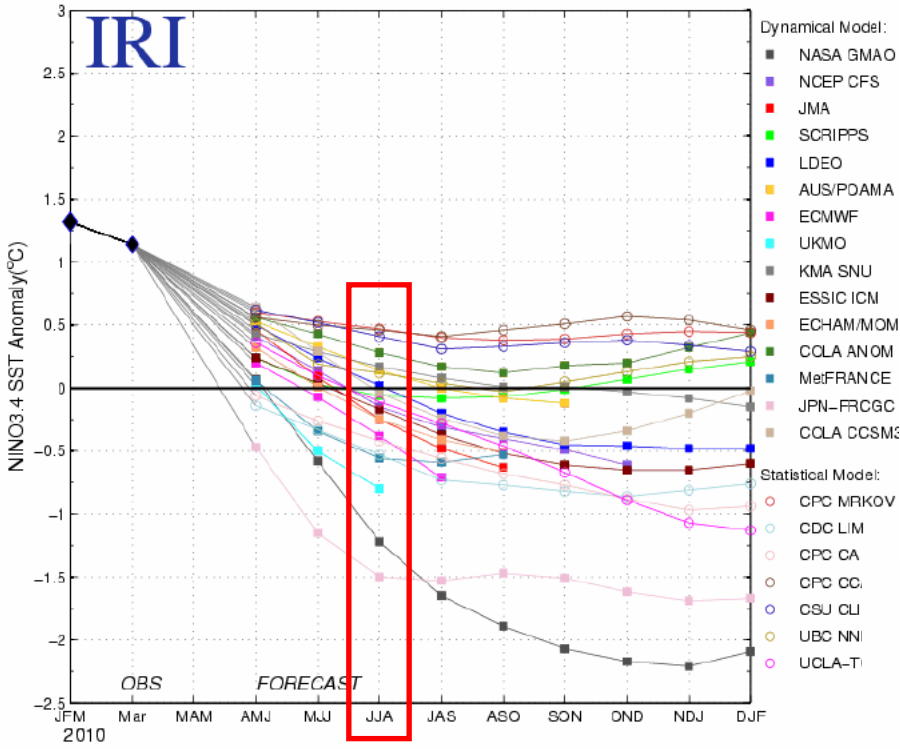Aldo Montecinos
Departamento de Geofísica
Universidad de Concepción

Extratropical source of interannual rainfall variability in central Chile during winter

What is beyond ENSO?

Aldo Montecinos
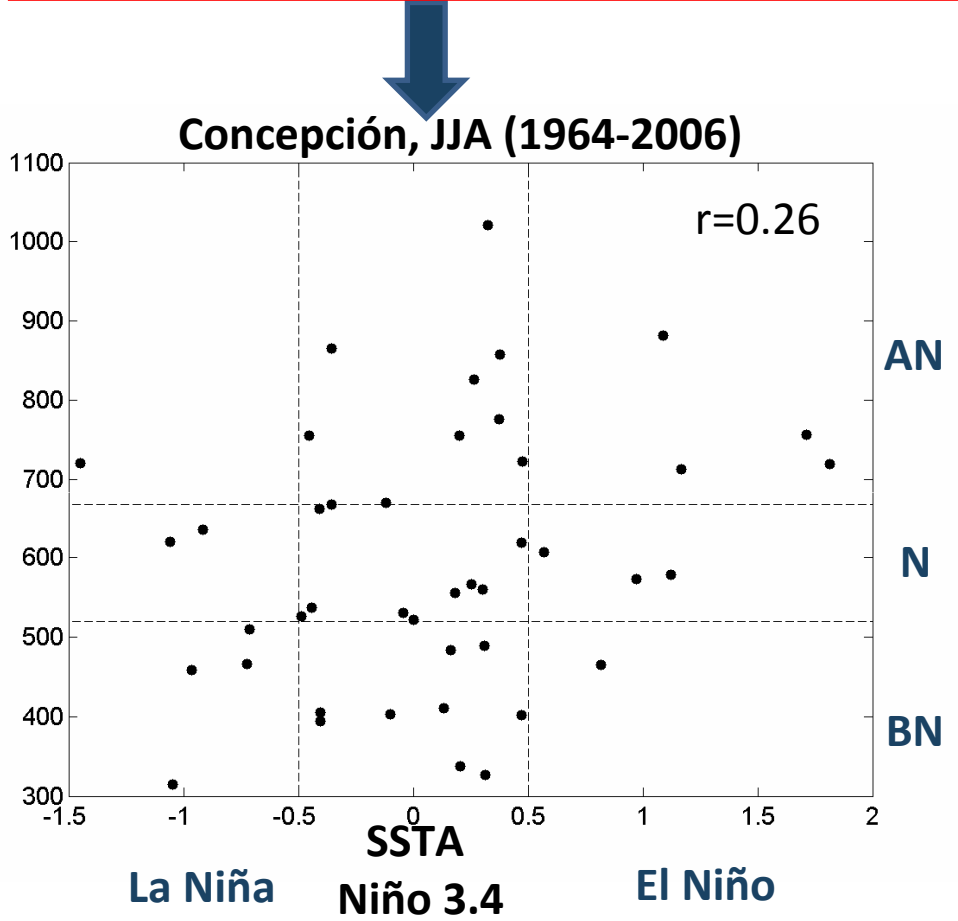Departamento de Geofísica
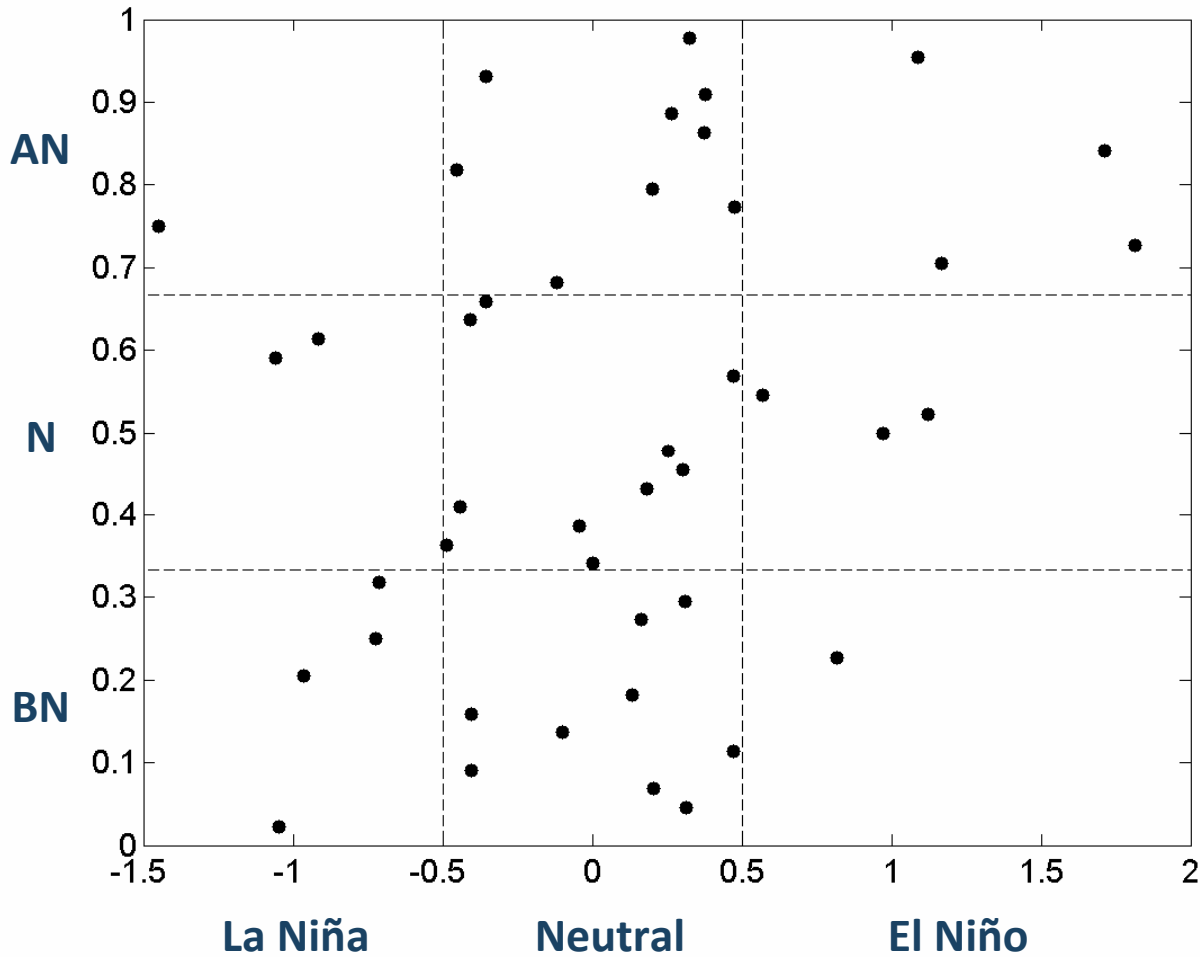Universidad de Concepción

Model Forecasts of ENSO from *Apr 2010*

La Niña (N34 < -0.5C)   20%

Neutral condition   80%

El Niño (N34 > +0.5C)   0%

Concepción, JJA (1964-2006)

r=0.26

SSTA
Niño 3.4

La Niña   El Niño

Concepción, JJA (1964-2006)

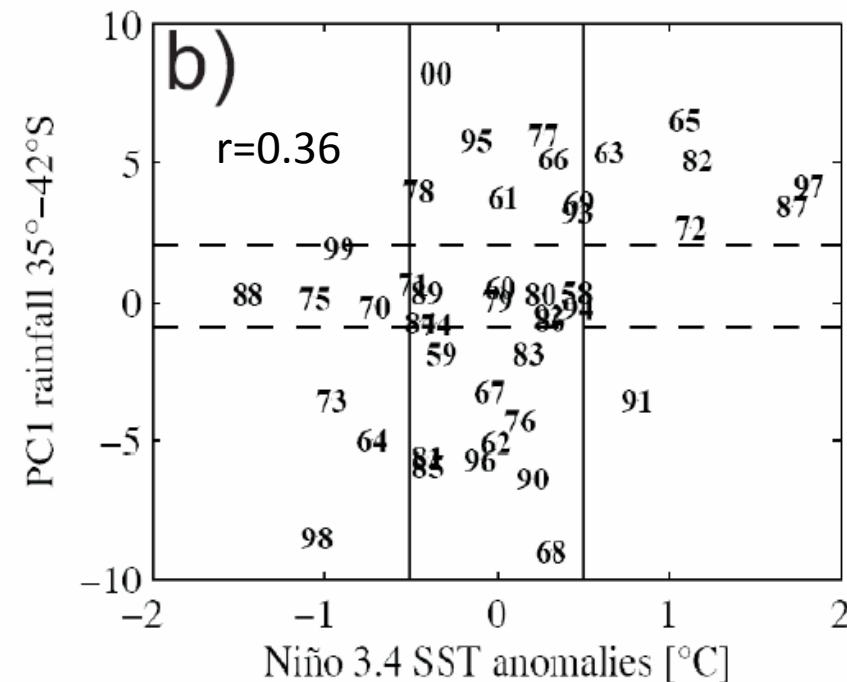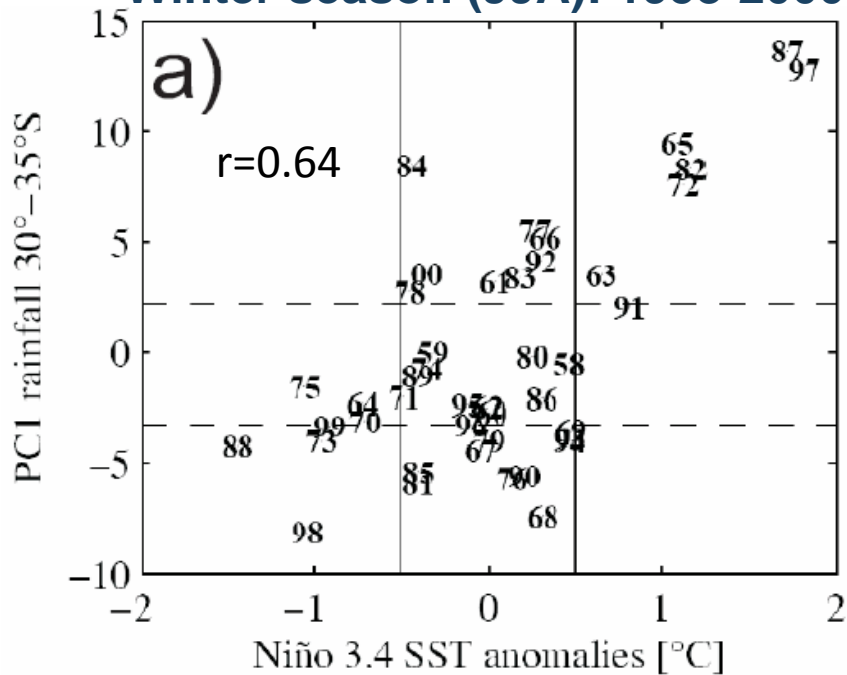|		LN	NT	EN		BN	N	AN
Early May 2010		20	80	0		36	36	28
Early June 2010		25	75	0		38	36	26
Perfect Forecast		100	0	0		57	29	14

IRI Multi-Model Probability Forecast for Precipitation for June-July-August 2010, Issued April 2010
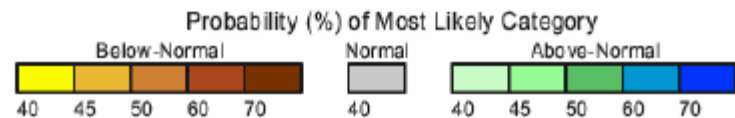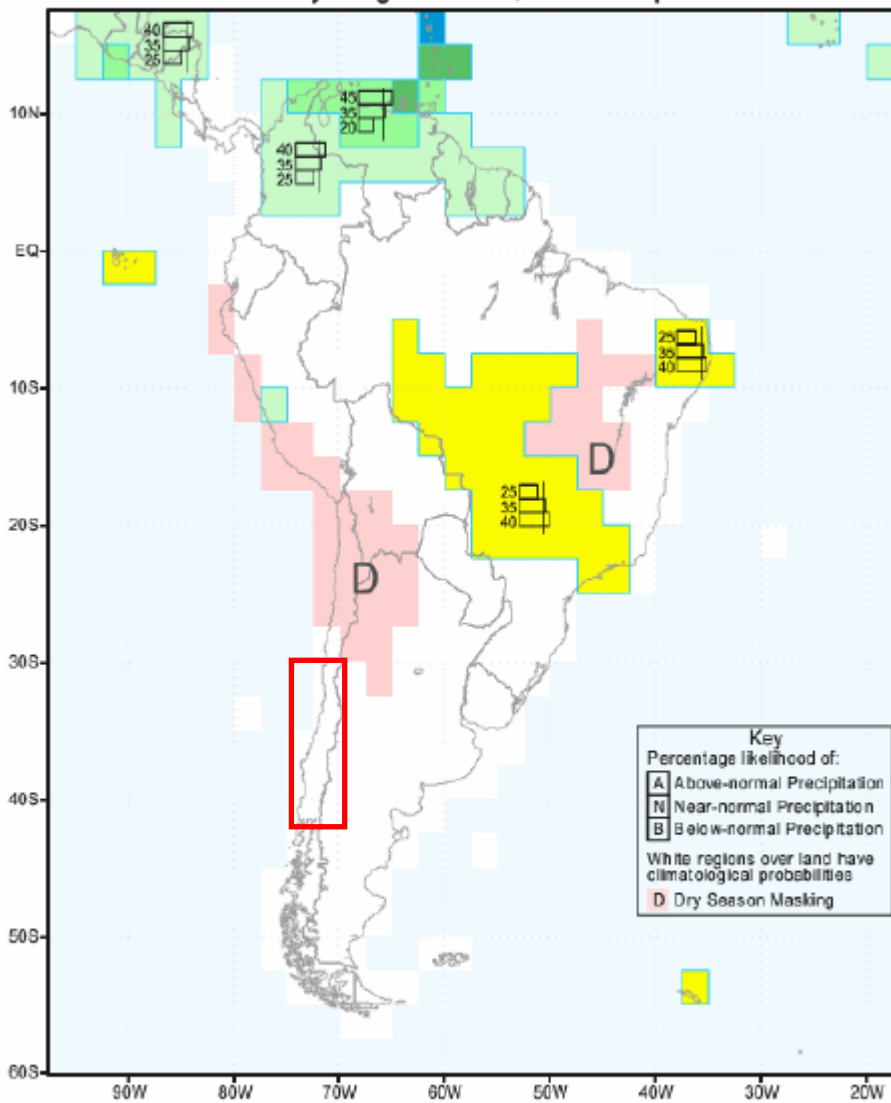
IRI Multi-Model Probability Forecast for Precipitation for June-July-August 2010, Issued May 2010

Key
Percentage likelihood of:
A Above-normal Precipitation
N Near-normal Precipitation
B Below-normal Precipitation
White regions over land have climatological probabilities
D Dry Season Masking

Probability (%) of Most Likely Category

Below-Normal   Normal   Above-Normal
40 45 50 60 70   40   40 45 50 60 70
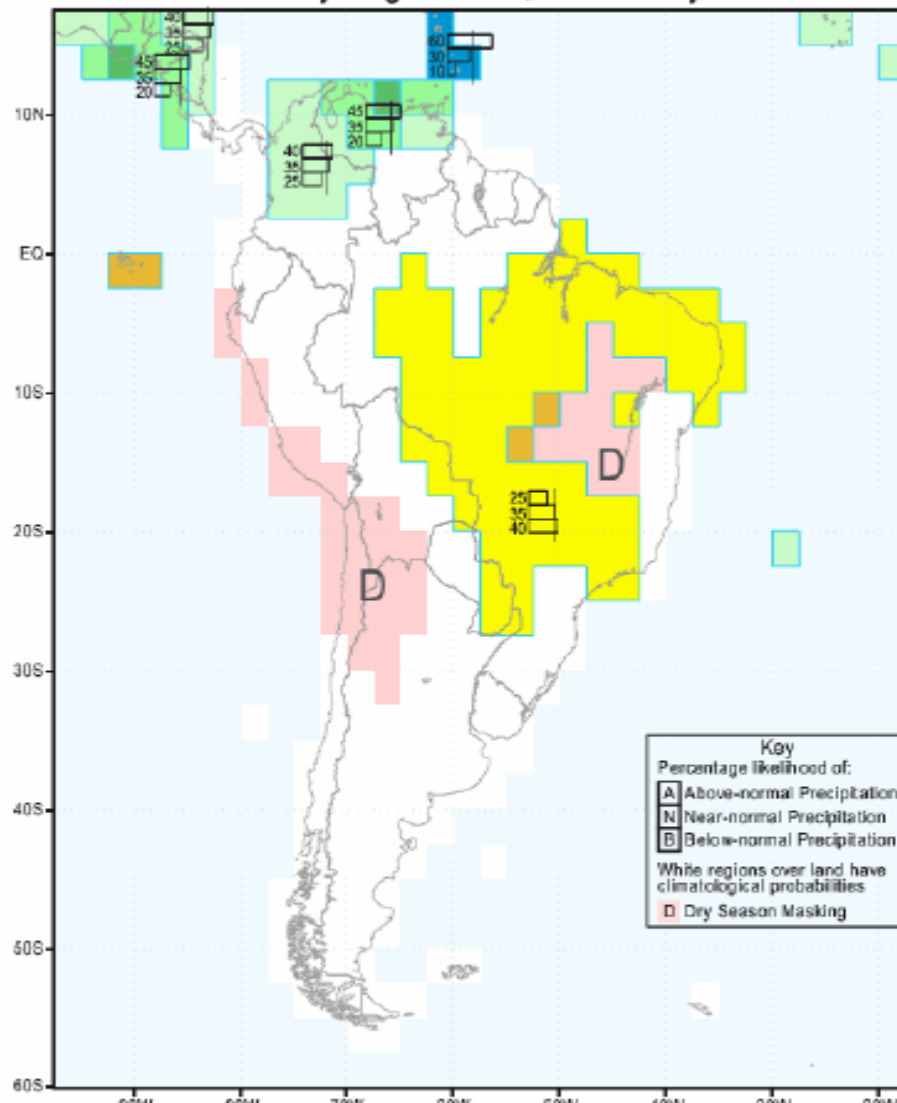
Winter season (JJA): 1958-2000

Some ideas from these simple scattering diagrams:

1. The limit of predictability for seasonal rainfall forecast in central Chile is ENSO-rainfall relation itself.

2. During neutral conditions in the Tropical Pacific, rainfall is distributed almost equally in rainfall categories.

3. We can give a reliable forecast during 3 or 4 years by decade in regions where ENSO is the main source of variability.

4. Conditional probability for El Niño is highly significant but is lower during La Niña.

5. In both regions, 6 of 14 wet winters (43%), and 4-3 of 14 dry winters (21-29%) can be predicted.
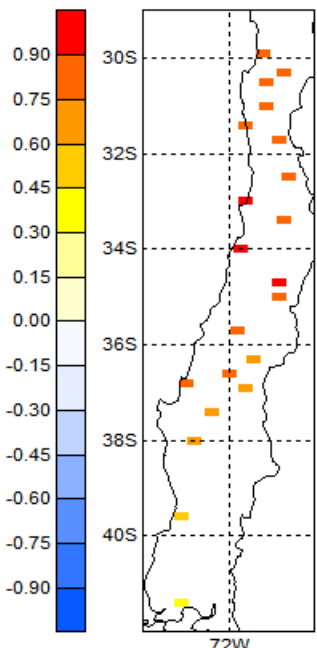
Results from CPT's IRI software and ECHAM4.5 model simulations
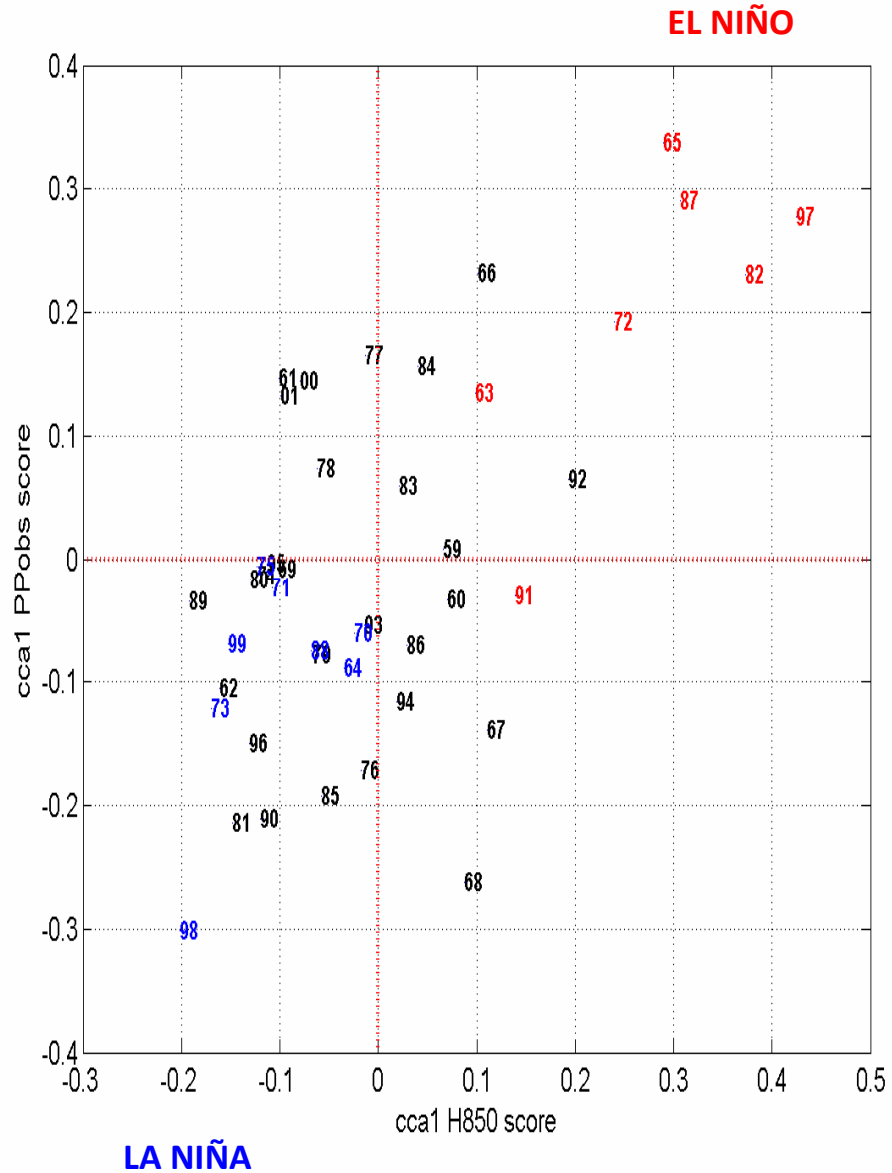
CCA1 H850 pattern; JJA ECHAM4.5 sim
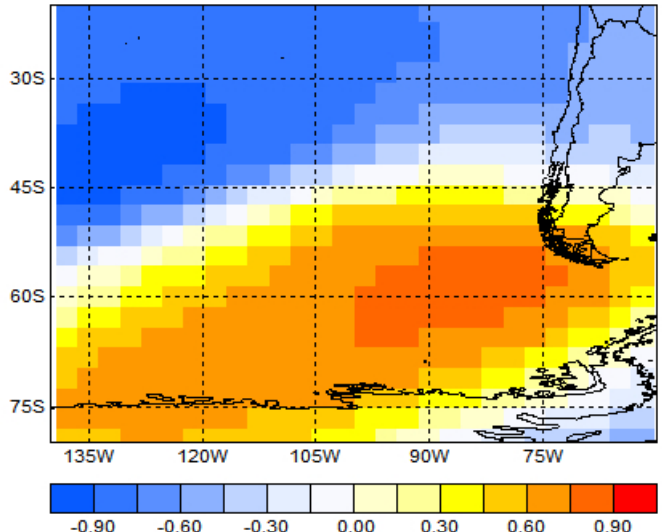
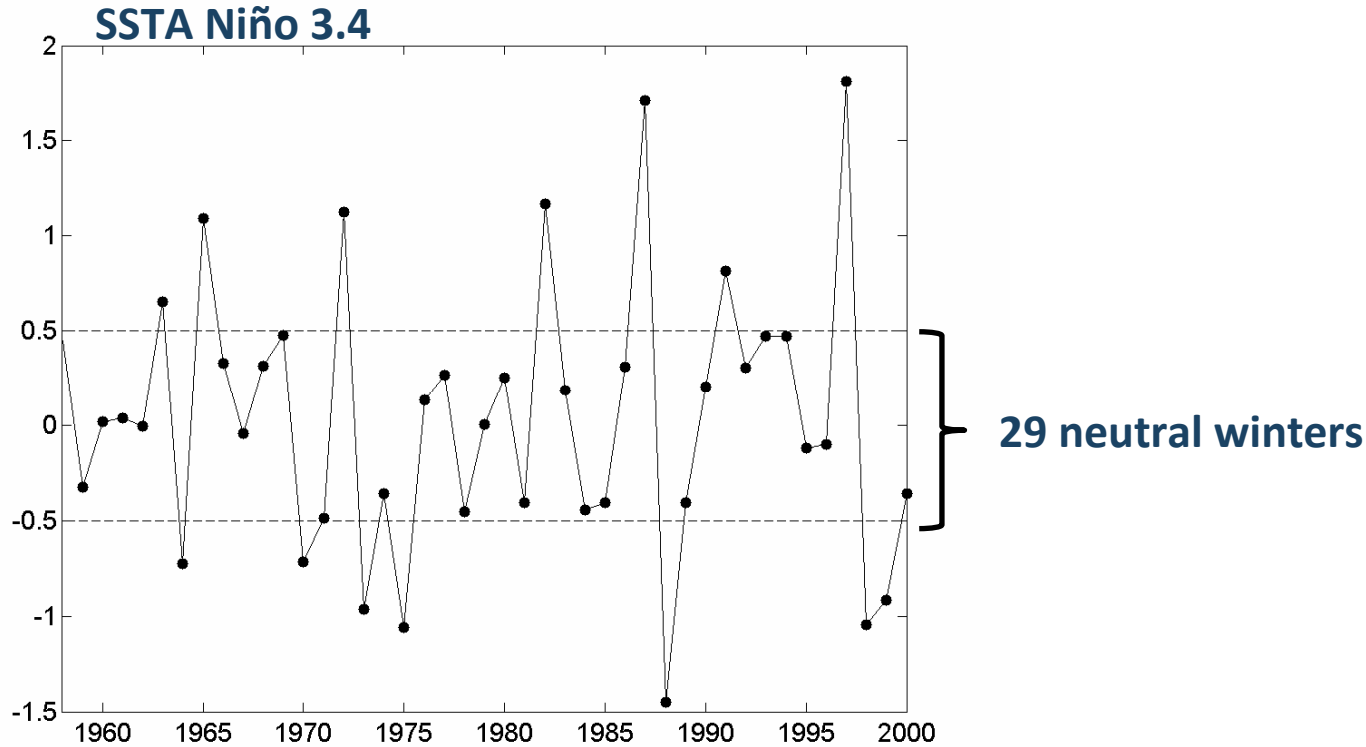

CCA1 PPobs pattern; JJA ECHAM4.5 sim

CCA1 mode

ECHAM4.5 simulated H850 & rainfall in Central Chile

Canonical correlation analysis for neutral winters in the central equatorial Pacific

SSTA Niño 3.4

29 neutral winters

Potential "predictor"

Zonal wind at 700 hPa

Wintertime Precipitation Episodes in Central Chile: Associated Meteorological Conditions and Orographic Influences

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Effect of the Andes Cordillera on Precipitation from a Midlatitude Cold Front

Bradford S. Barrett

Department of Oceanography, U.S. Naval Academy, Annapolis, Maryland

René D. Garreaud and Mark Falvey

Department of Geophysics, Universidad de Chile, Santiago, Chile
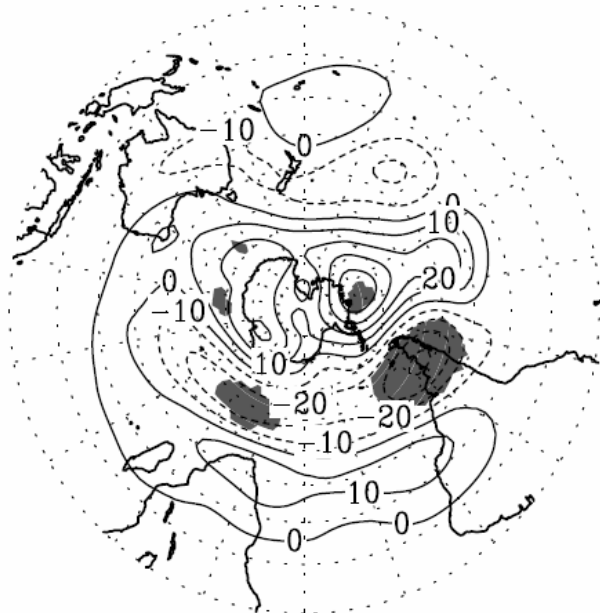
(c) U700 cca mode 1
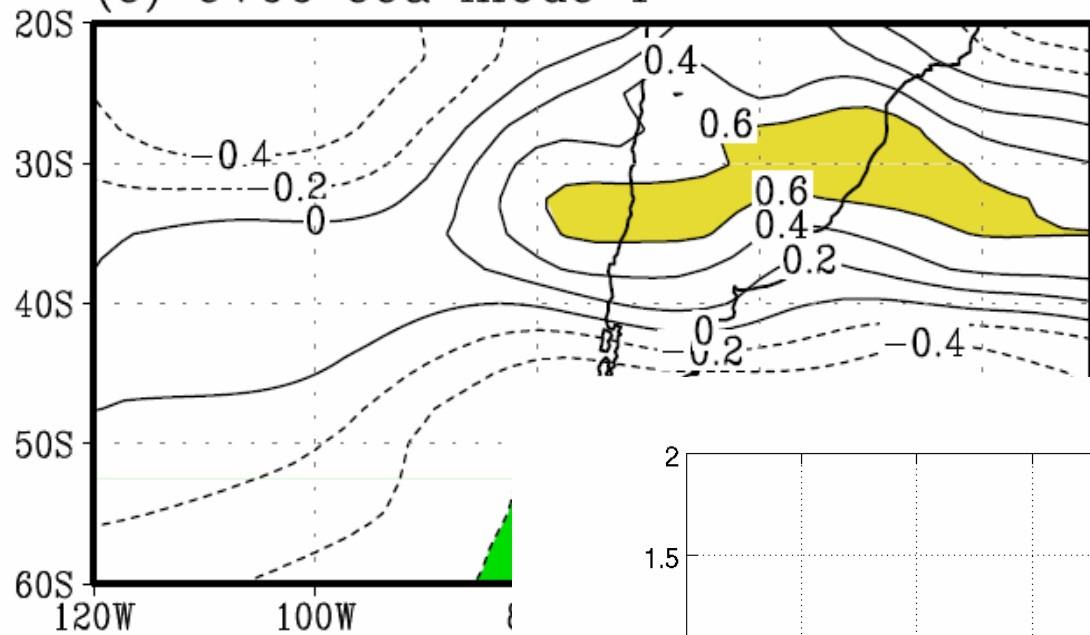
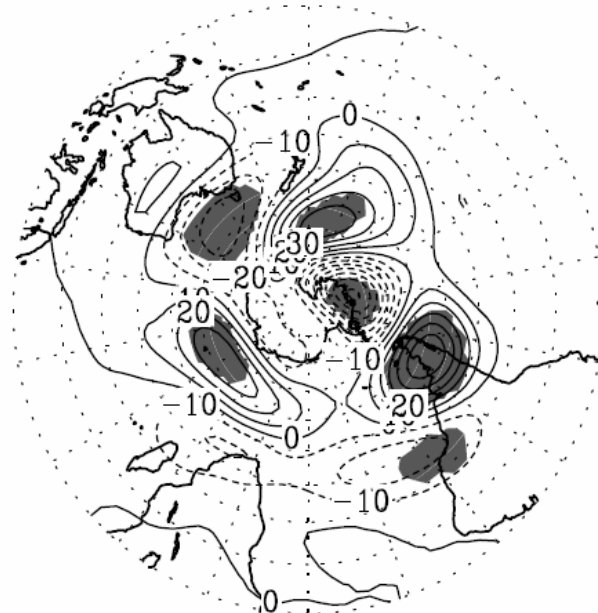(d) PP
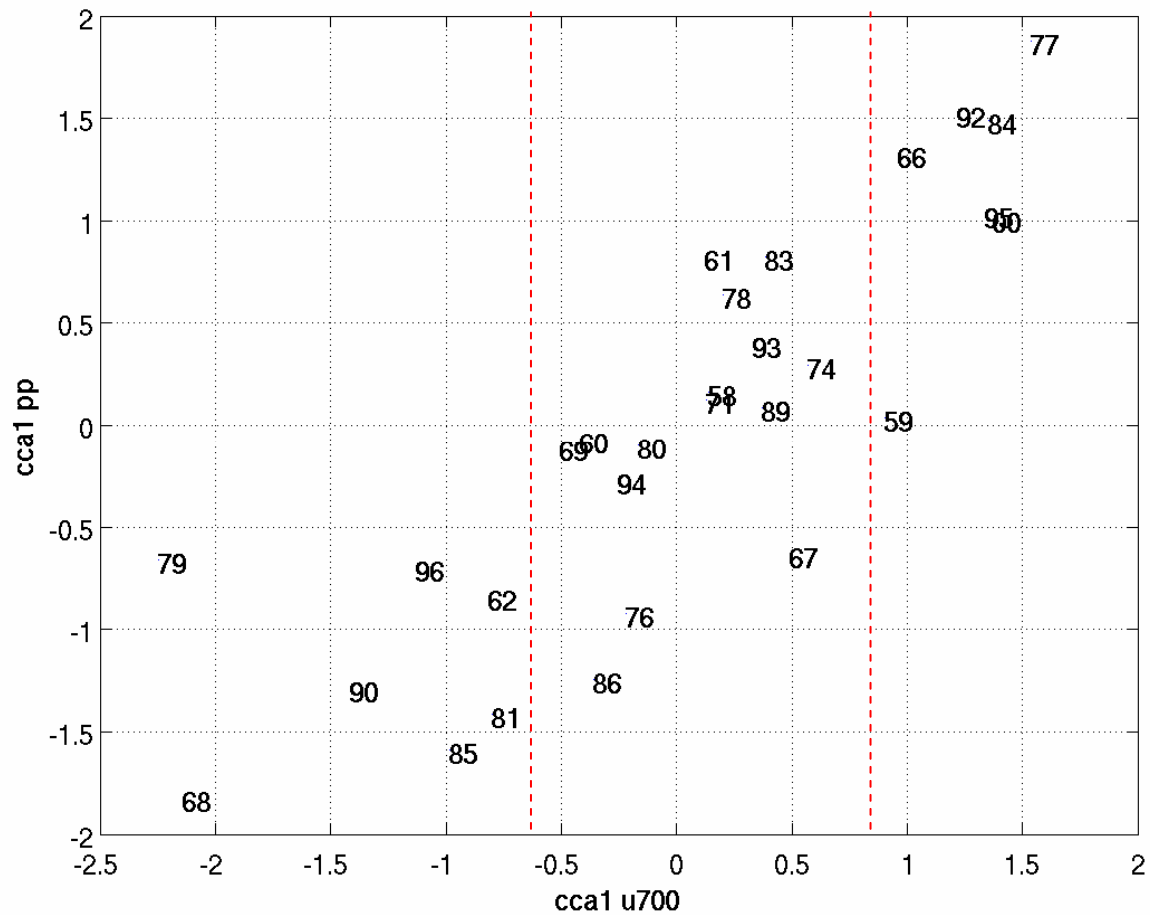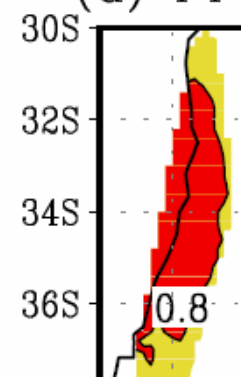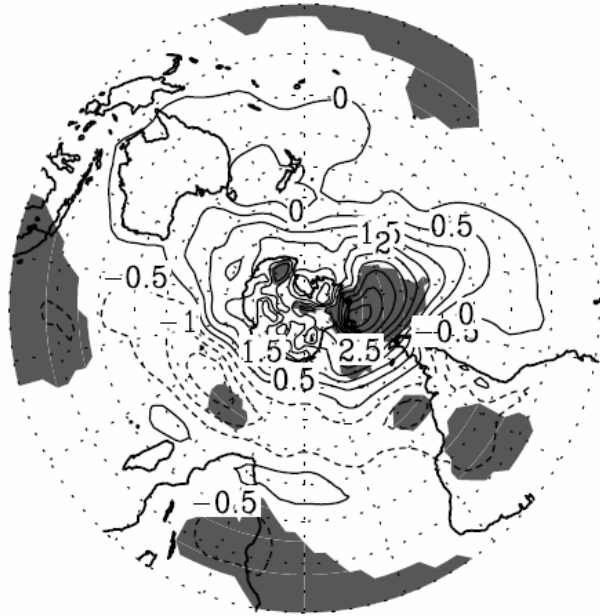
(a) SLP, wet phase u700   (b) SLP, dry phase u700
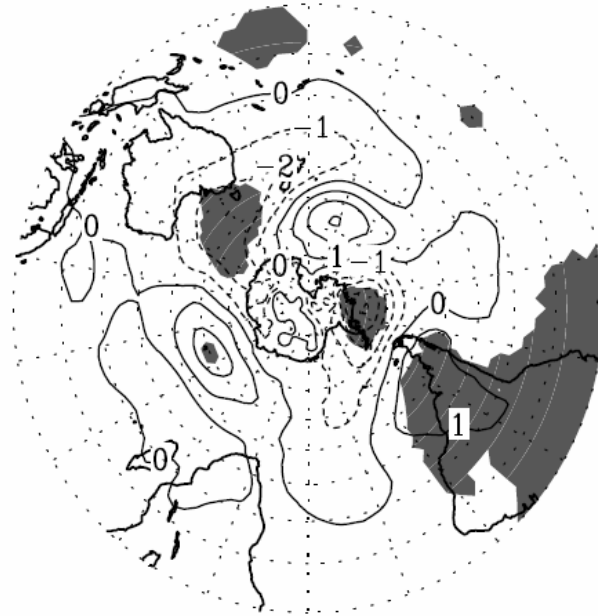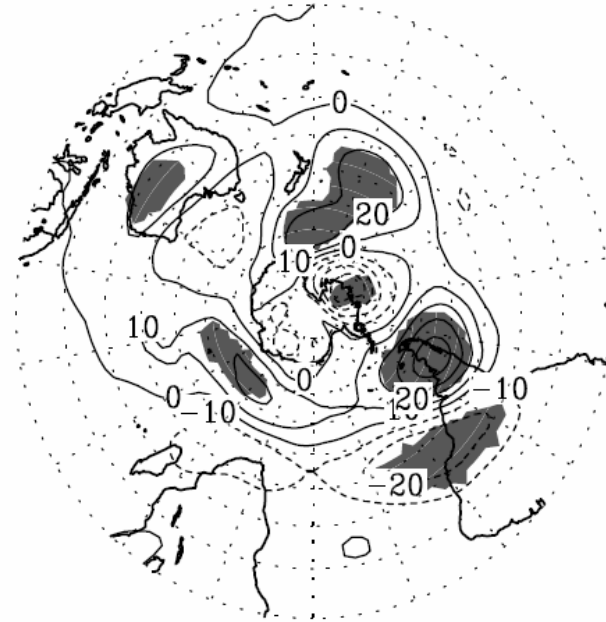
(c) H200, wet phase u700   (d) H200, dry phase u700
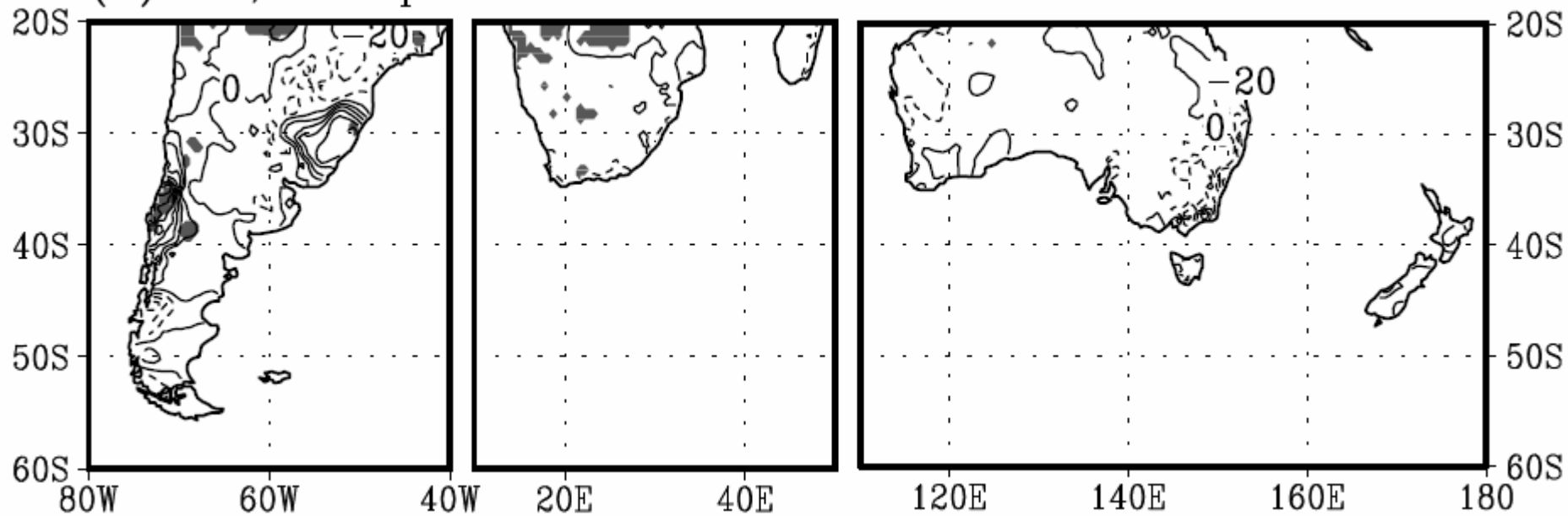
(c) Zmil200, wet phase u700   (d) Zmil200, dry phase u700
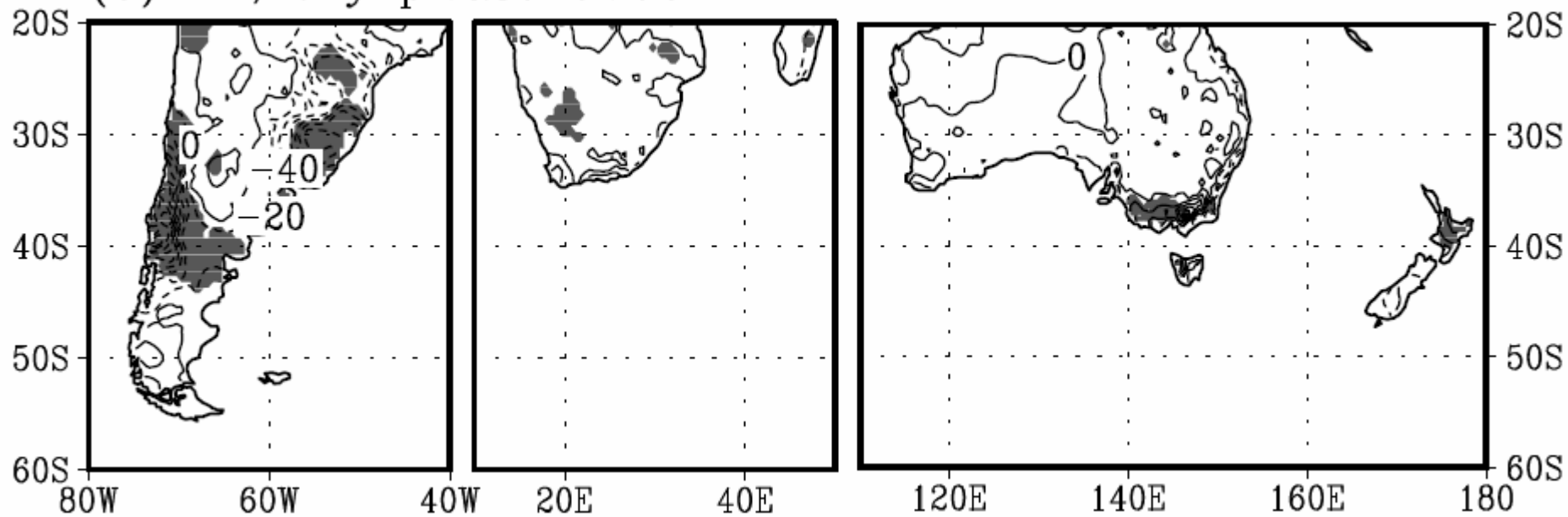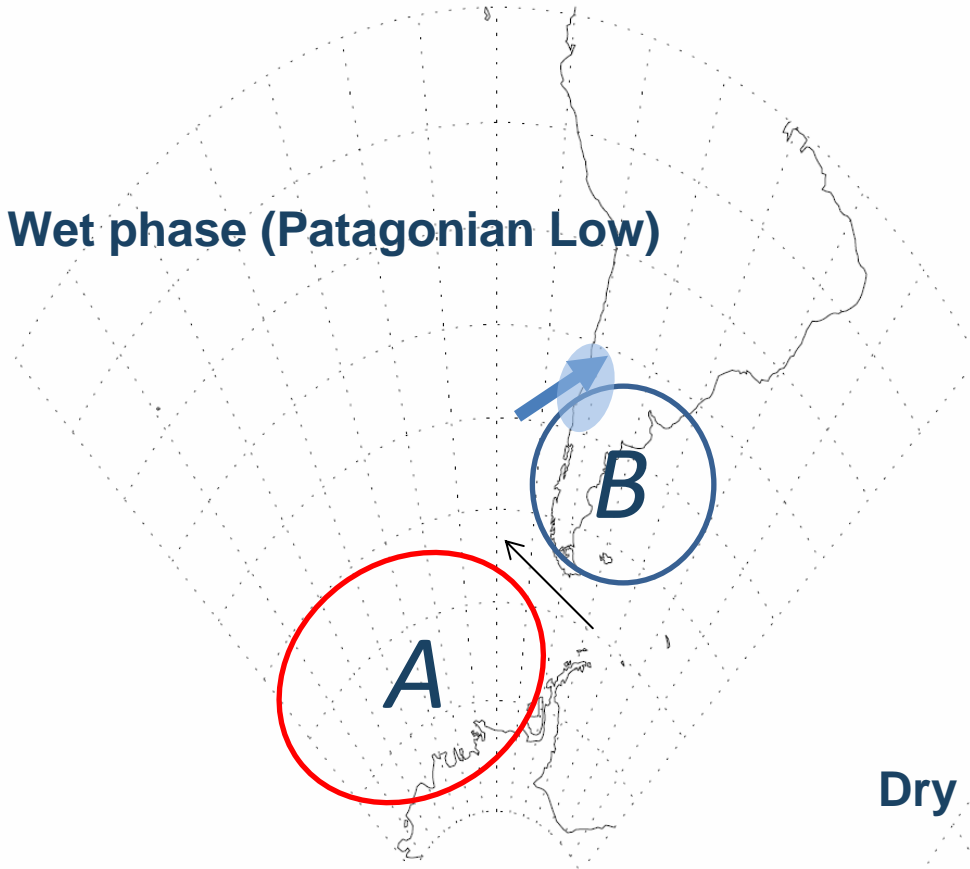
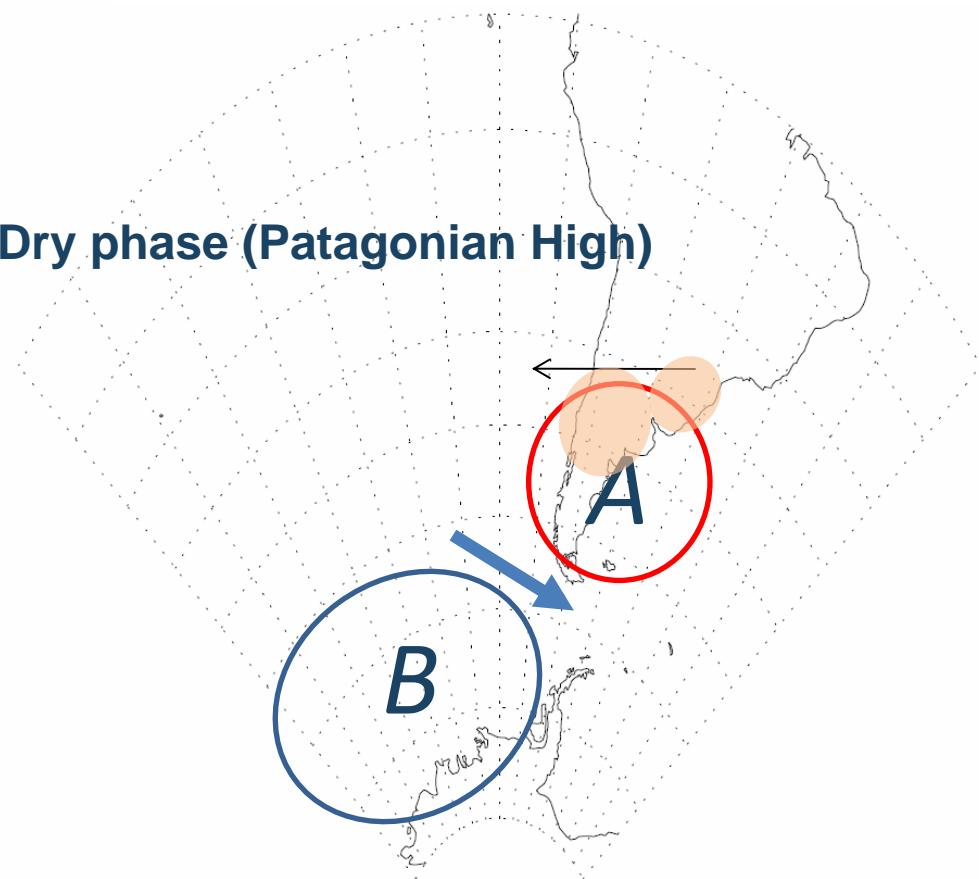(a) PP, wet phase u700

(b) PP, dry phase u700
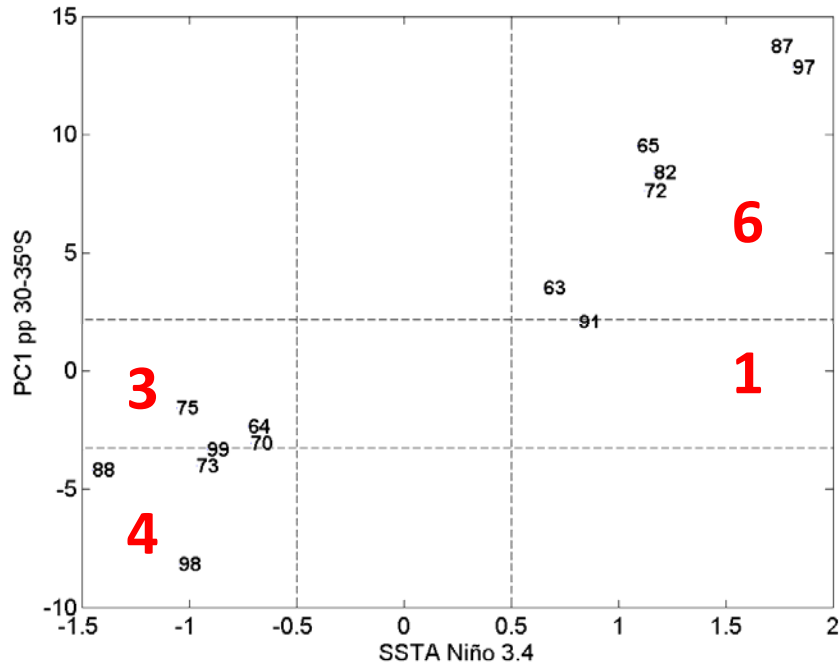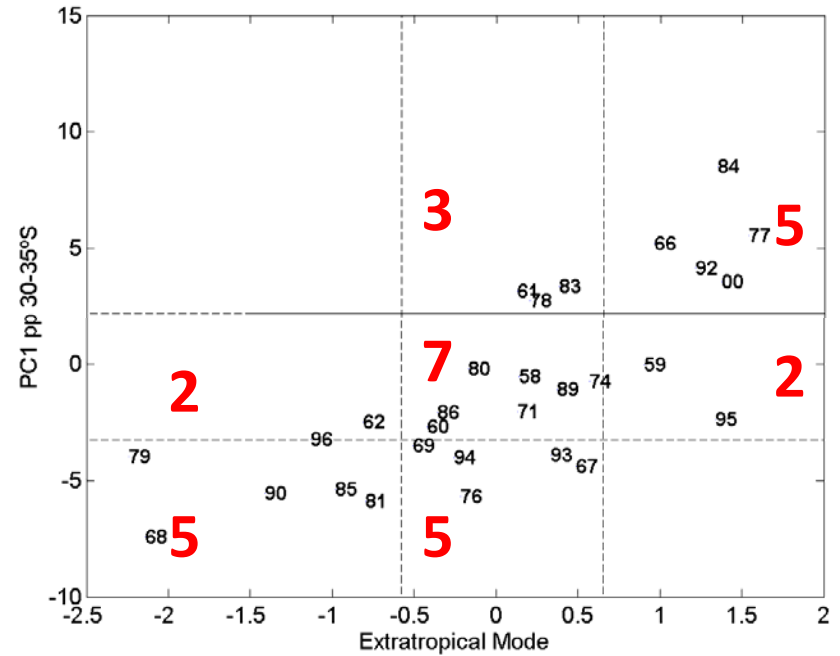
Wet phase (Patagonian Low)

Dry phase (Patagonian High)

Winter season (JJA): 1958-2000
30-35ºS

Tropical Mode

Extratropical Mode

But… can the extratropical mode be simulated? forecasted?
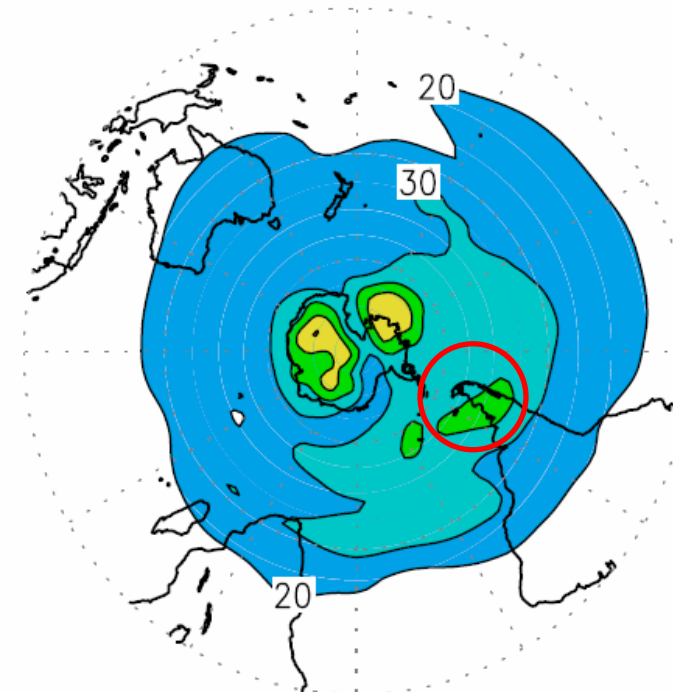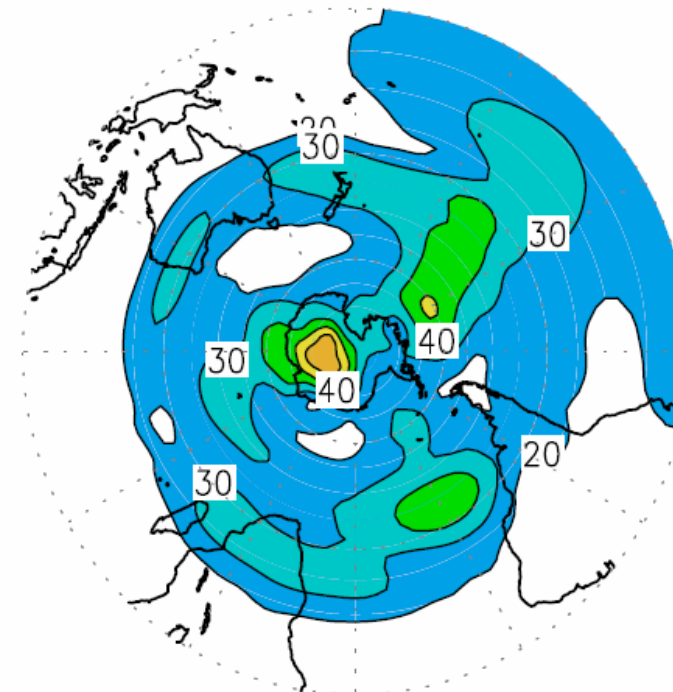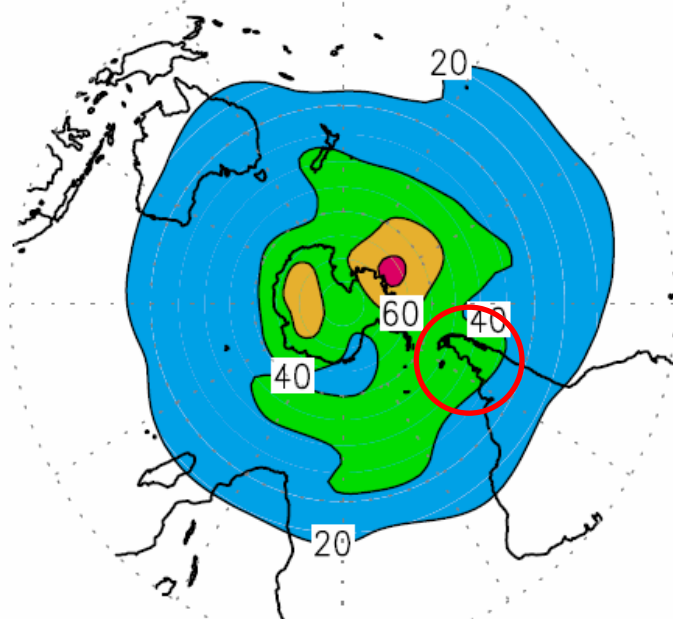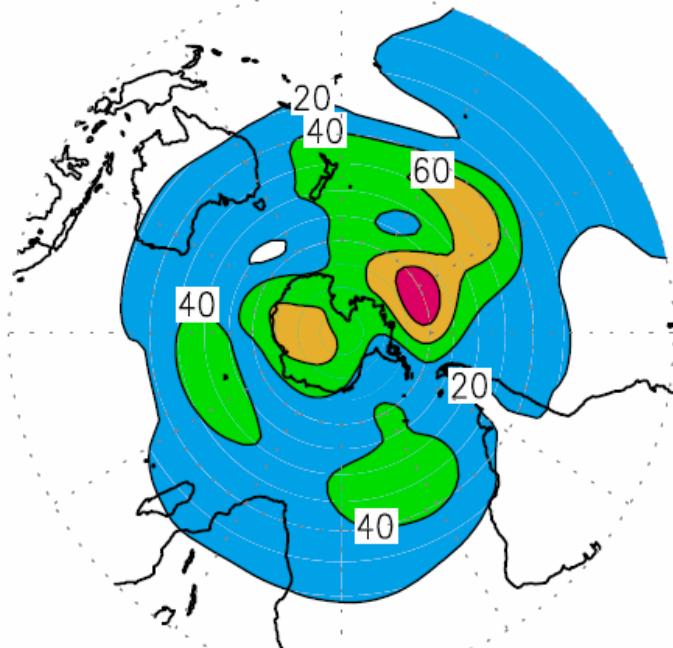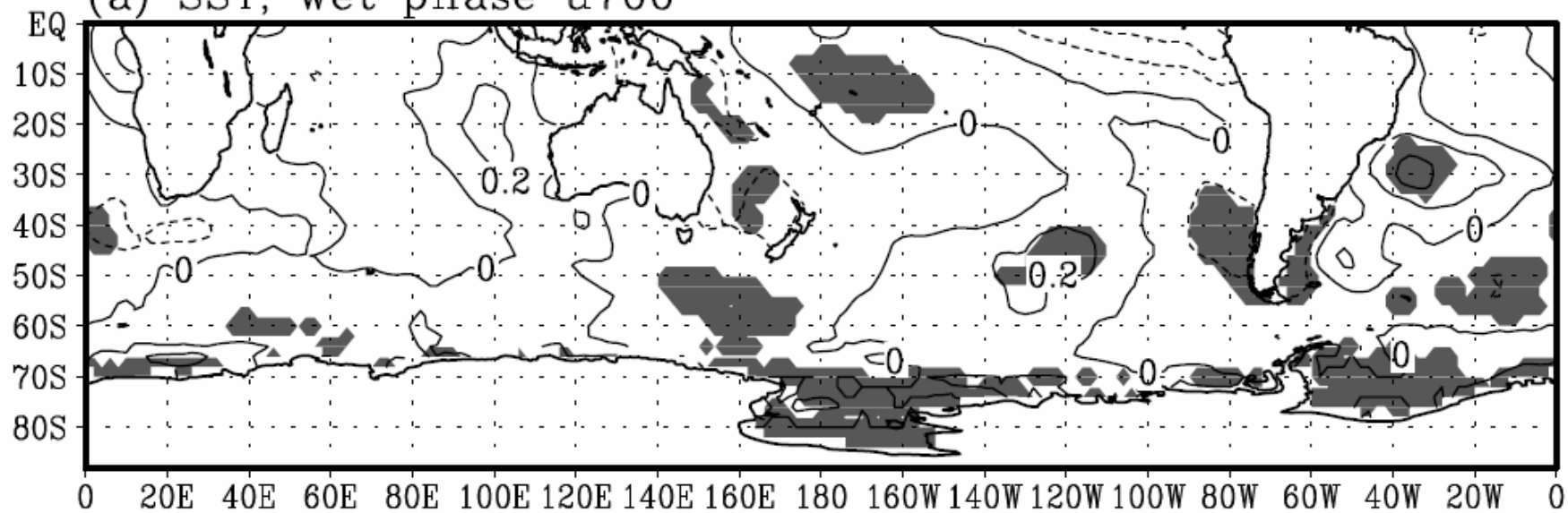
THANKS

VARIANCE

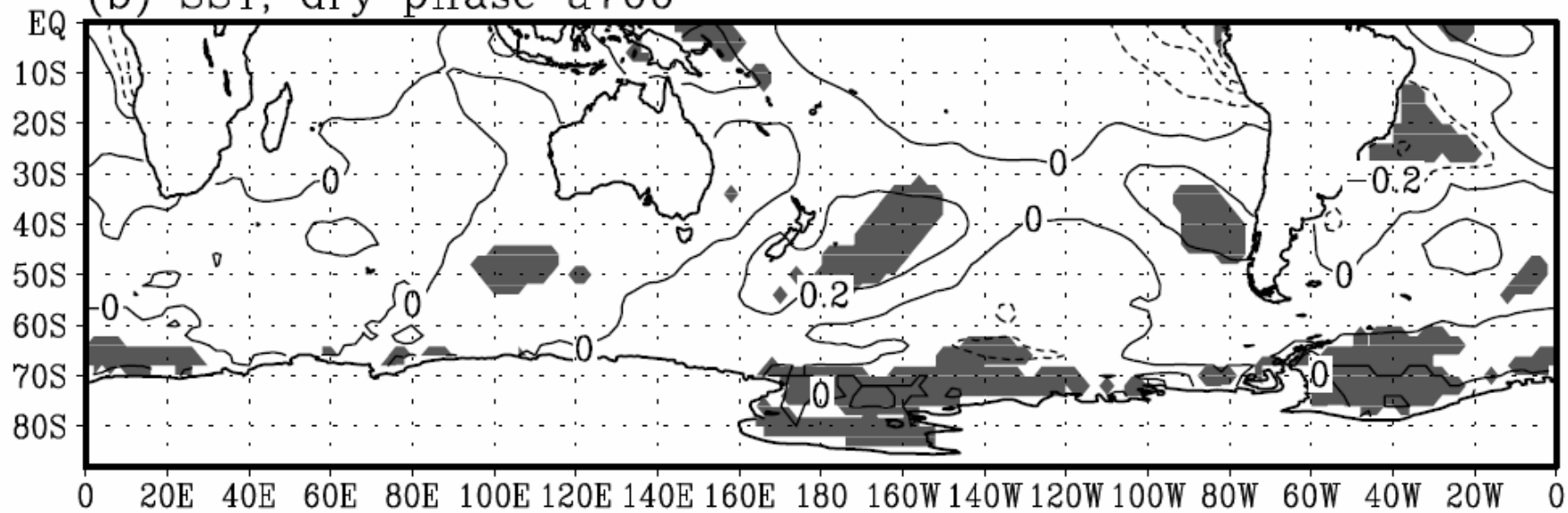ENSO winters   non-ENSO winters

HGT 200

Z 1000-200

(a) SST, wet phase u700

(b) SST, dry phase u700

average elevation of the Andes cordillera