Assessment of CFS_*v*2 over the Pacific Islands

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Talk Outline

1 CFS_v1 – Sooraj, Annamalai, Kumar and Wang (2012) – Weather and Forecasting

L0-2 months – useful prediction of precipitation over Pacific Islands
Skill of ENSO prediction – tied to skillful prediction of USAPI precipitation

2 CFS_v2 - During El Nino – dryness over USAPI begins in SON (Y0) and continues into MAM (Y+1) or even into JJA (Y+1)

2000 – 2010 – Skill assessment with TRMM precipitation observations

Feb-Mar 2006 – continuous rainfall for about 45 days over Hawaii

3 Way forward – MSE diagnostics – moist and radiative processes – rainfall anomalies

Pacific Islands

West Pacific Monsoon

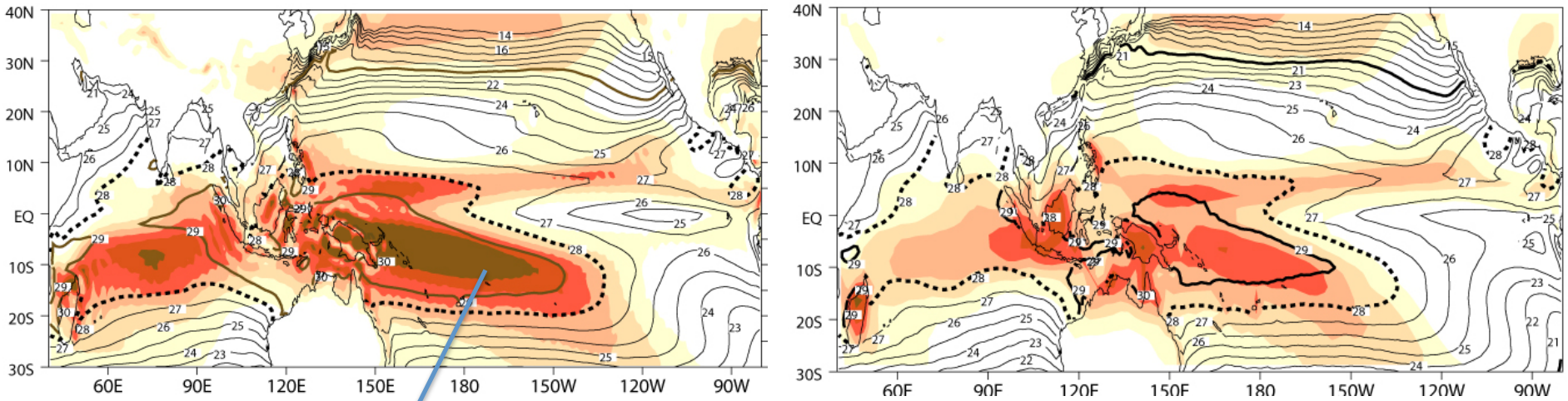
Trades, storms Orography

SPCZ

December – February

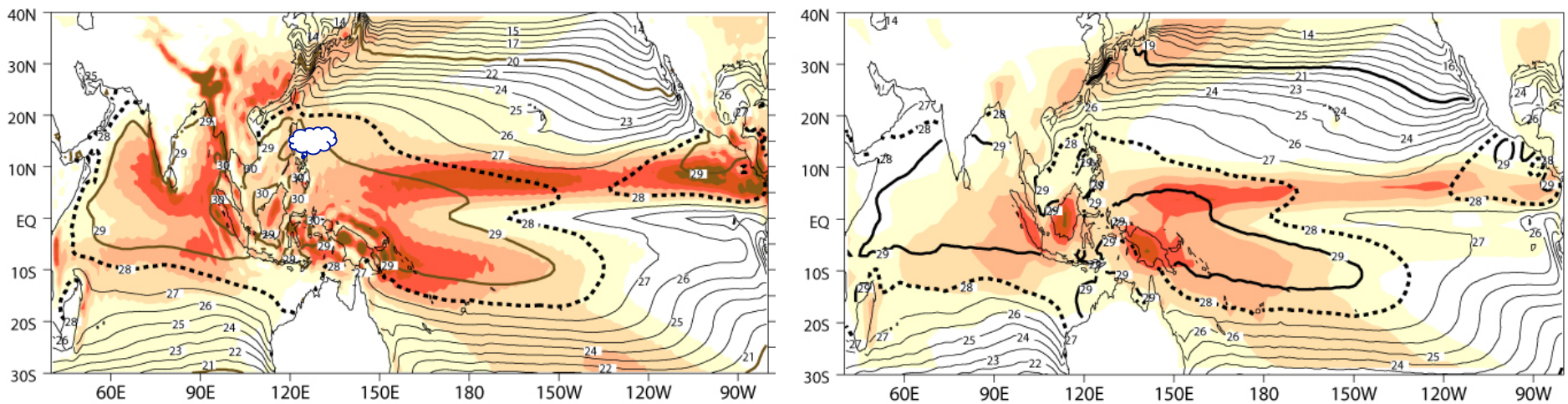
CFS_v2

Obs

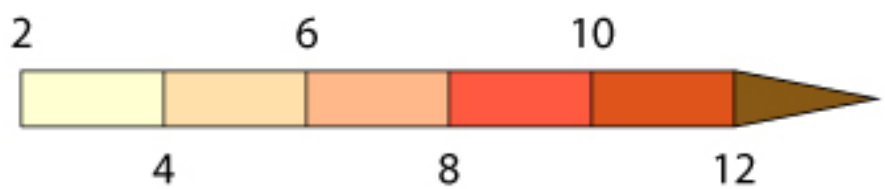


"warm pool"

March - May

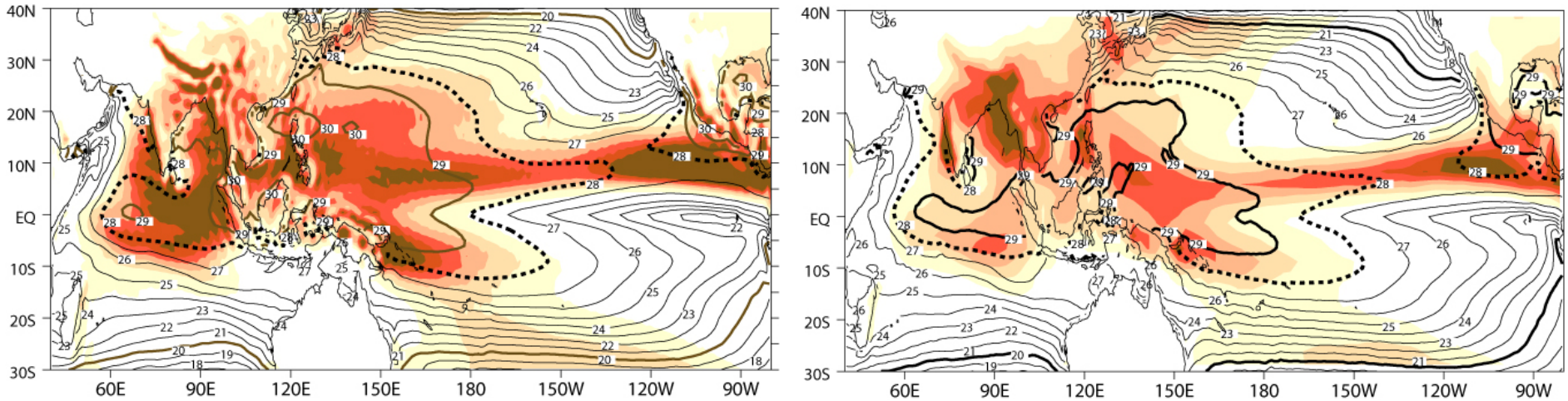


Too much precipitation along SPCZ
Too early monsoon onset – W. Pacific

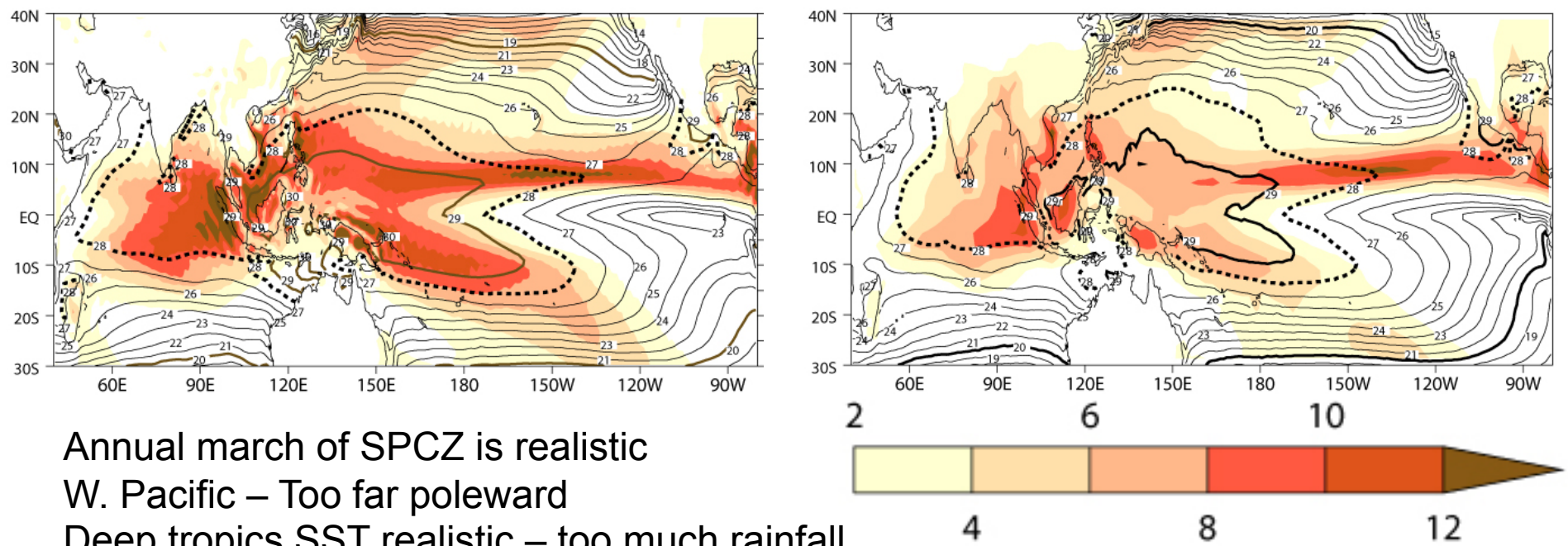


June – August

CFS_v2 Obs

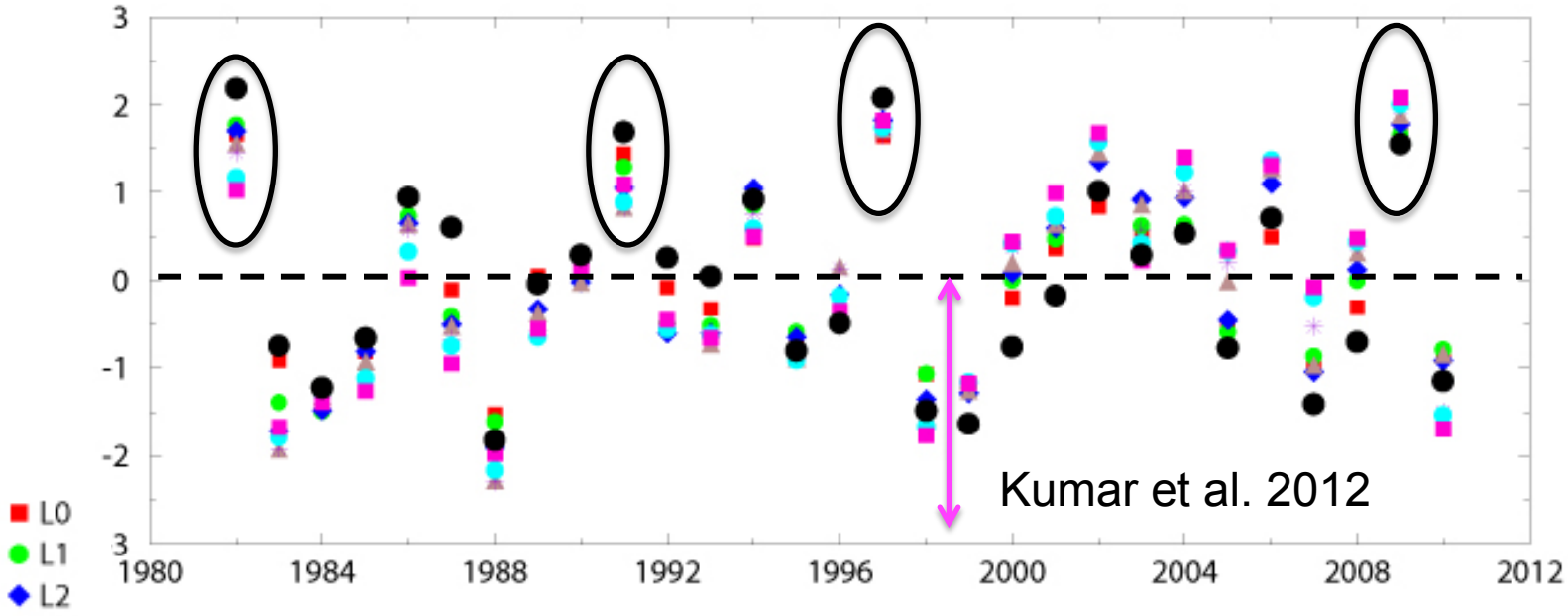


September - November



Annual march of SPCZ is realistic
W. Pacific – Too far poleward
Deep tropics SST realistic – too much rainfall
too high variance

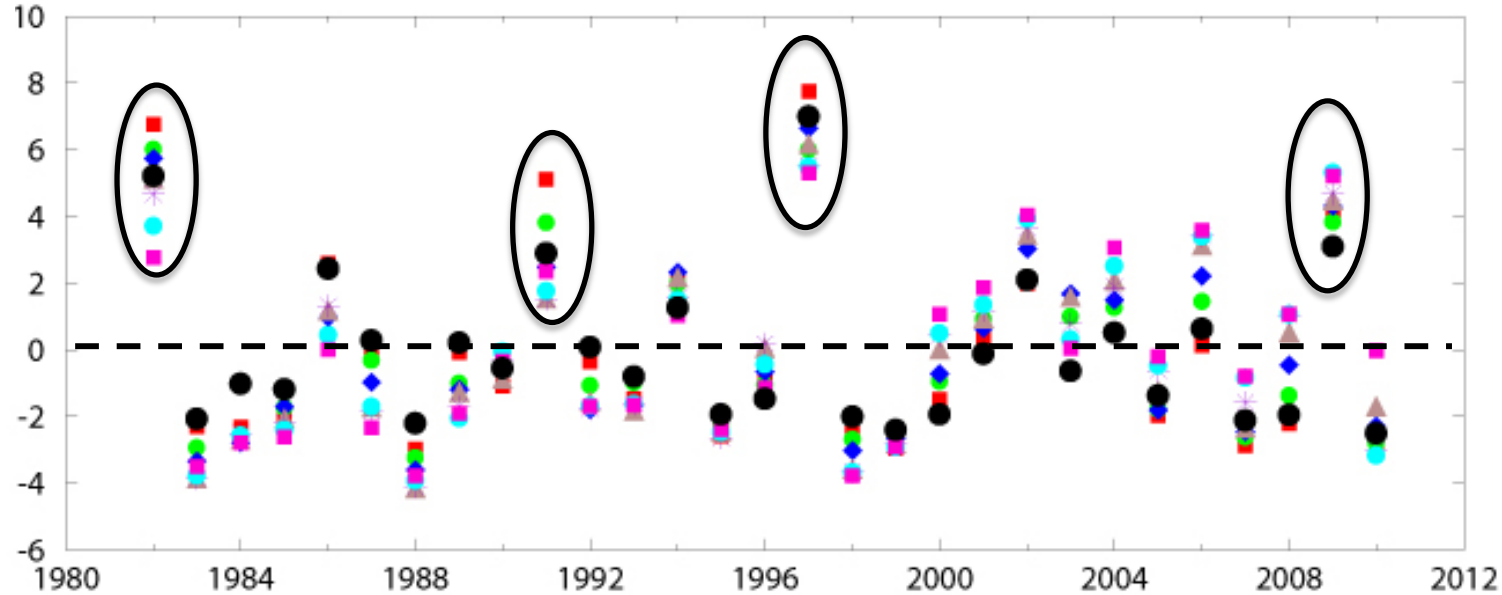
Nino3.4 SST anomalies (December – February)



ACC

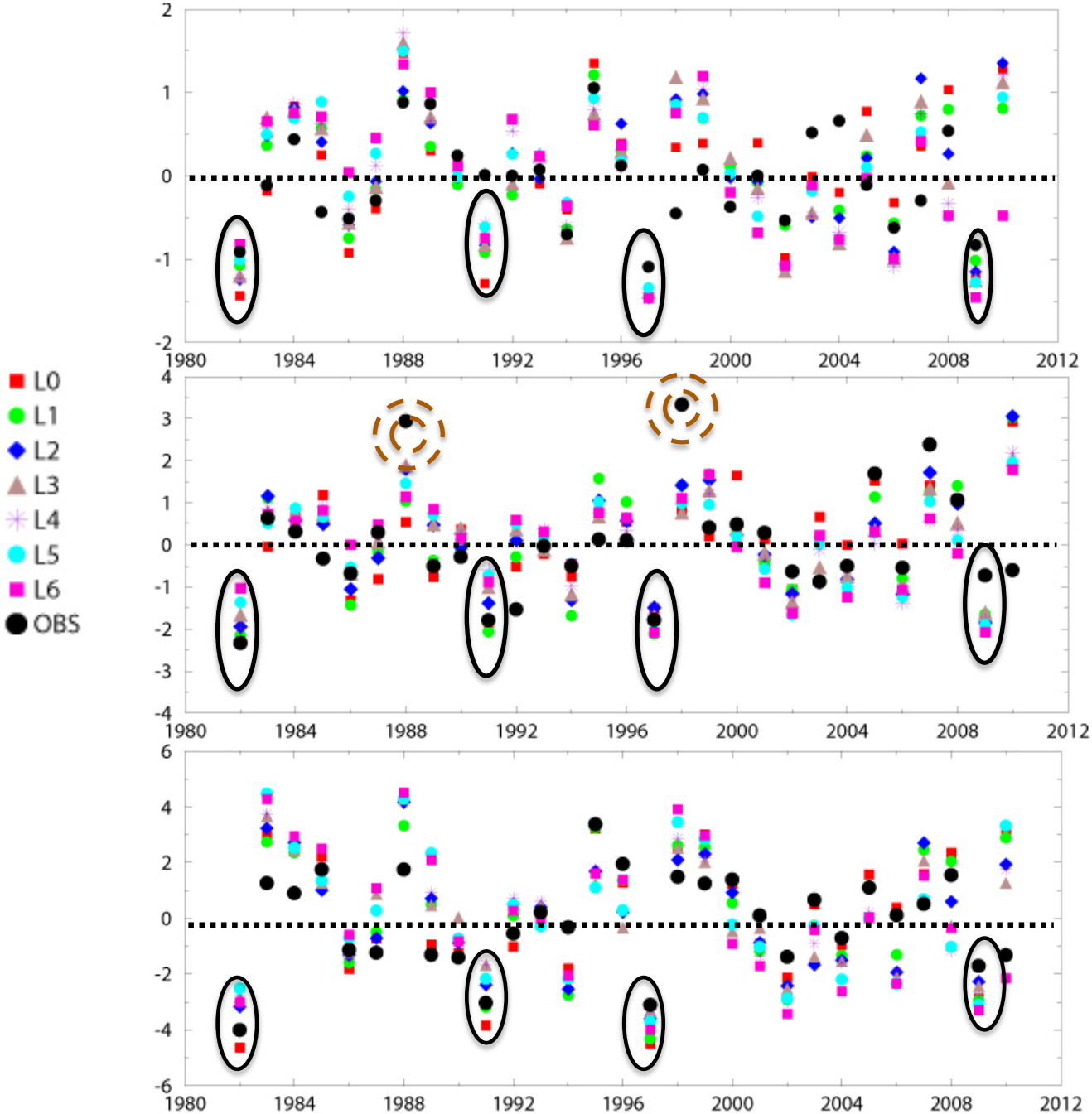
L0 – 0.96
L1 – 0.92
L2 – 0.89
L3 – 0.85
L4 – 0.82
L5 – 0.79
L6 – 0.76

Equatorial Pacific (170 E – 110 W) rainfall anomalies (December – February)



L0 – 0.98
L1 – 0.95
L2 – 0.91
L3 – 0.85
L4 – 0.82
L5 – 0.79
L6 – 0.73

December – February rainfall anomalies hindcast

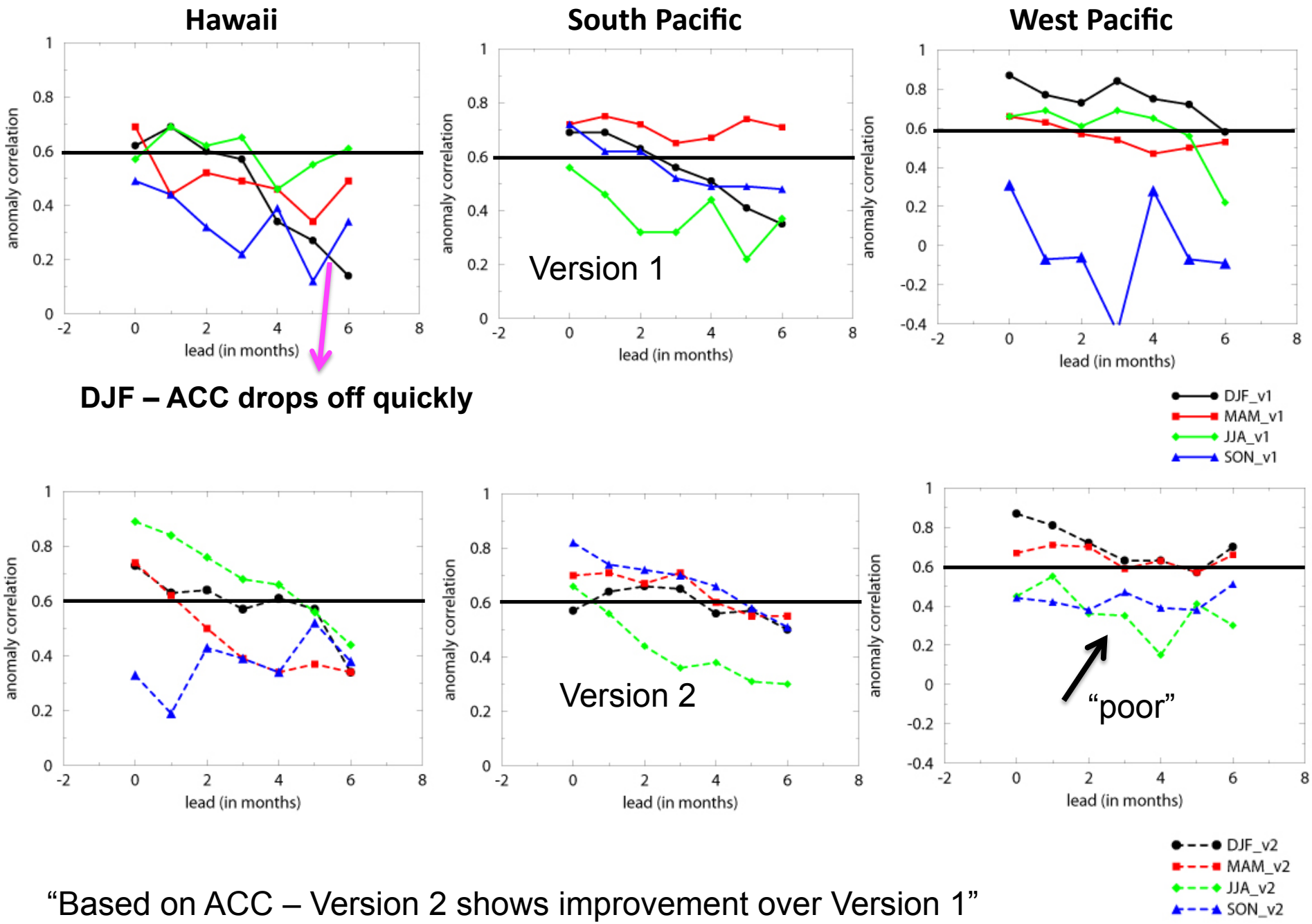


Hawaii

South Pacific

West Pacific

"sign realistic magnitude not"



"Based on ACC – Version 2 shows improvement over Version 1"

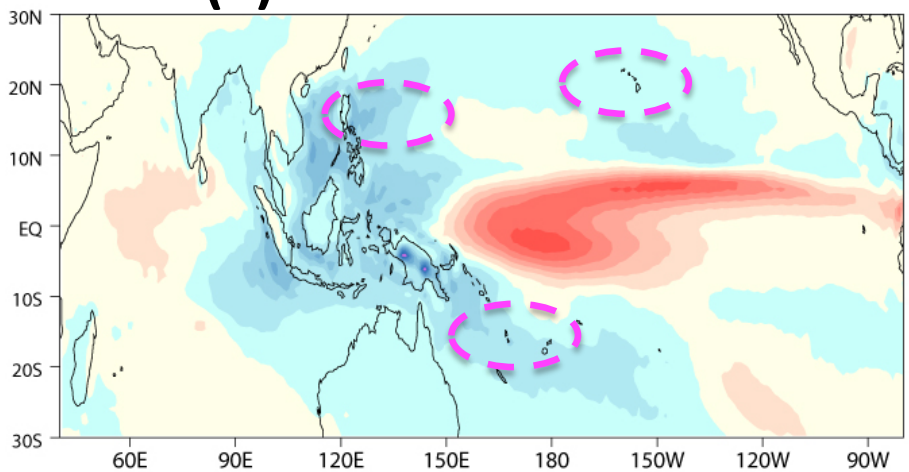
CFS_v2 validation against TRMM

Lead	Hawaii	W. Pacific	S. Pacific
0	0.68	0.94	0.8
1	0.6	0.94	0.85
2	0.6	0.86	0.93
3	0.5	0.82	0.94
4	0.61	0.83	0.82

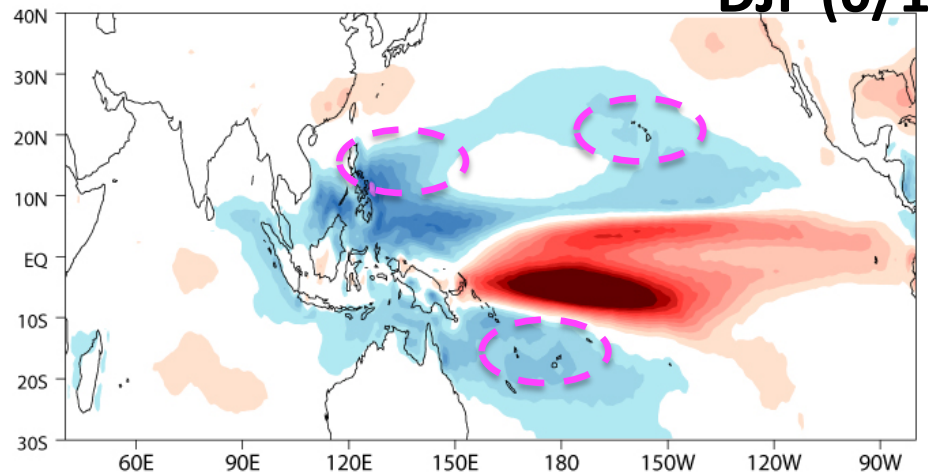
DJF – rainfall anomalies

Persistence of dryness over the USAPI (L0 hindcast)

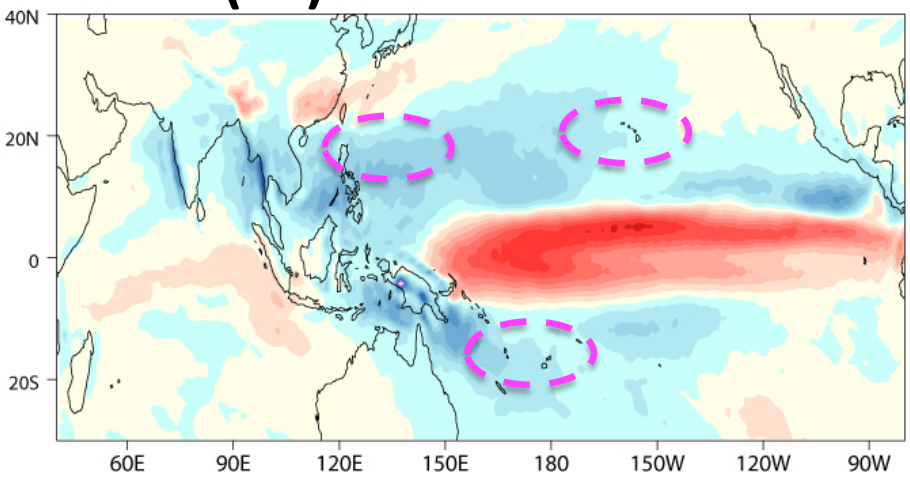
SON (0)

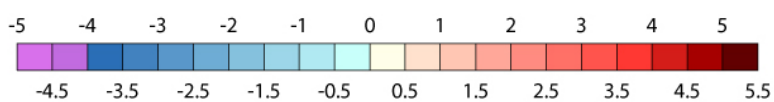


DJF (0/1)



MAM (+1)





How the dryness is maintained –
Large-scale and local feedbacks

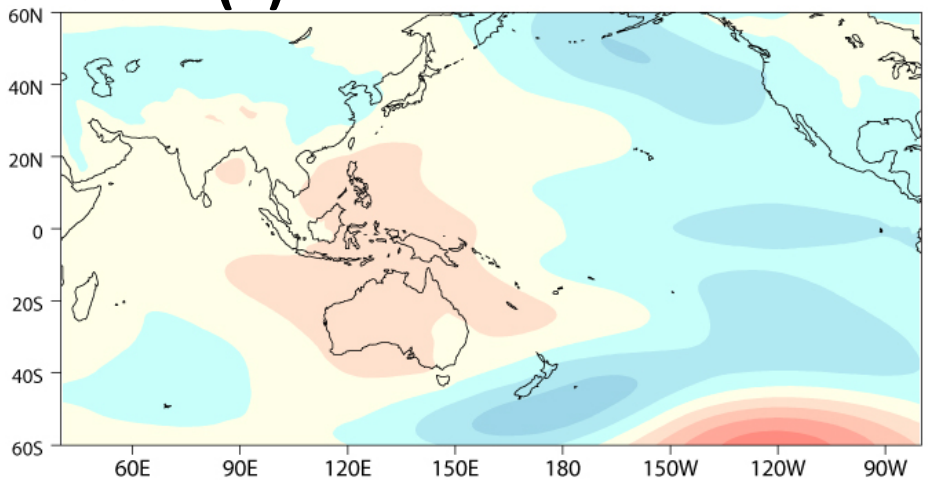
W Pacific (Wang et al. 2000 – local air/sea;
(Annamalai et al. 2005a,b – TIO effect)

Hawaii (Chu et a. 1996 – large-scale descent)

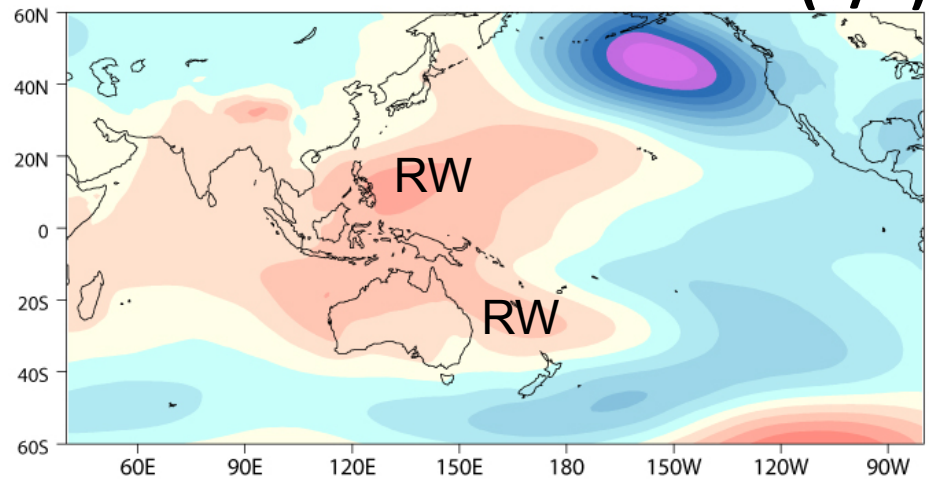
S. Pacific (Su and Neelin 2002;2005 –
reduction in evaporation) – but over
the S. Pacific Islands

SLP anomalies – CFS_v2 (L0)

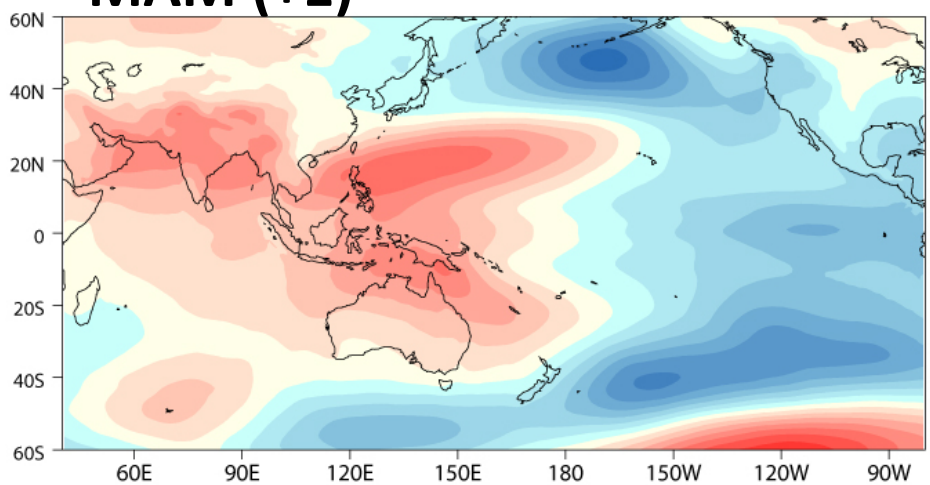
SON (0)

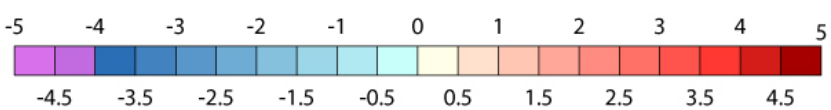


DJF (0/1)



MAM (+1)





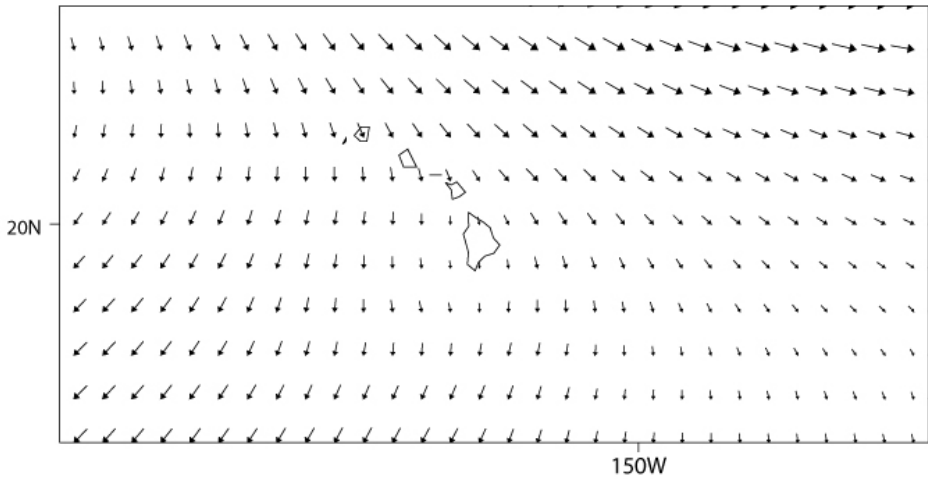
(i) High pressure anomalies over West Pacific forms in SON (0) – RW descent

(ii) TIO SST/SSH – well represented in CFS

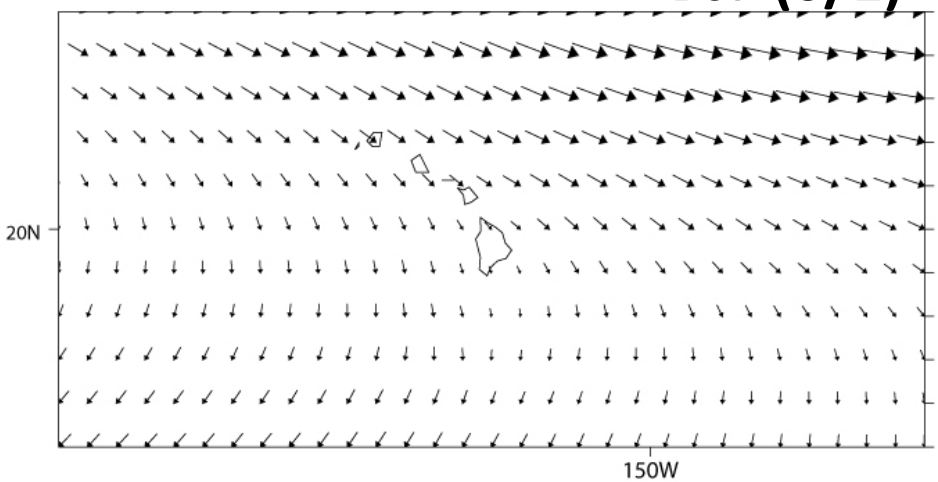
(iii) W. Pacific SST anomalies – realistic in CFS

CFS_v2 (L0) – Hindcast 850 hPa wind anomalies

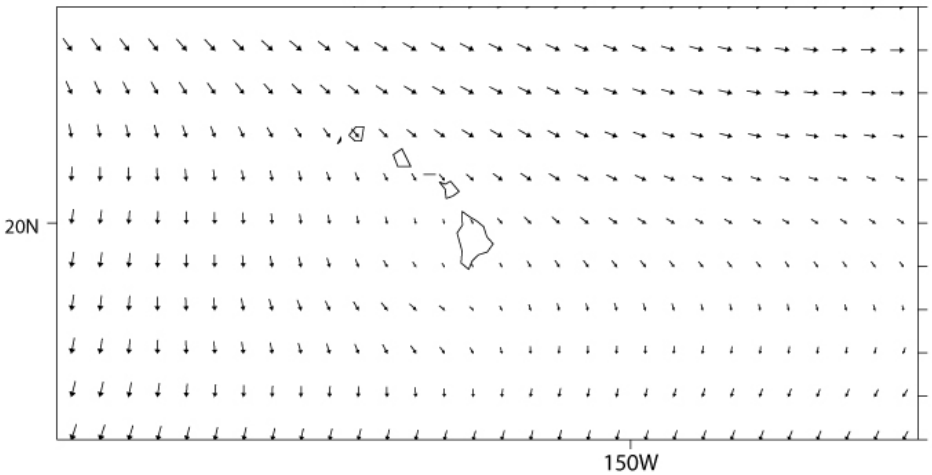
SON (0)



DJF (0/1)



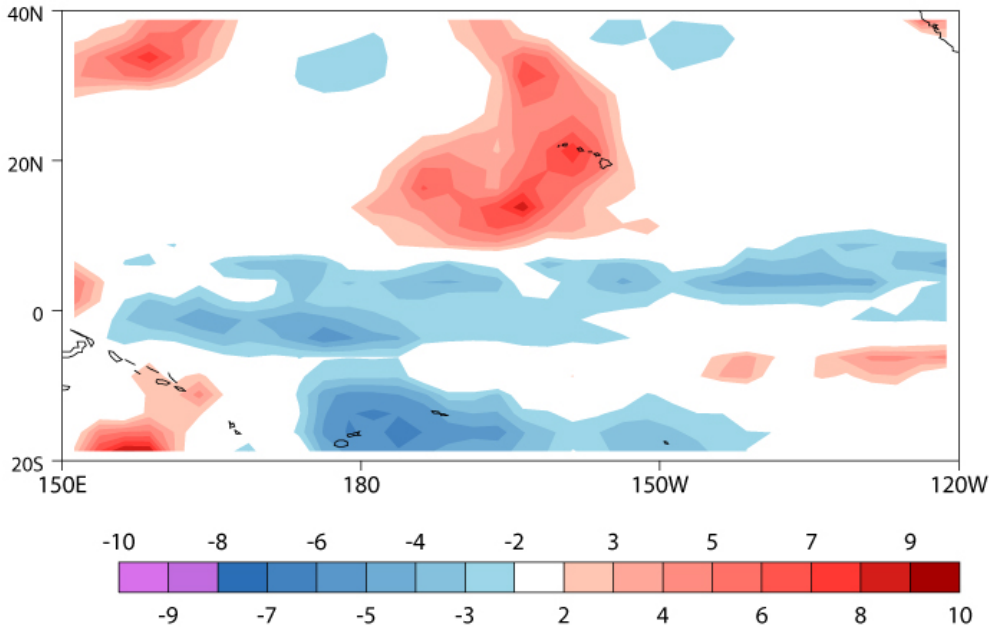
MAM (+1)



Circulation anomalies – realistic

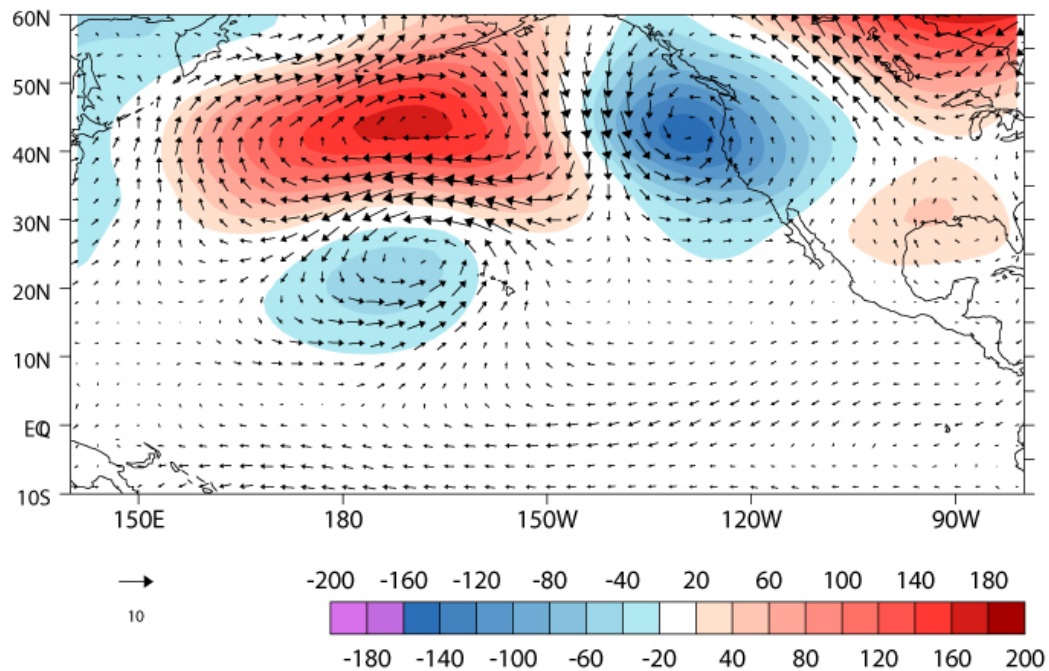
advect low MSE air – reduce rainfall over Hawaii

Observed Rainfall anomalies



March 2006 event

ERA-Interim Z500 / Wind 850hPa



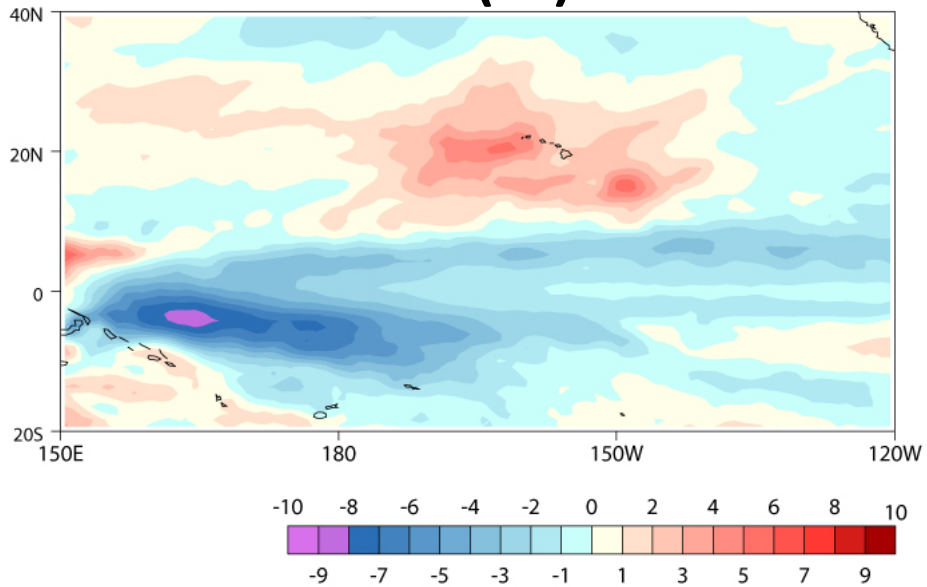
Jeyawardene et al. (2012)

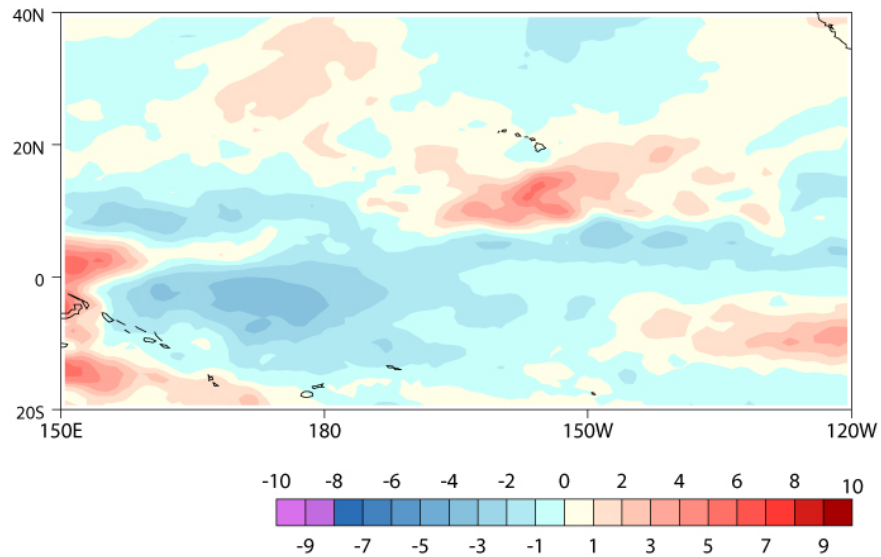
- Three events during 1958-2010

CFS – Feb 2006 (L0)

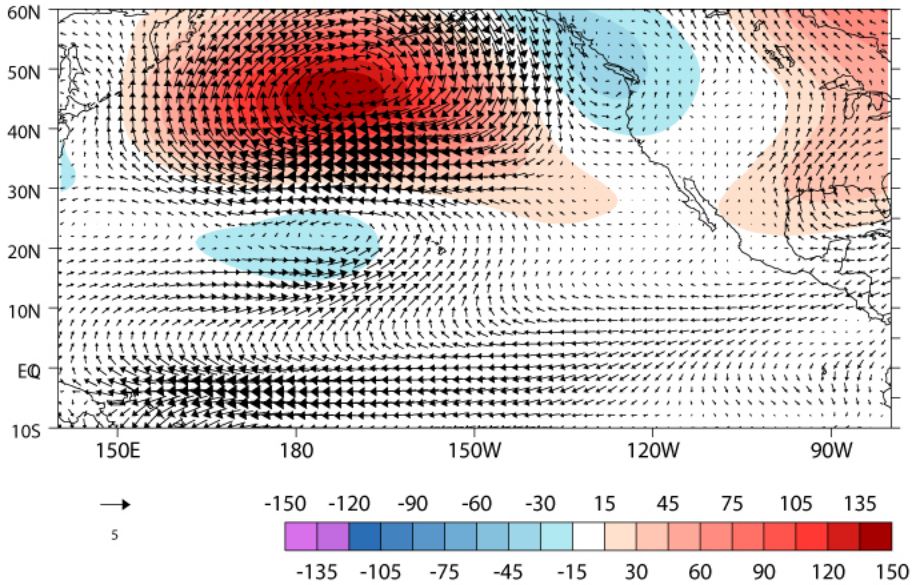
Rainfall anomalies

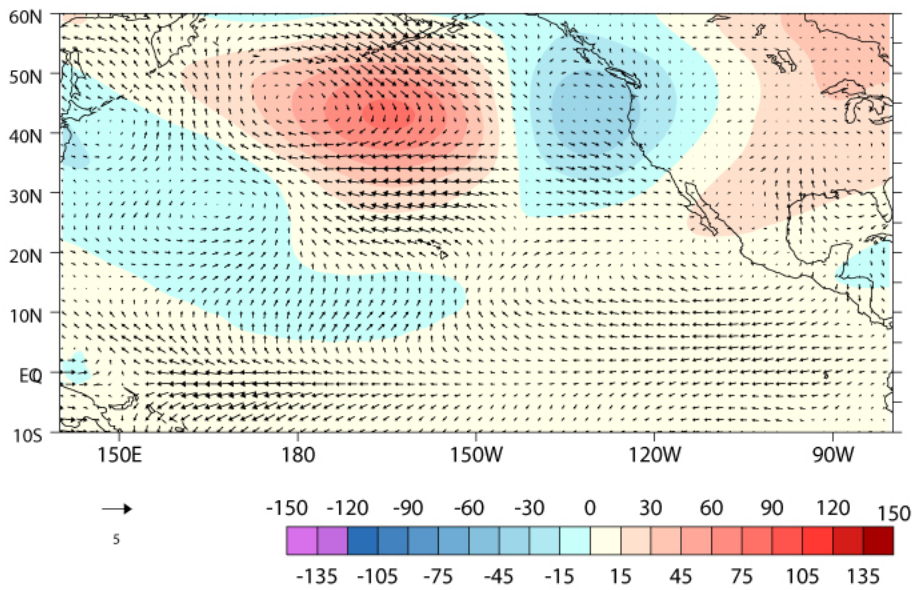
CFS – Mar 2006 (L0)





Z500 / Wind 850hPa





Summary

1. Based on ACC – CFS_v2 shows improvement in rainfall prediction over USAPI

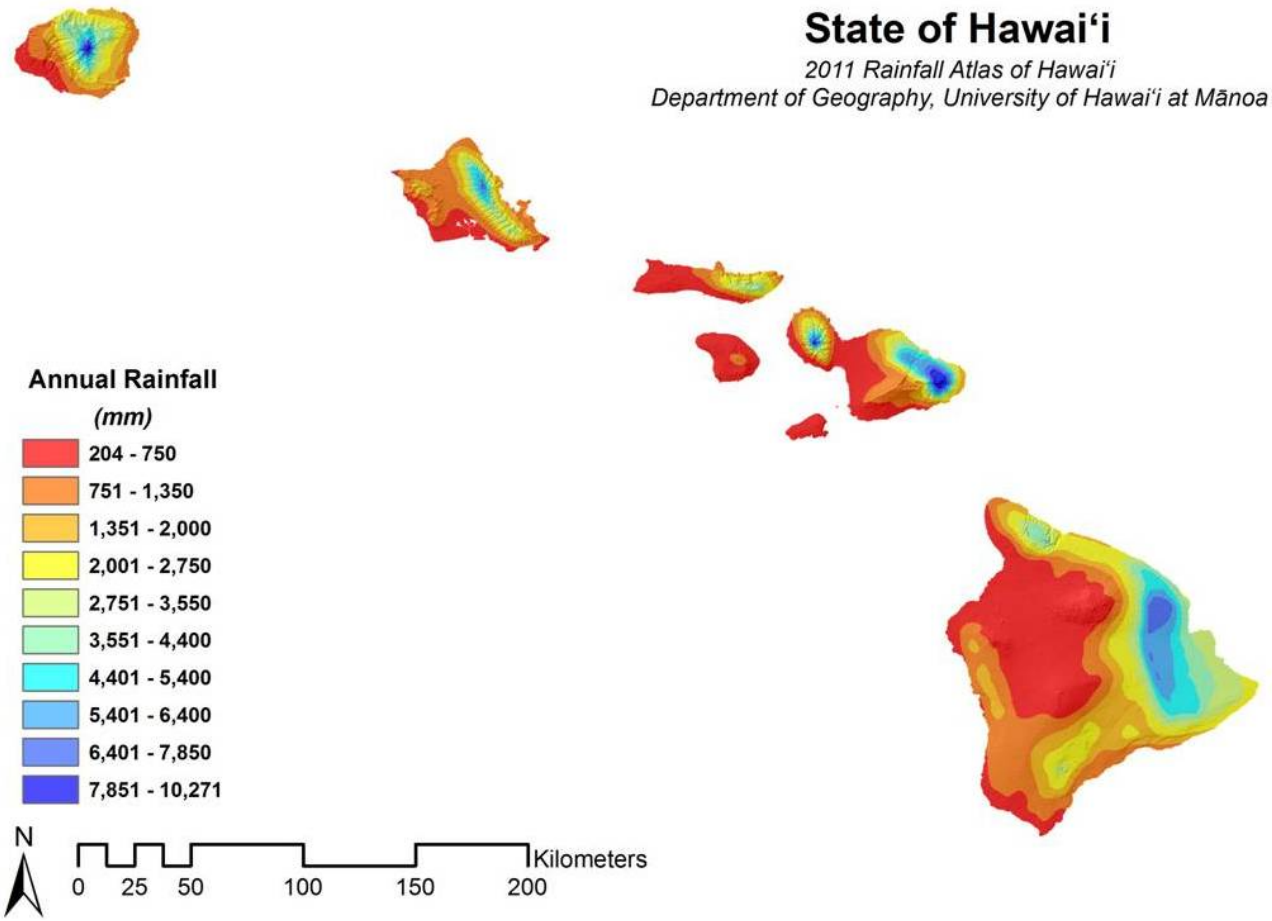
2. Large-scale processes are well represented during ENSO

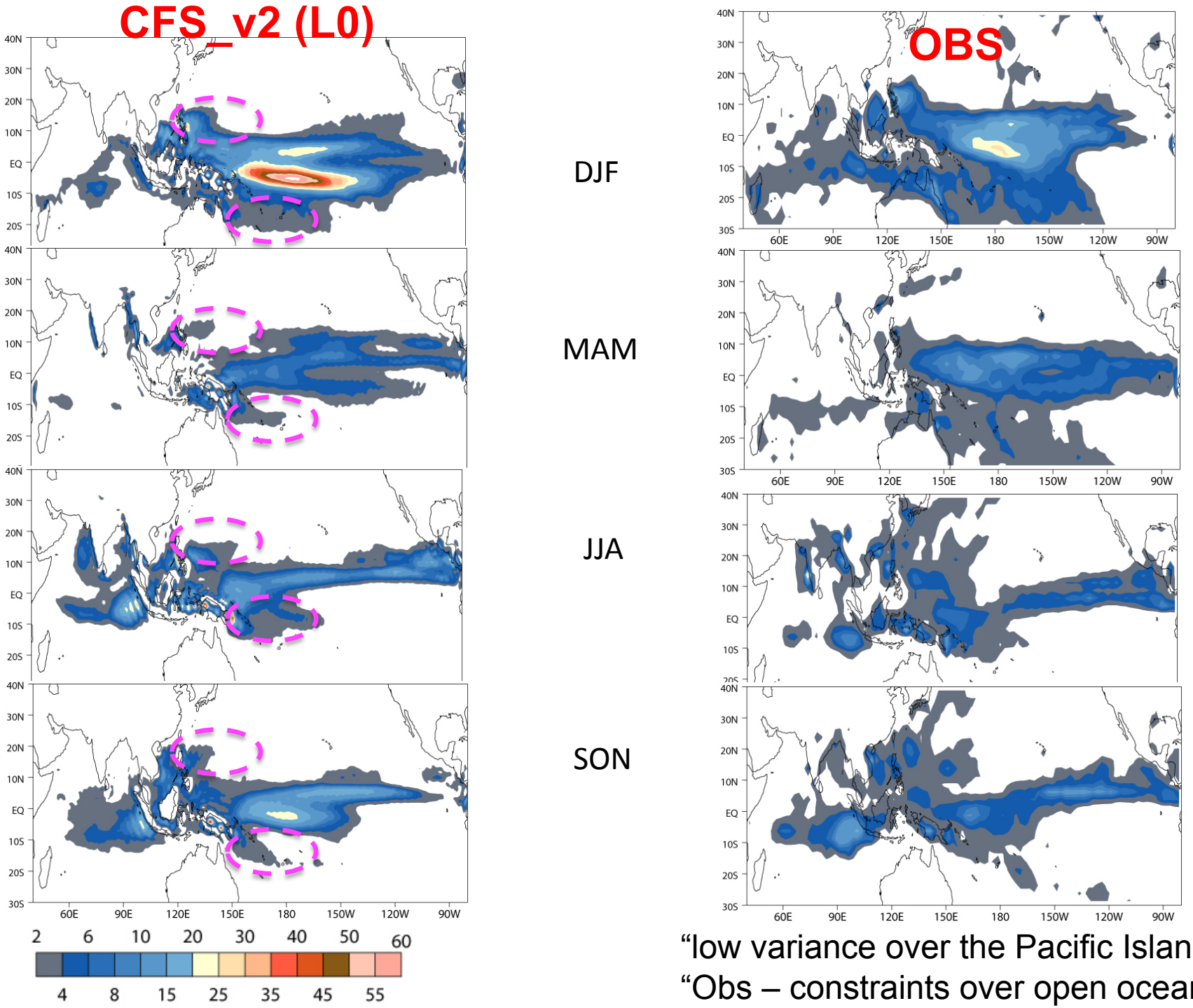
3. Extreme events during Feb-March 2006 – L0-1 months skillful prediction

4. Apply MSE diagnostics – details physical processes identification

Mean Annual Rainfall
State of Hawai‘i

2011 Rainfall Atlas of Hawai‘i
Department of Geography, University of Hawai‘i at Mānoa

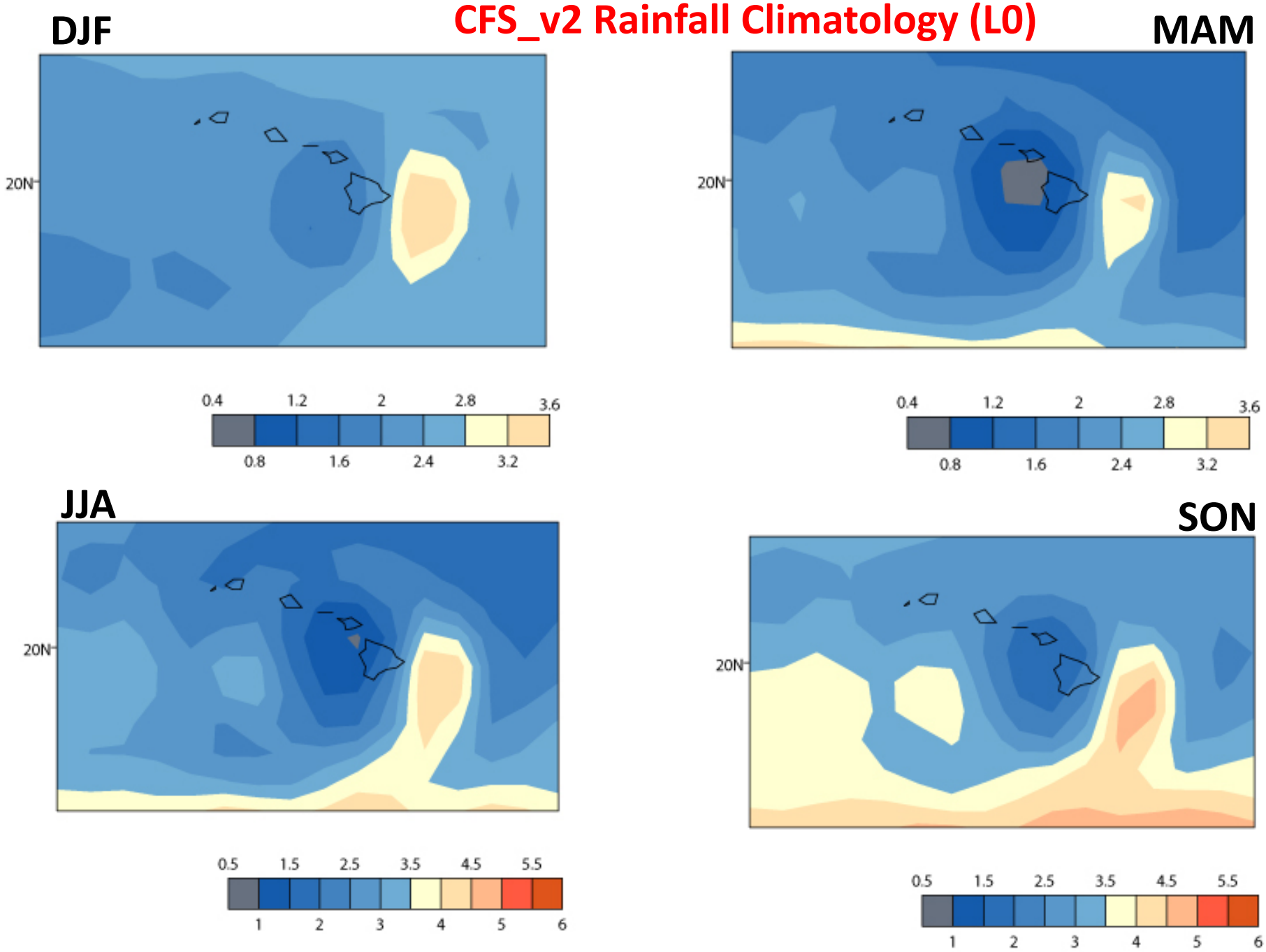




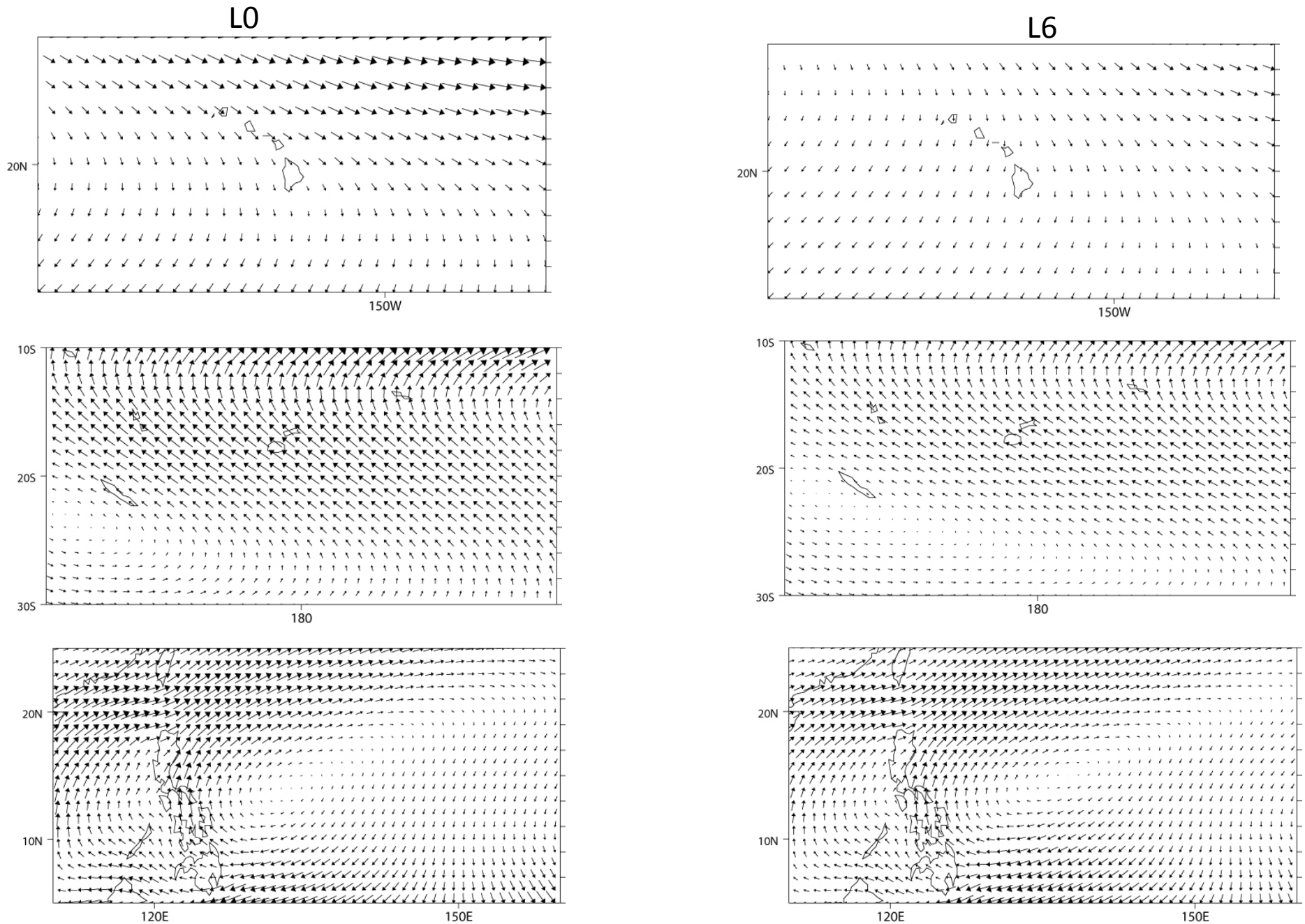
"low variance over the Pacific Islands"

"Obs – constraints over open oceans"

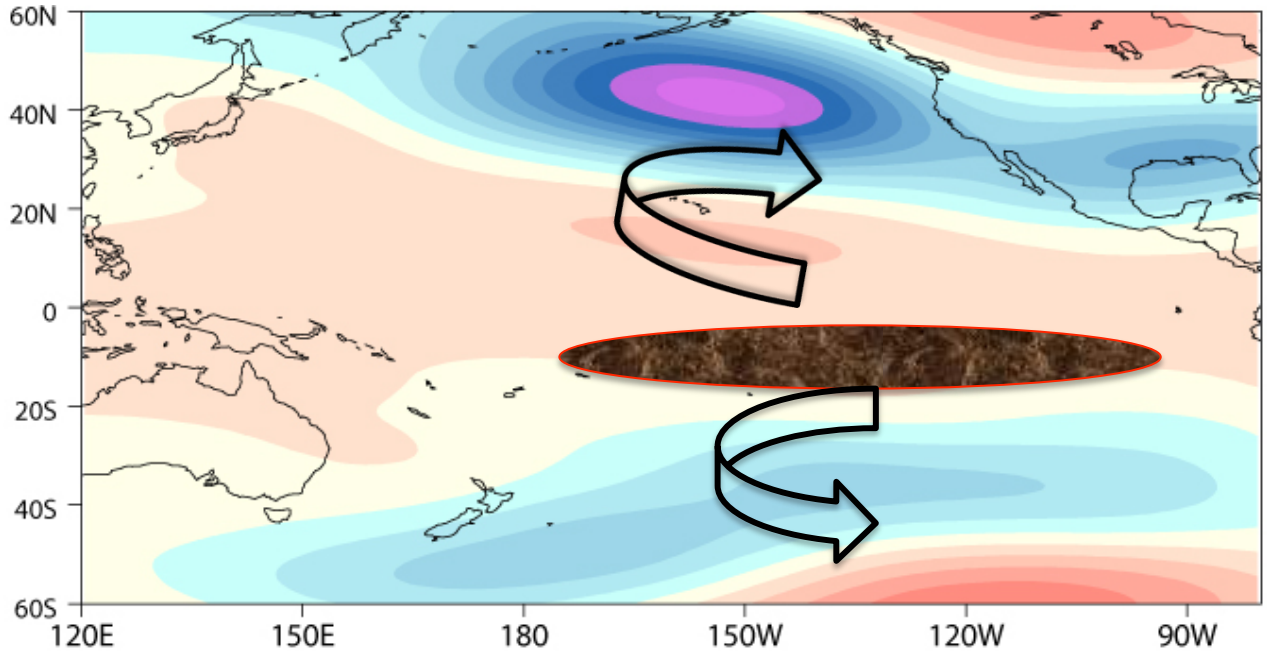
CFS_v2 Rainfall Climatology (L0)



850 hPa wind anomalies El Nino (DJF) composite

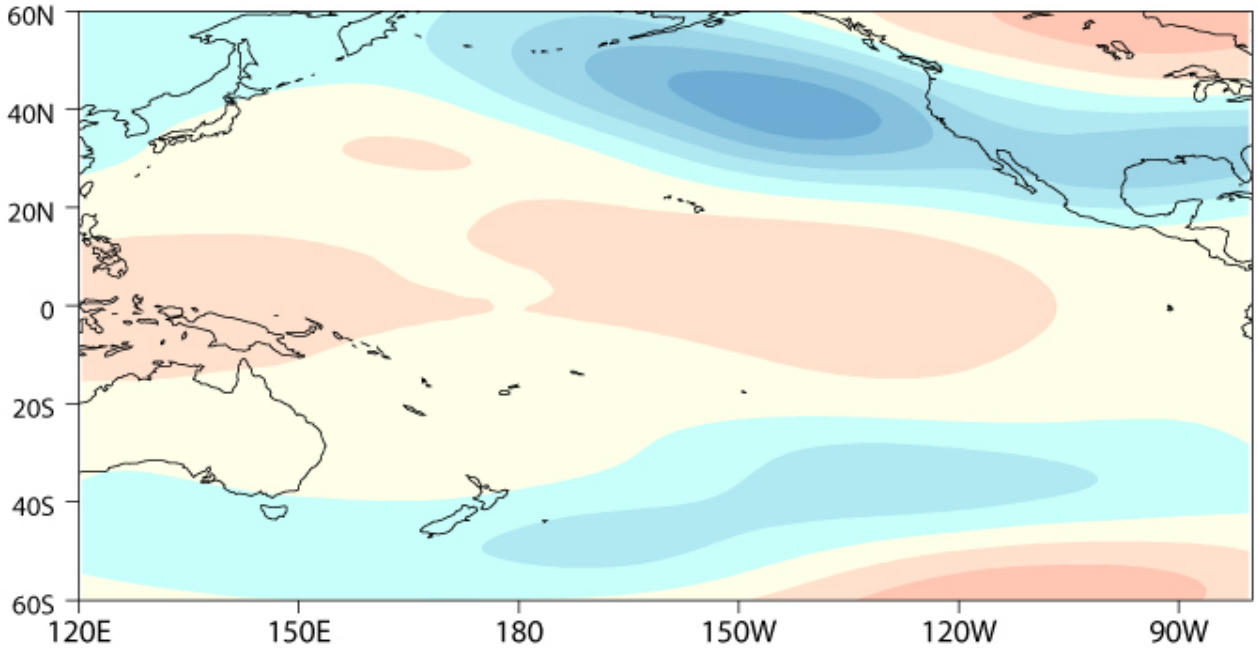


CFS_v2 (L0)



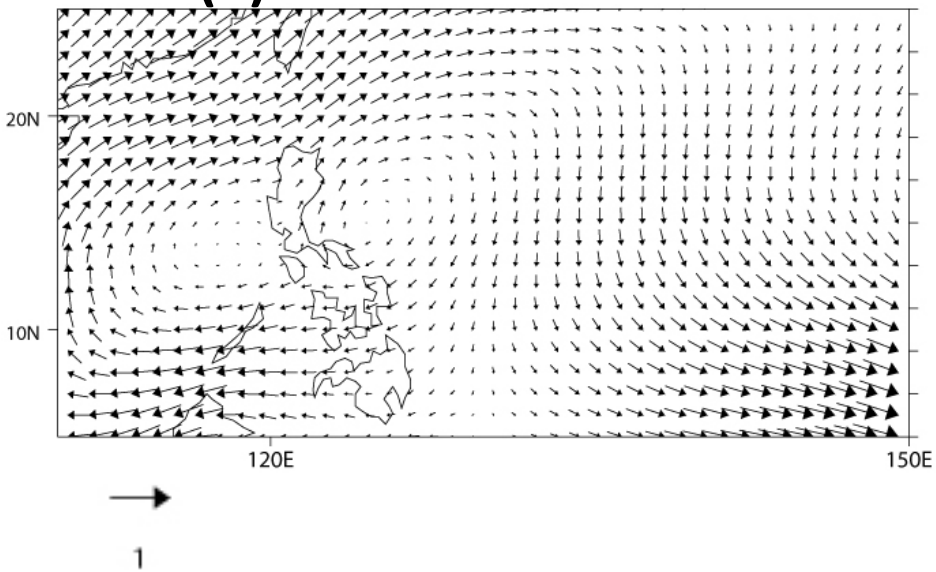
Z500 El Nino (DJF)

CFS_v2 (L6)

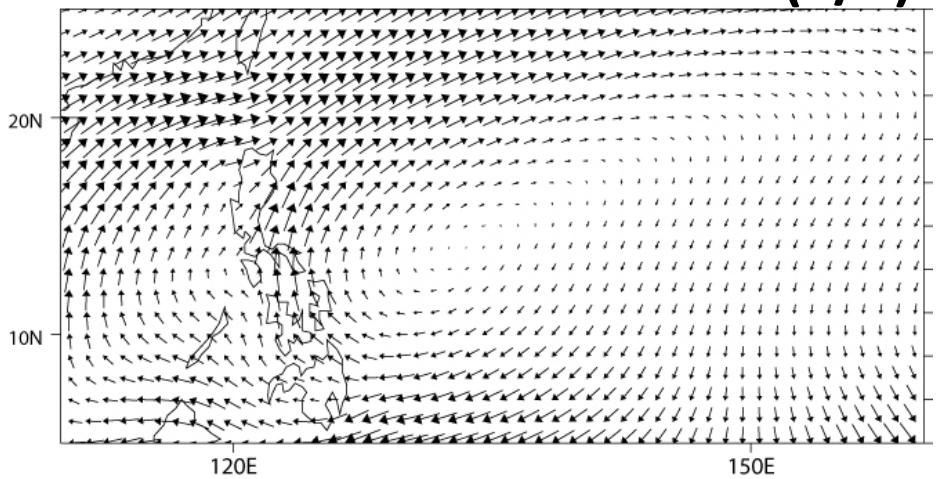


CFS_v2 (L0) – Hindcast 850 hPa wind anomalies

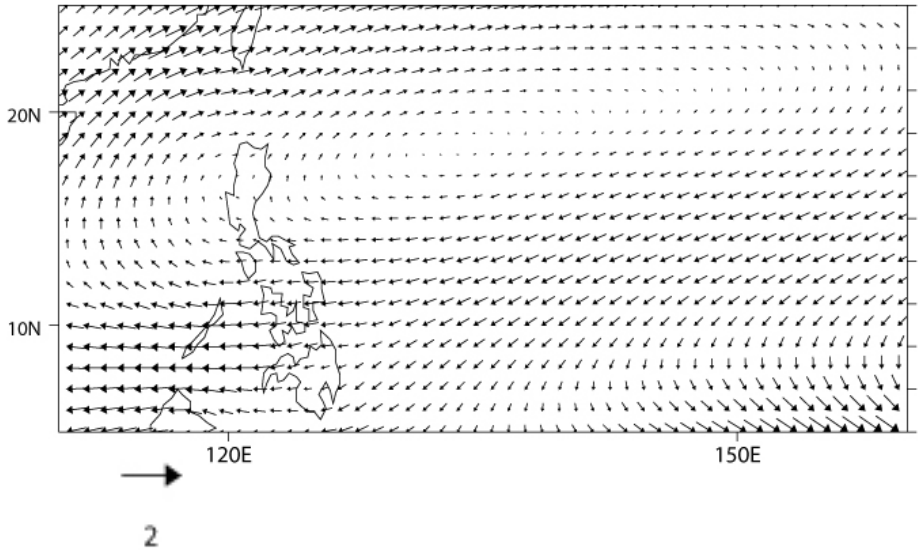
SON (0)



DJF (0/1)

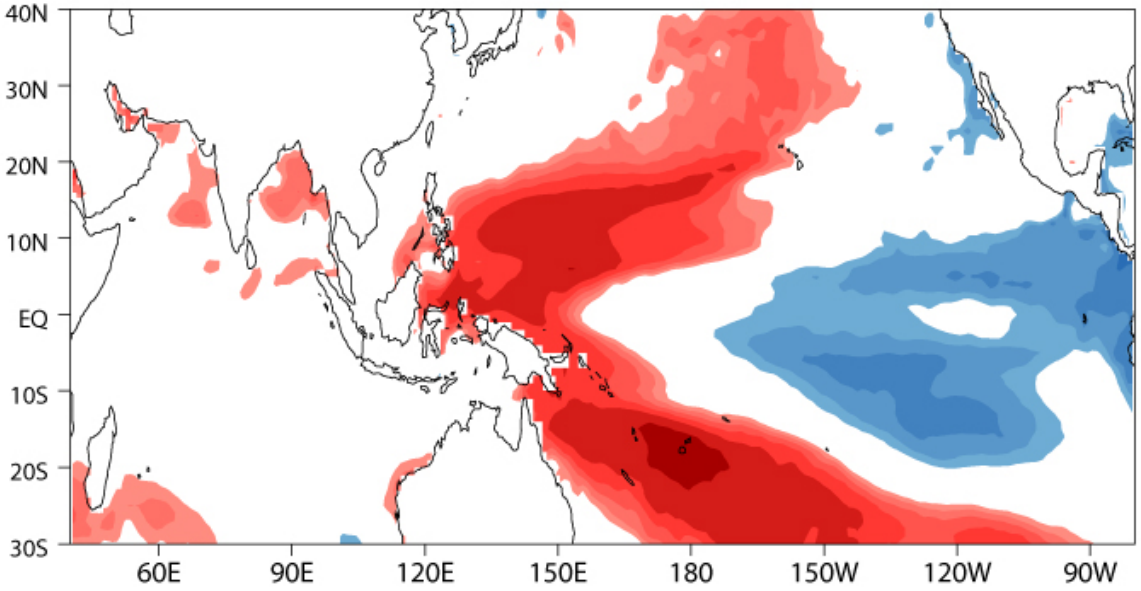


MAM (+1)



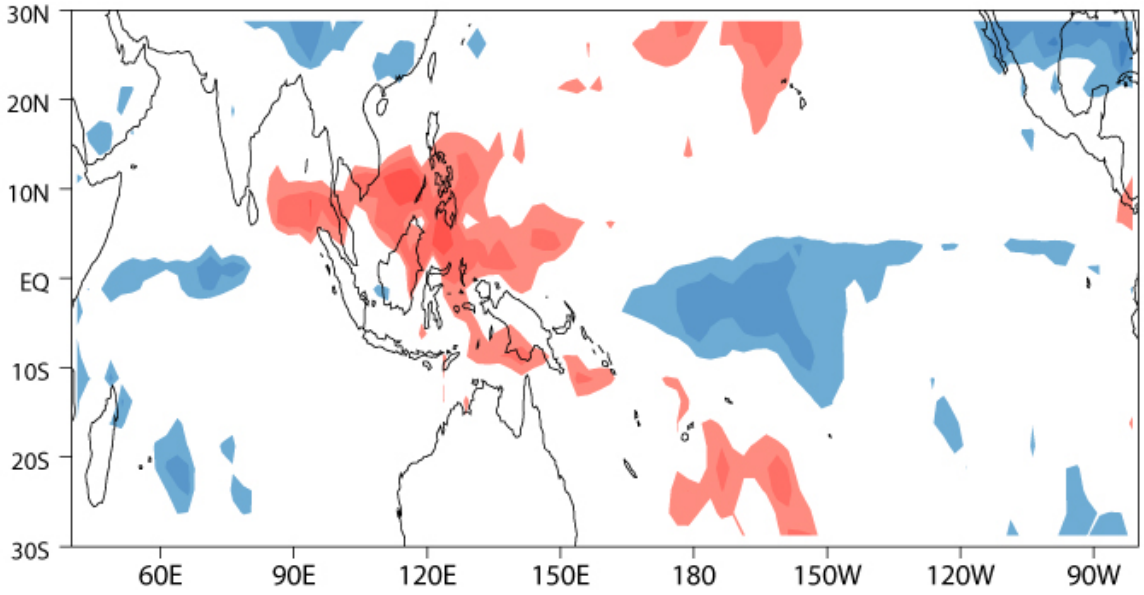
A/C – Rossby wave – realistic

advect low MSE air -

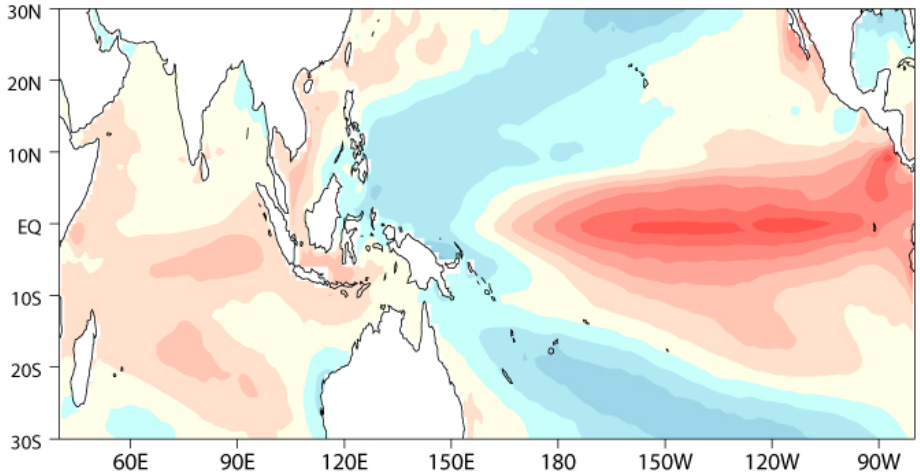


DJF rainfall over S. Pacific
L0

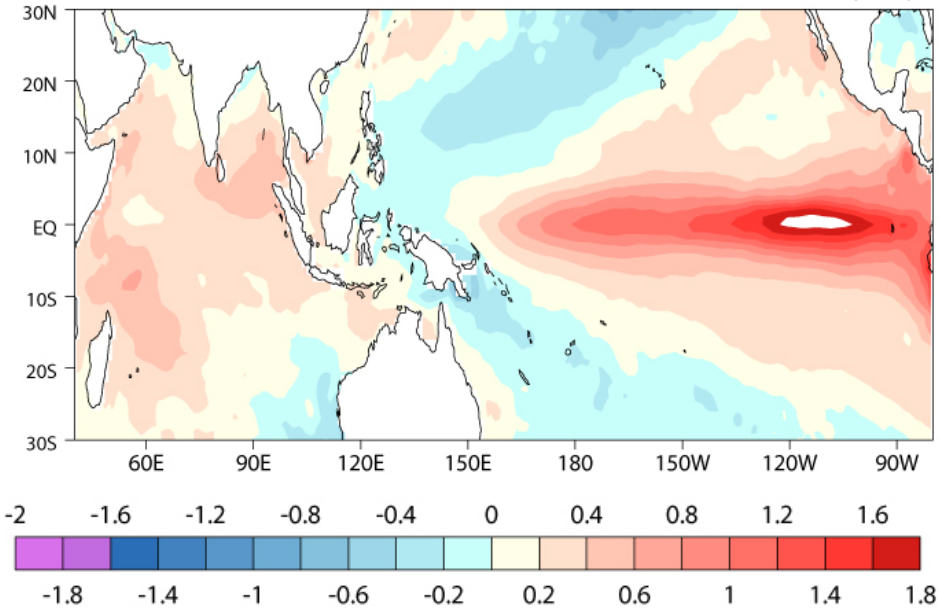
Obs



SST - DJF (L0)

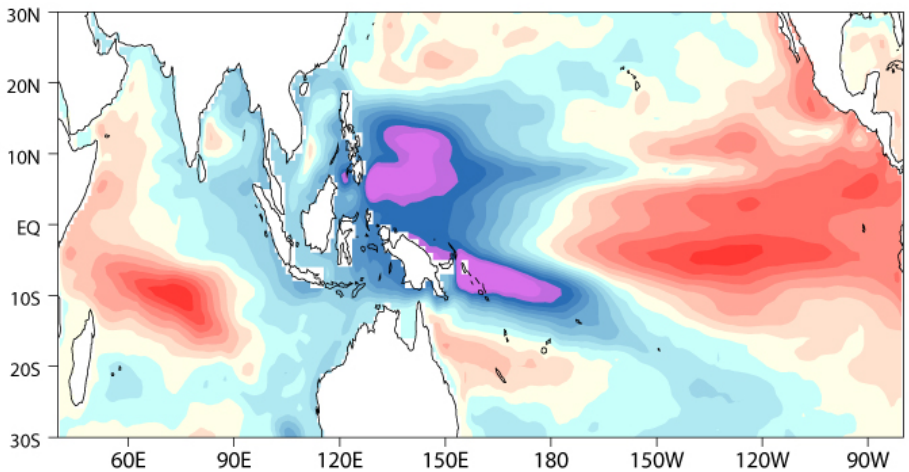


SST - MAM (L0)

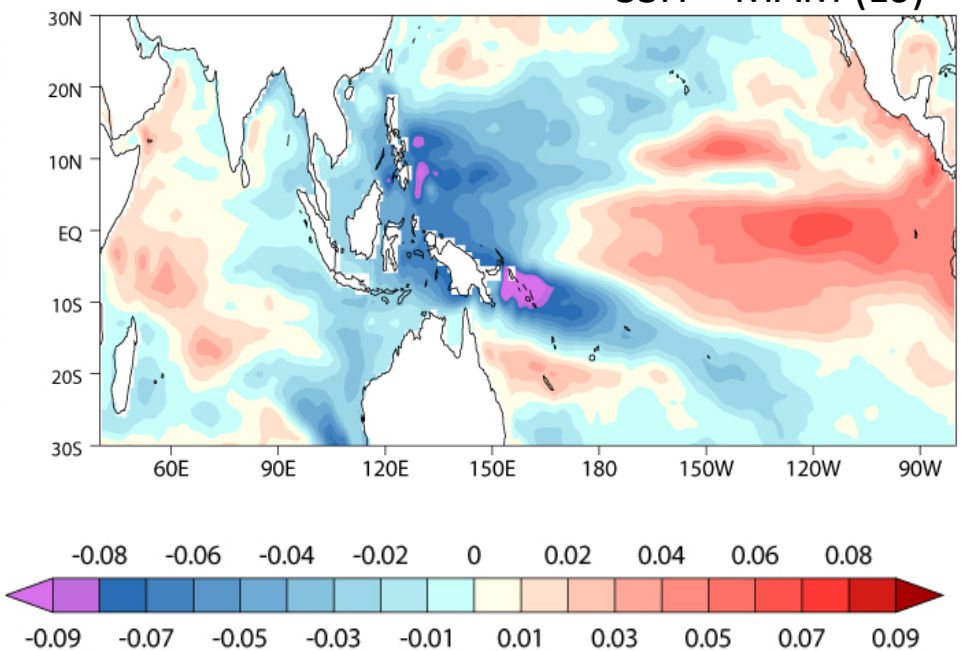


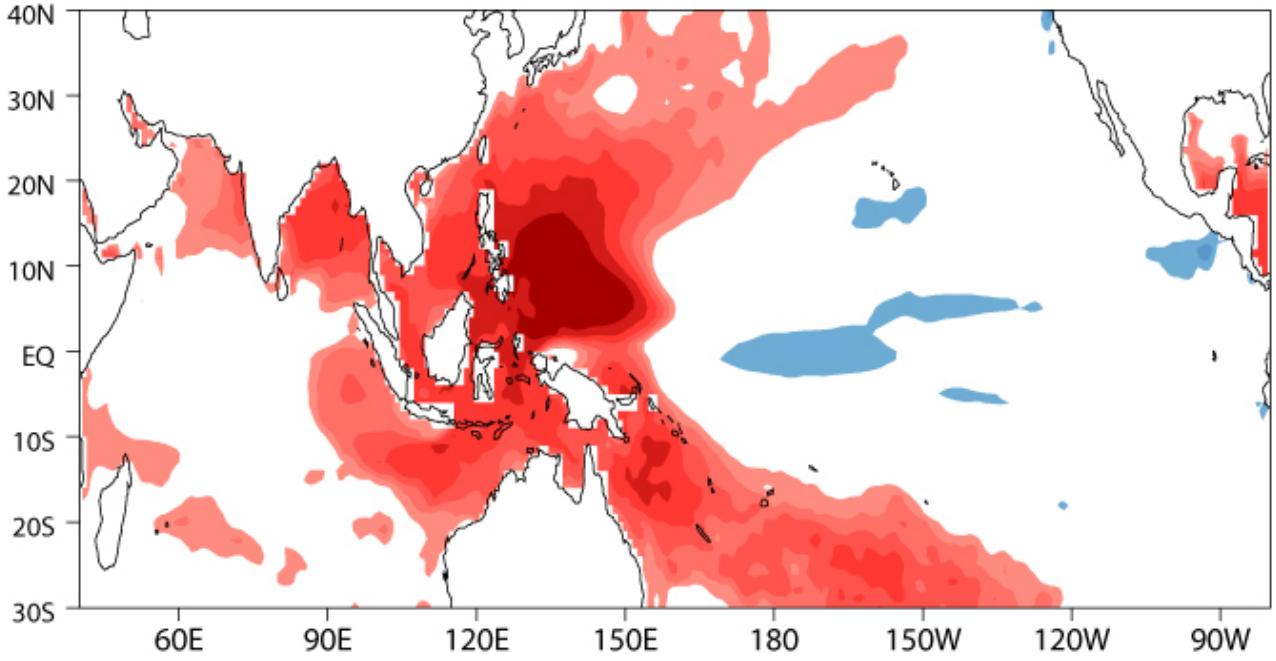
SSH – DJF (L0)

“thermocline”

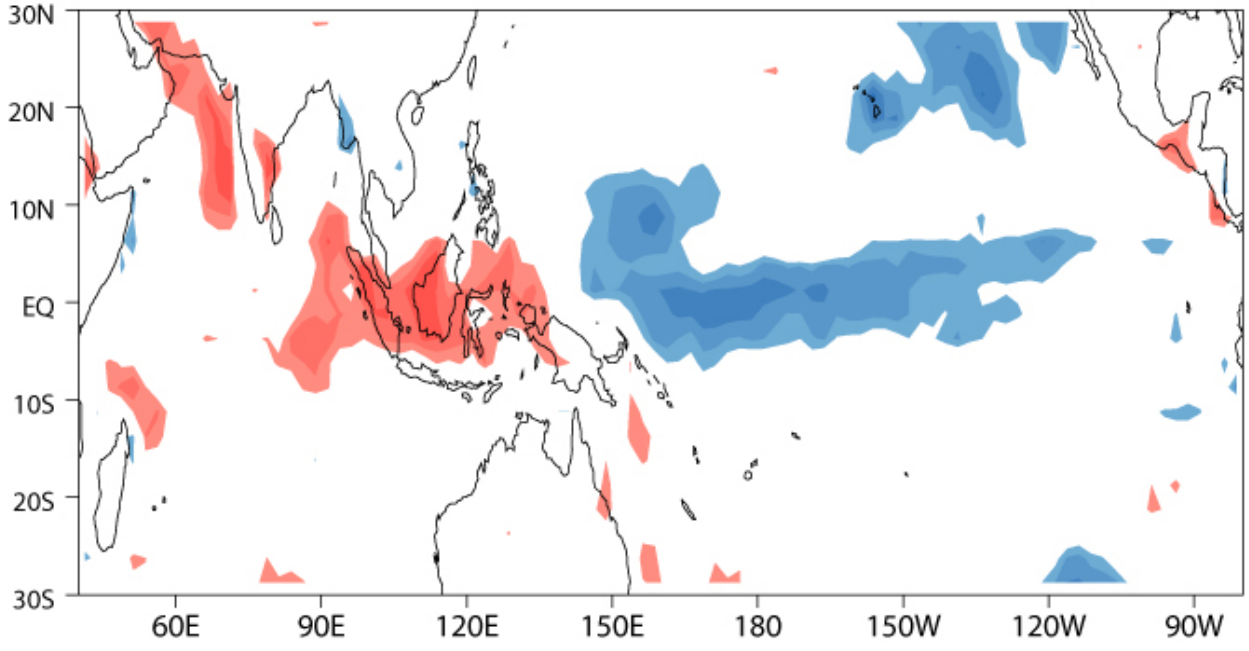


SSH – MAM (L0)





JJA rainfall anomalies

W. Pacific (L0)

Obs