



Western Pacific Meteorology from a CONTRAST perspective

Jim Bresch

NCAR/MMM

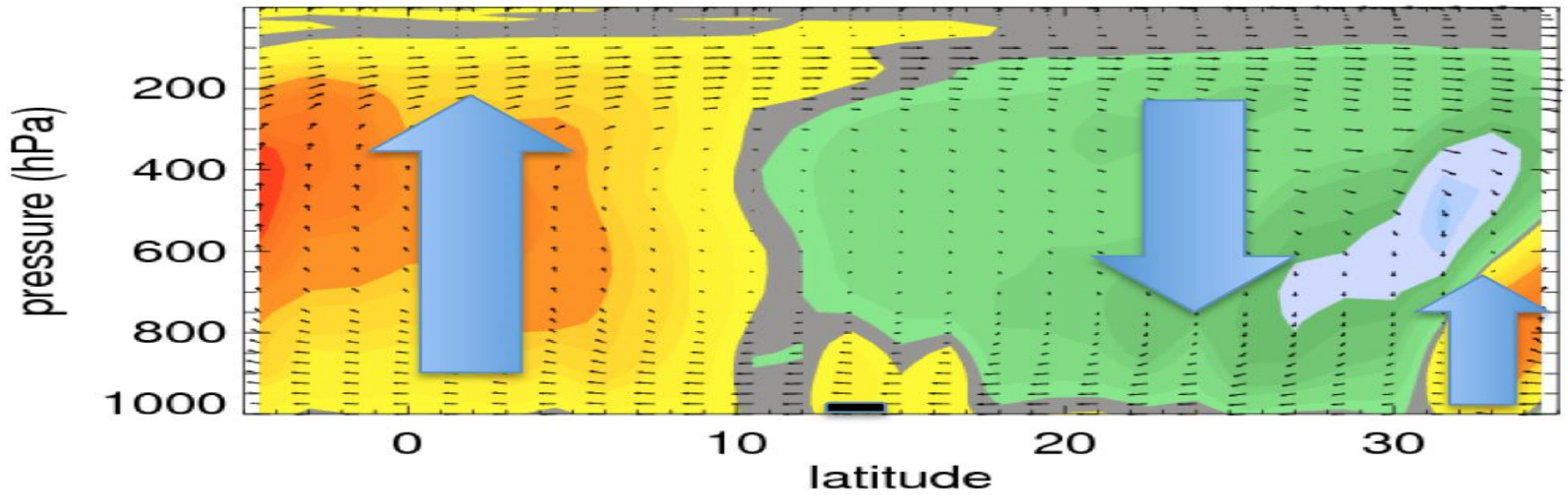
20 October 2014

with contributions from Chuntao Liu and Shawn Honomichl

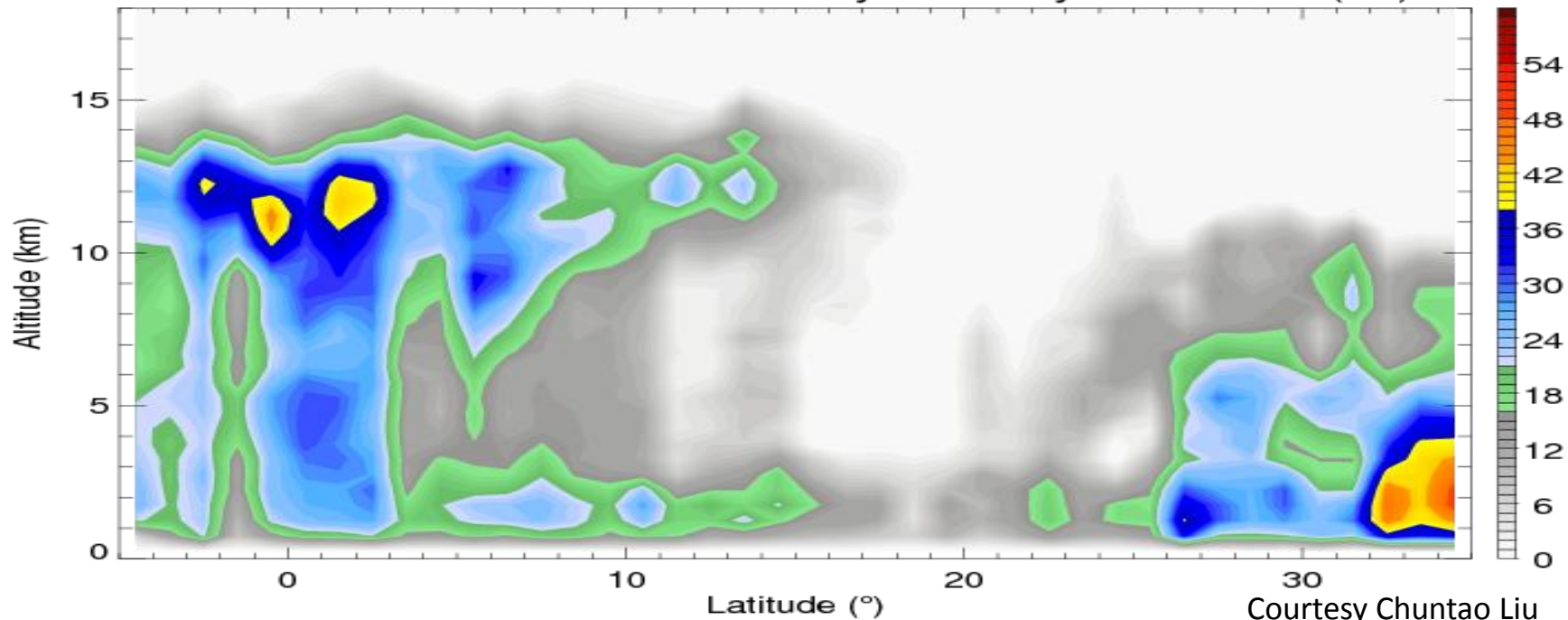
Summary of notable tropospheric features during CONTRAST

- Frequent occurrence or passage of cold fronts/shear lines.
- Above normal rainfall.
- Two distinct MJO episodes.
- One typhoon and two tropical storms.
- Dry air intrusions into low latitudes.
- Low-level boundaries in low latitudes (remnant shear lines, ITCZ, near-equatorial trough).

Mean ERA interim ω in January-February

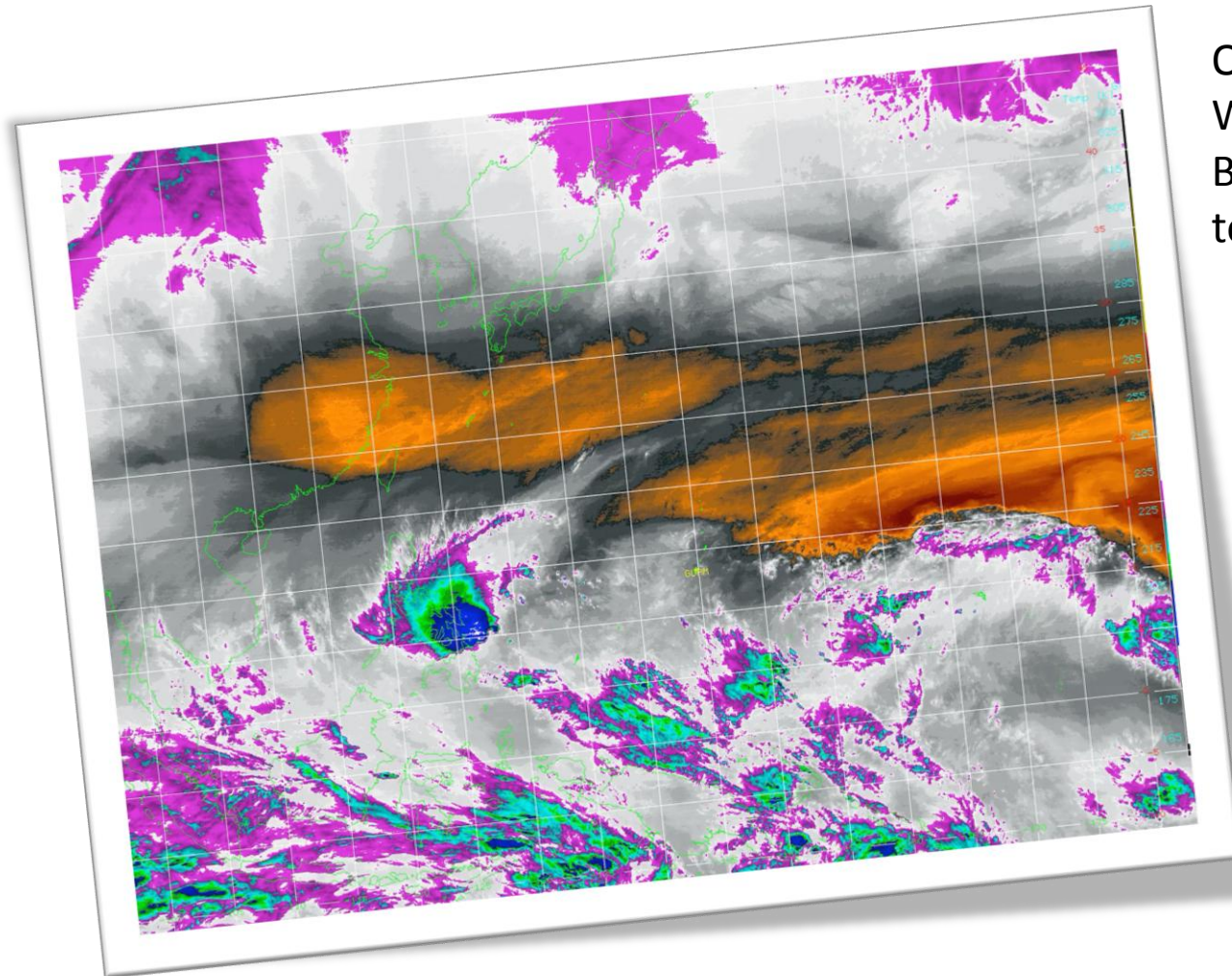


CloudSat cloud fraction in January-February at 144.5°W (%)



Courtesy Chuntao Liu

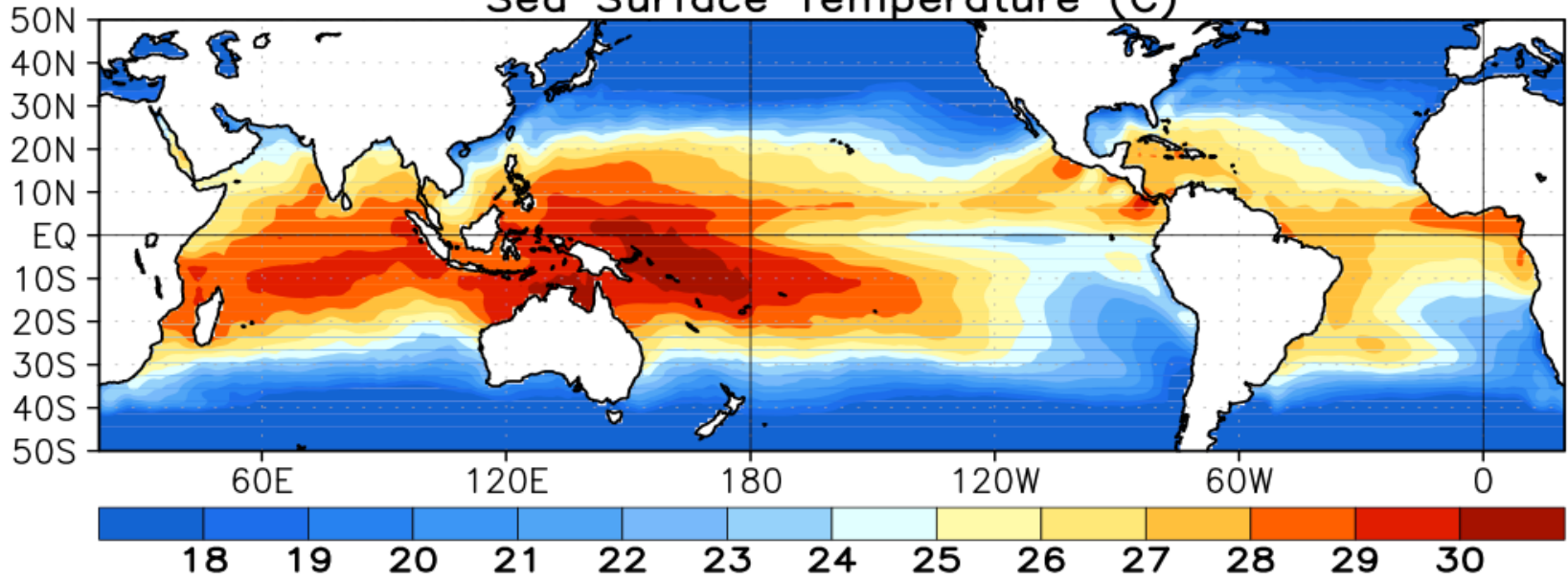
CONTRAST water vapor image loop



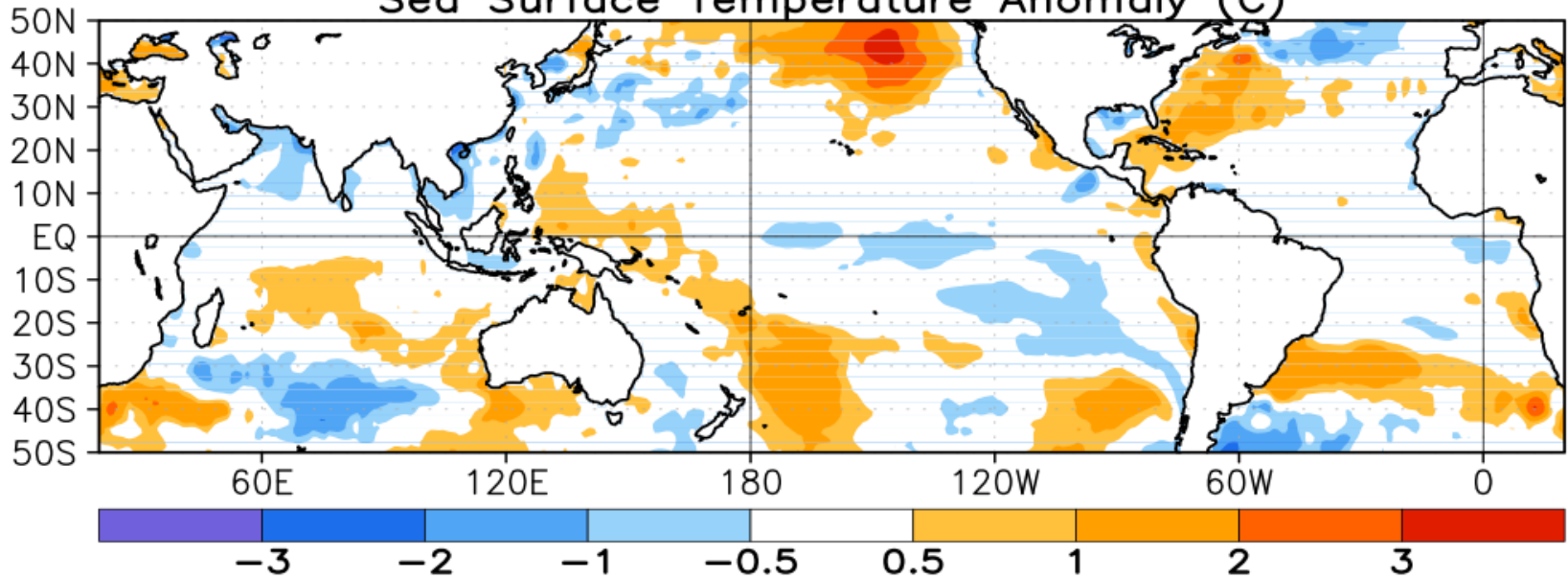
Orange: dry
White: moist
Blue: cold cloud
top

January 2014

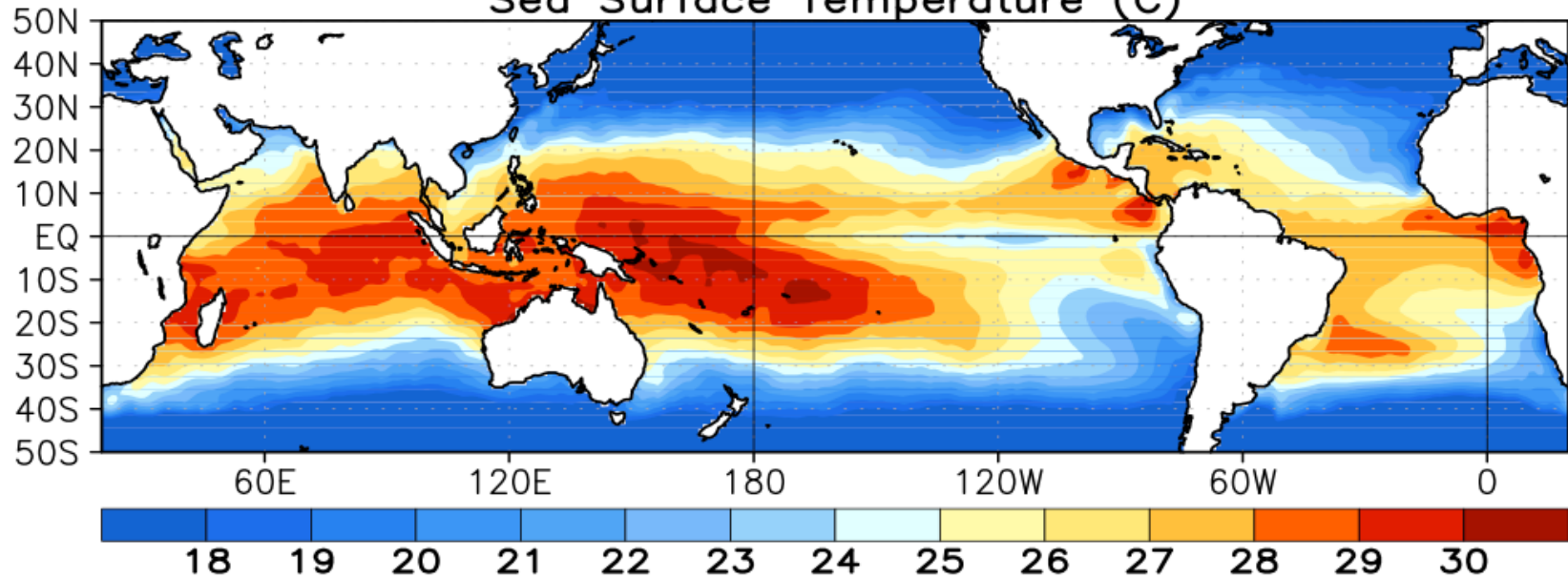
Sea Surface Temperature (C)



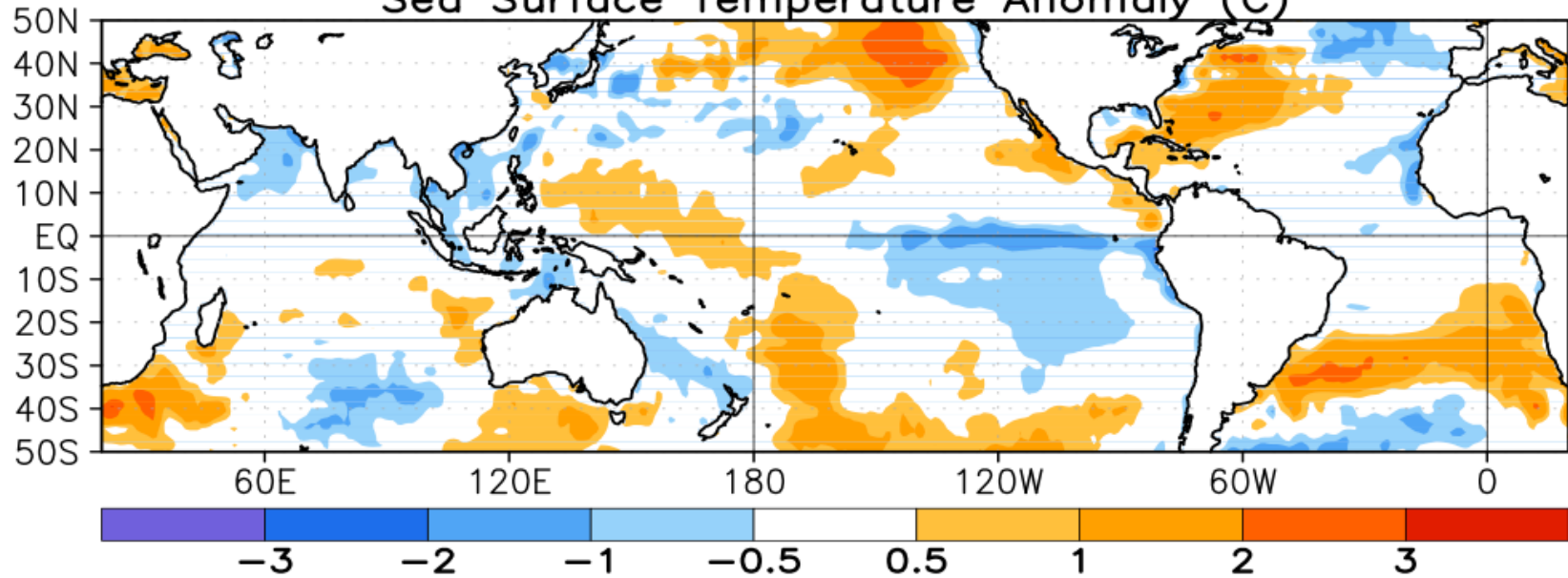
Sea Surface Temperature Anomaly (C)



February 2014
Sea Surface Temperature (C)



Sea Surface Temperature Anomaly (C)



NCEP GFS 0.5 degree

NCAR/MMM

Init: 00 UTC Sun 12 Jan 14

Fcst: 0 h

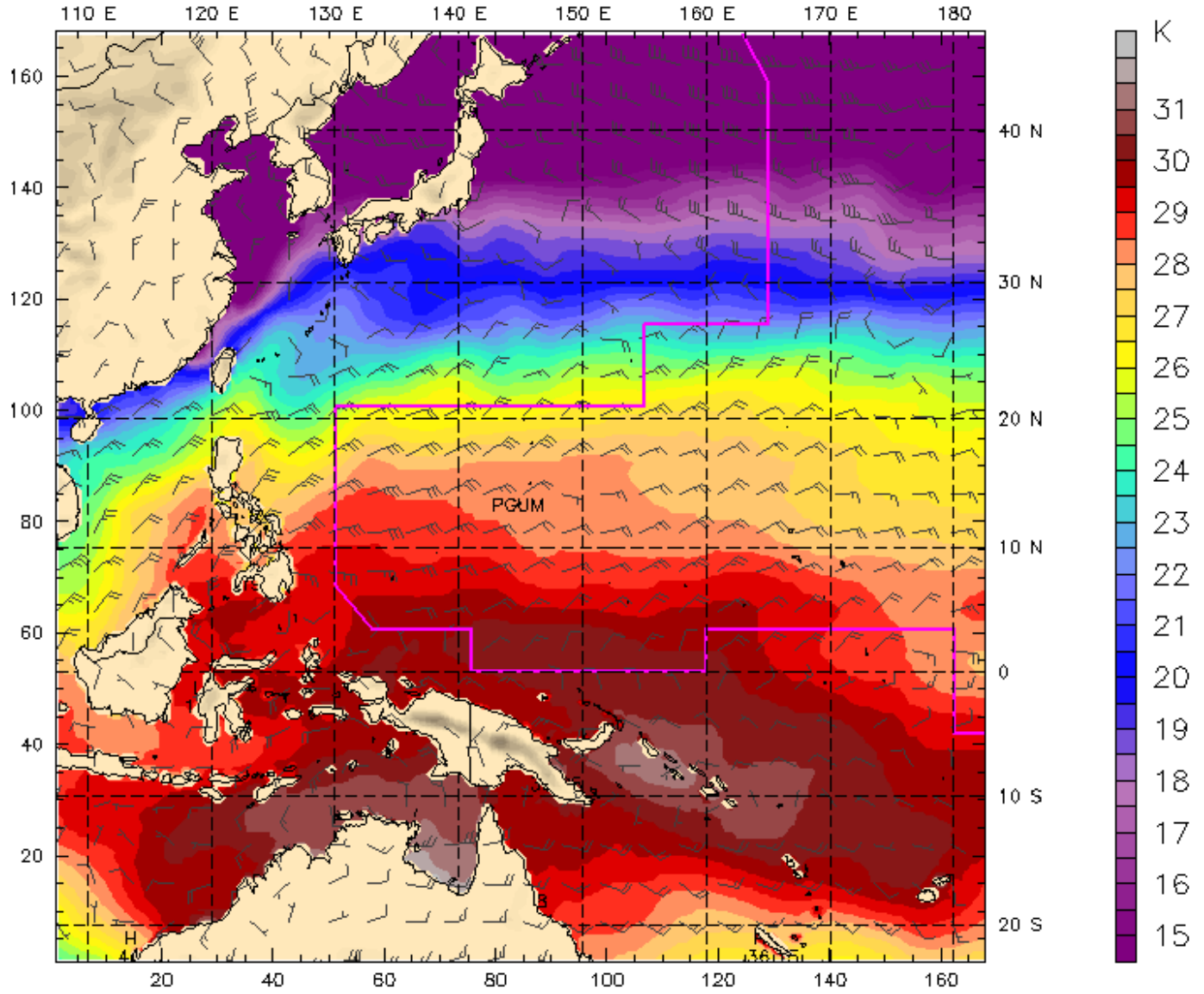
Valid: 00 UTC Sun 12 Jan 14 (10 LST Sun 12 Jan 14)

Skin temperature

Horizontal wind vectors

at pressure = 925 hPa

sm= 1



BARB VECTORS: FULL BARB = 10 kts

OUTPUT FROM METGRID V3.5.1 x = 168, y = 168, 50 km, 27 levels

NCEP GFS 0.5 degree

NCAR/MMM

Init: 00 UTC Sat 25 Jan 14

Fcst: 0 h

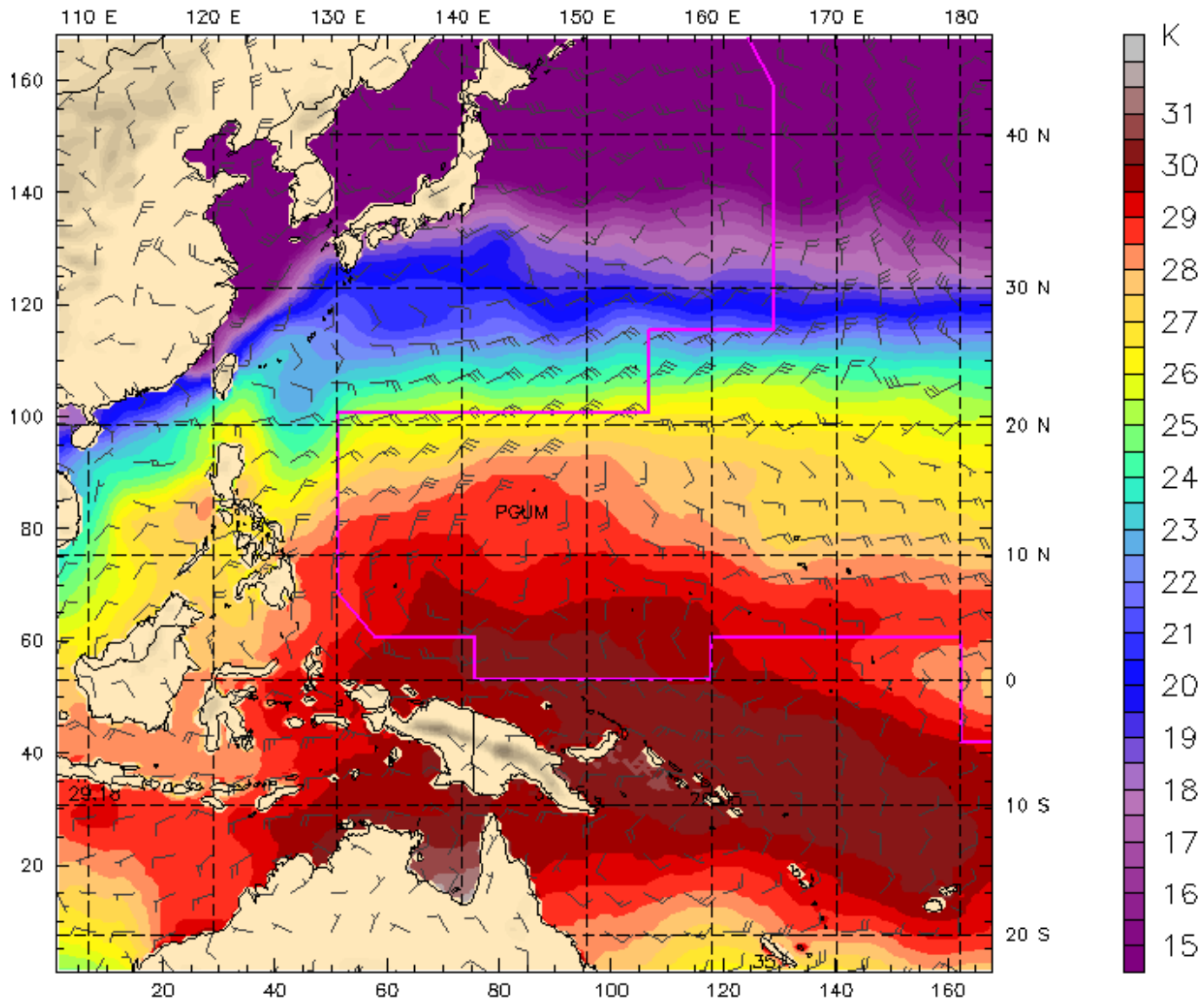
Valid: 00 UTC Sat 25 Jan 14 (10 LST Sat 25 Jan 14)

Skin temperature

Horizontal wind vectors

at pressure = 925 hPa

sm= 1



NCEP GFS 0.5 degree

NCAR/MMM

Init: 00 UTC Sat 08 Feb 14

Fcst: 0 h

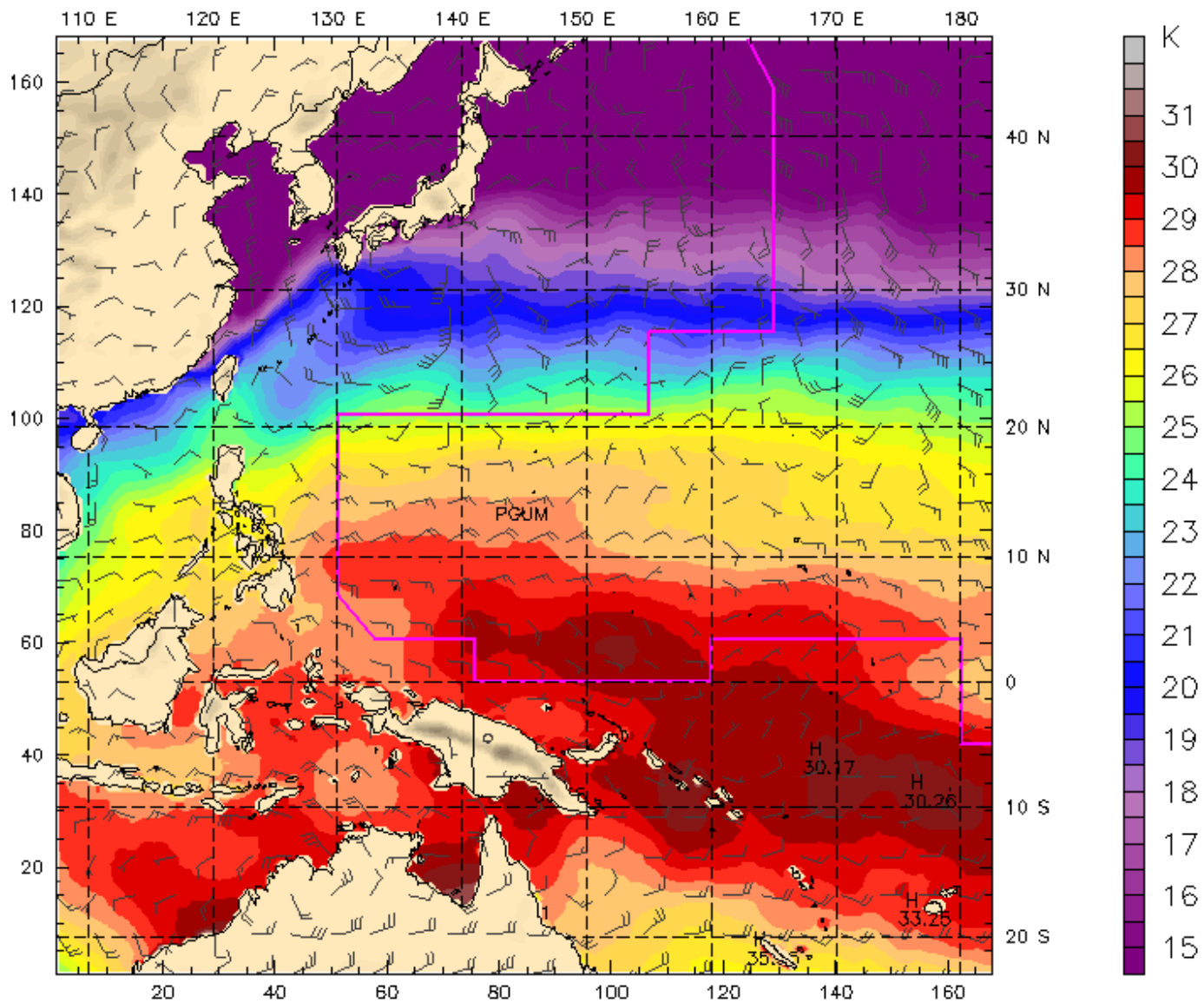
Valid: 00 UTC Sat 08 Feb 14 (10 LST Sat 08 Feb 14)

Skin temperature

Horizontal wind vectors

at pressure = 925 hPa

sm= 1



BARB VECTORS: FULL BARB = 10 kts

OUTPUT FROM METGRID V3.5.1 x = 168, y = 168, 50 km, 27 levels

NCEP GFS 0.5 degree

NCAR/MMM

Init: 00 UTC Sat 22 Feb 14

Fcst: 0 h

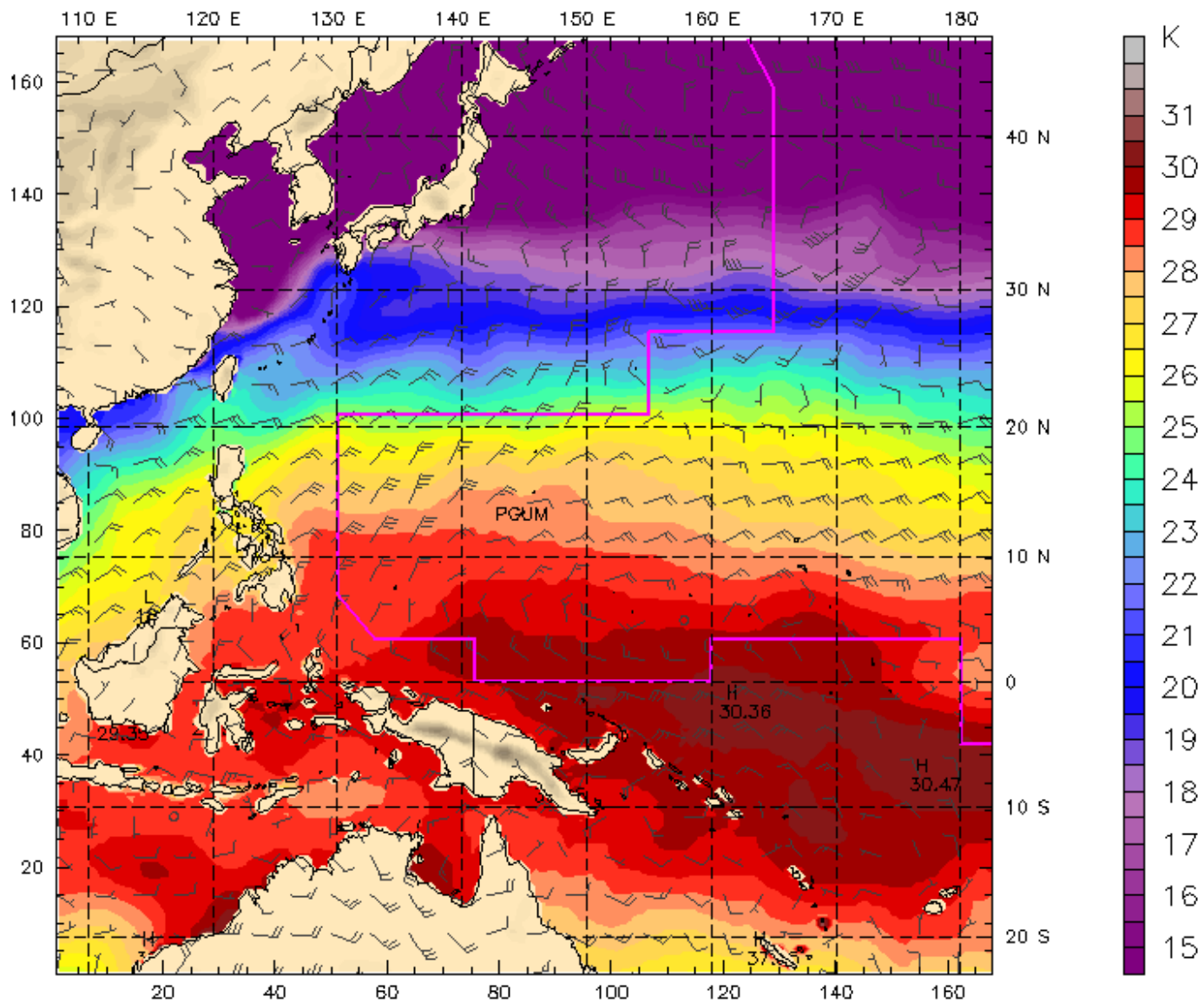
Valid: 00 UTC Sat 22 Feb 14 (10 LST Sat 22 Feb 14)

Skin temperature

Horizontal wind vectors

at pressure = 925 hPa

sm= 1

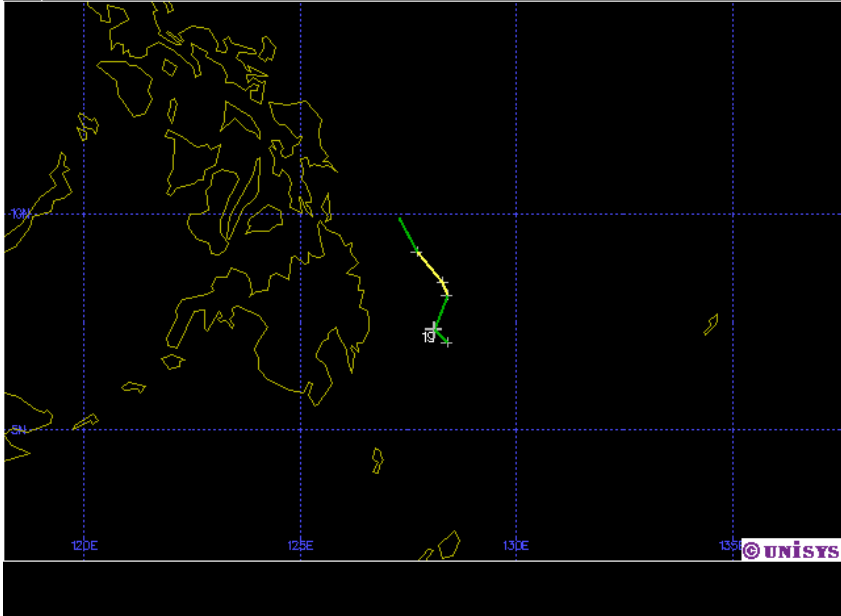


BARB VECTORS: FULL BARB = 10 kts

OUTPUT FROM METGRID V3.5.1 x = 168, y = 168, 50 km, 27 levels

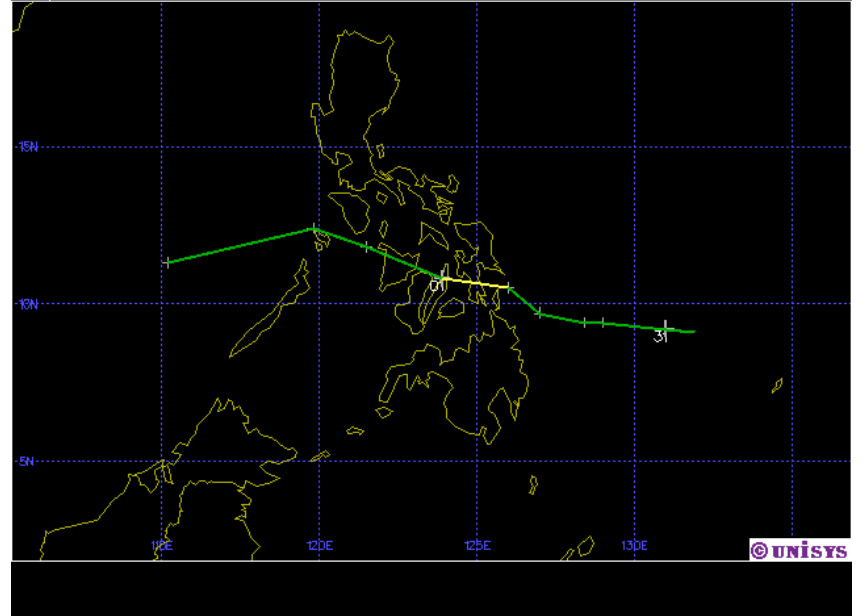
Tropical Storm LINGLING

18-19 JAN 2014



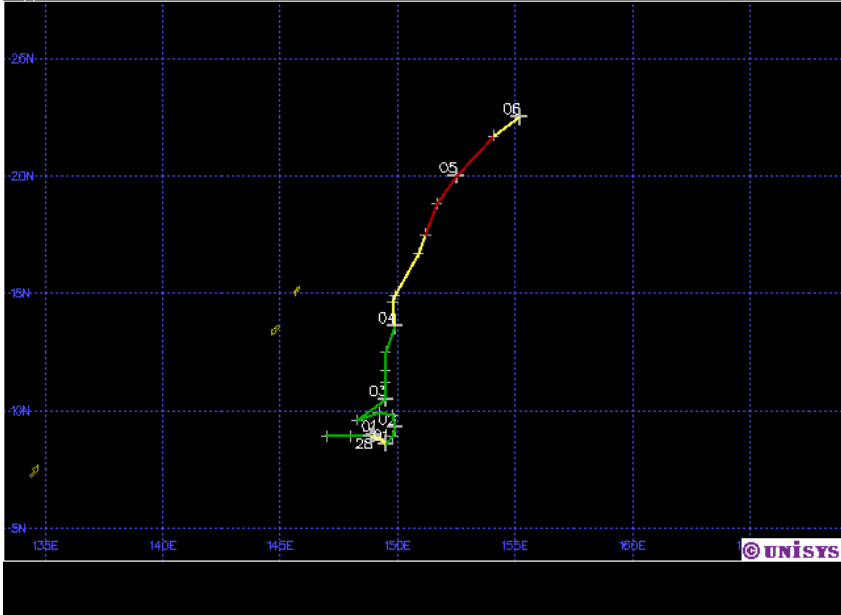
Tropical Storm KAJIKI

30 JAN-01 FEB 2014



Typhoon-1 FAXAI

28 FEB-06 MAR 2014



Two tropical storms and one typhoon occurred in the region, had no effect on any of the missions, but did have an impact on the OLR/TRMM averages.

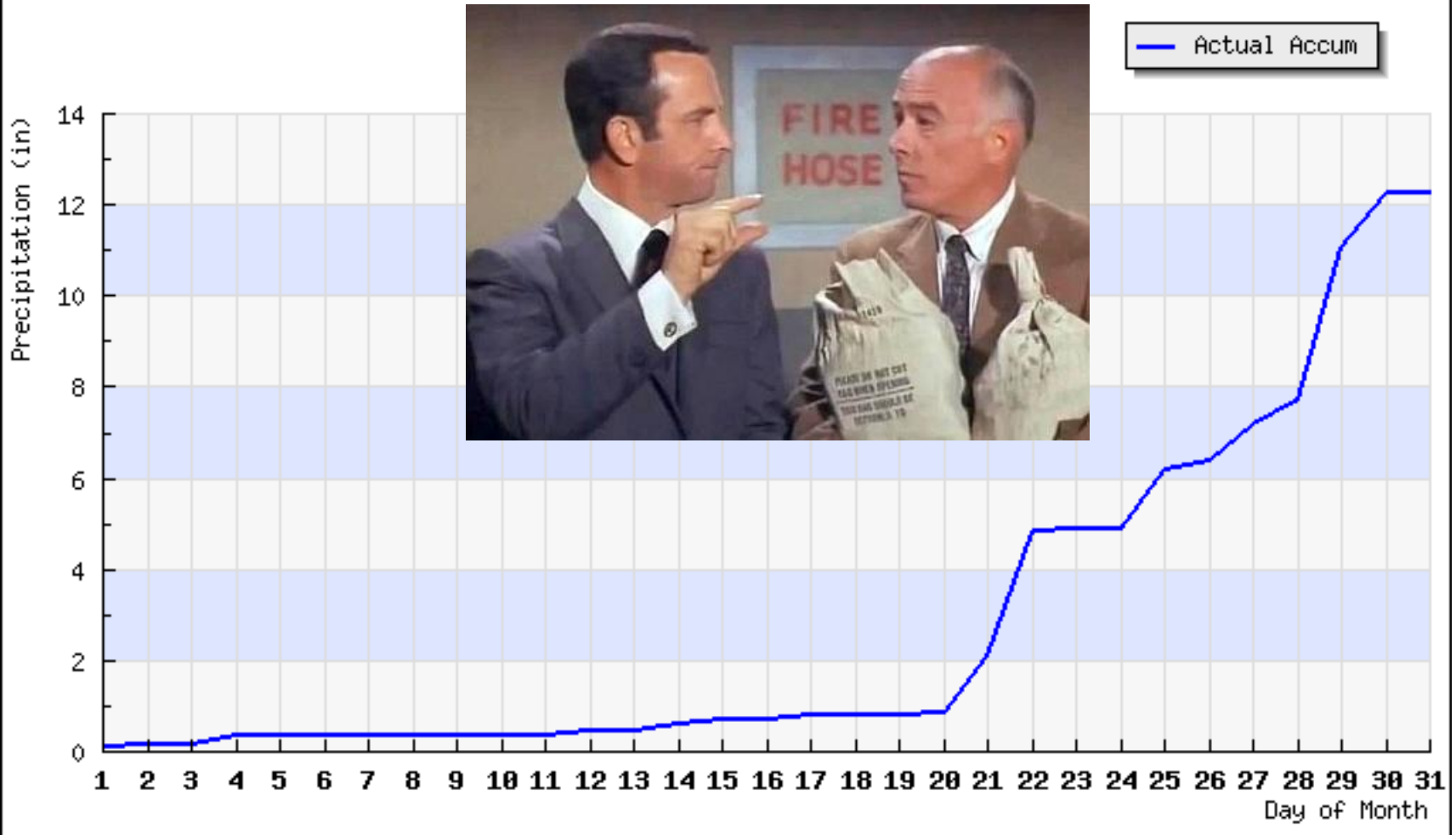
Guam airport ASOS rainfall

Official rain total: 16.89"

January record is still 18.09"

Normal: 4.96"

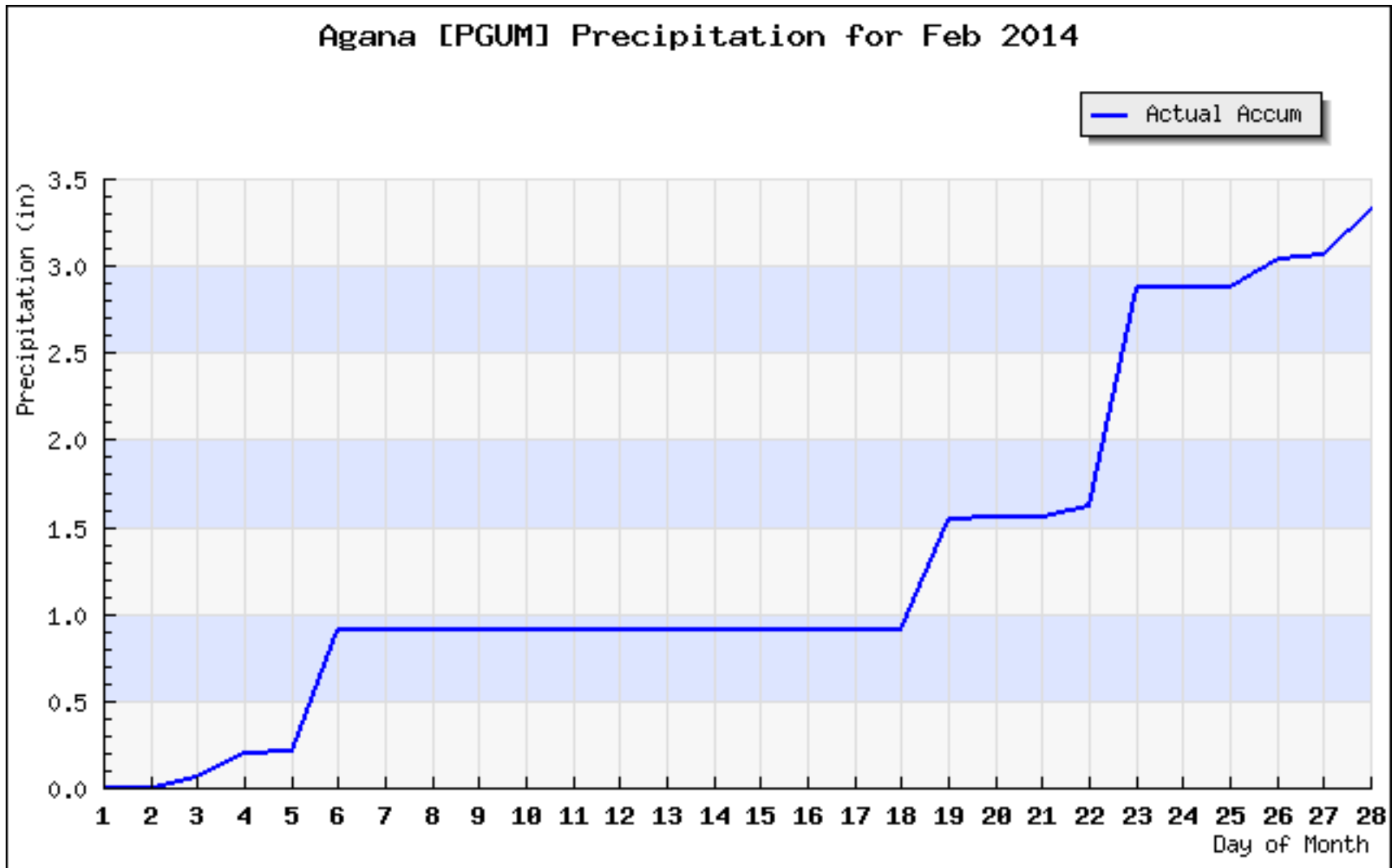
Agana [PGUM] Precipitation for Jan 2014



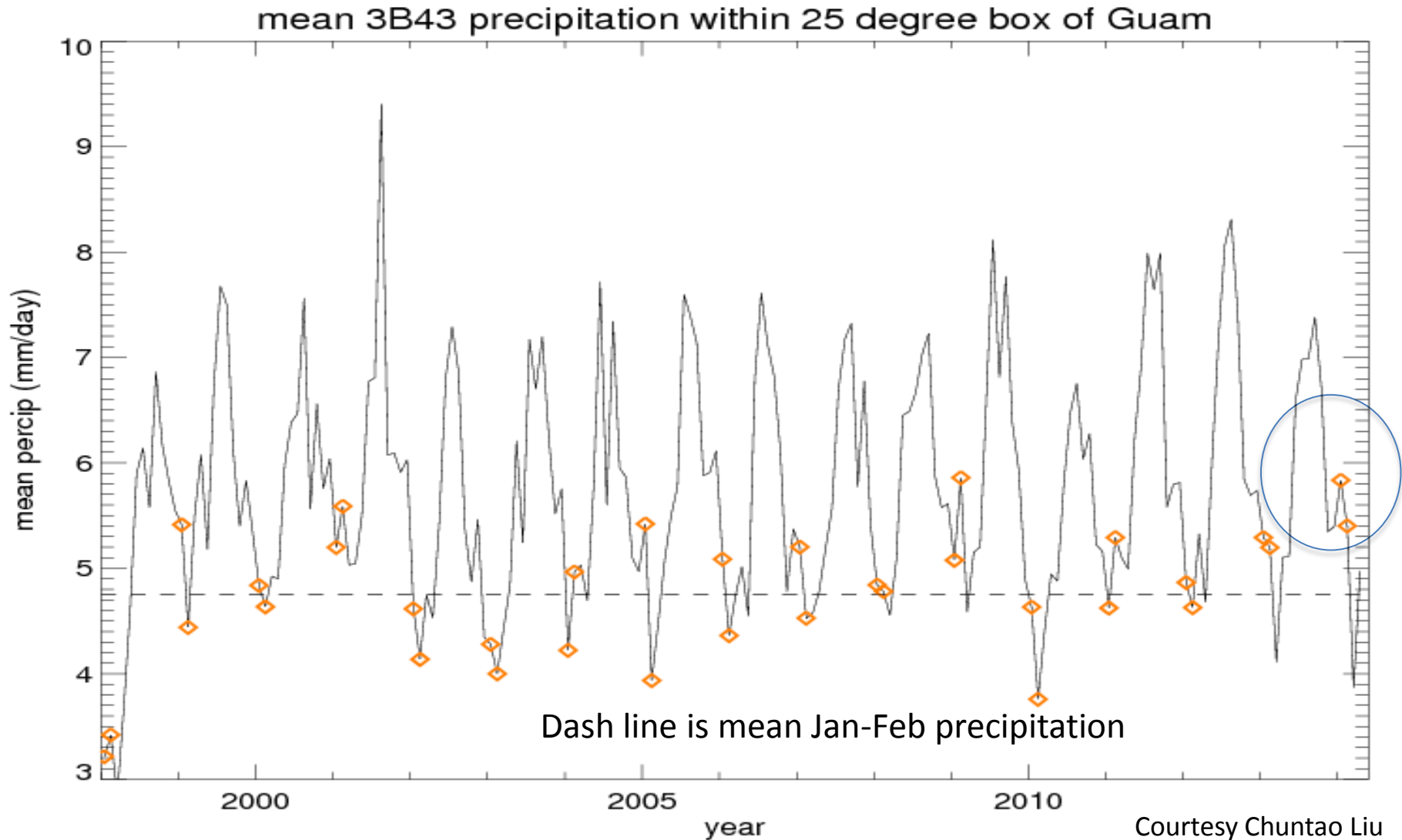
Guam airport ASOS rainfall

Official rain total: 5.14"

Normal: 4.53"

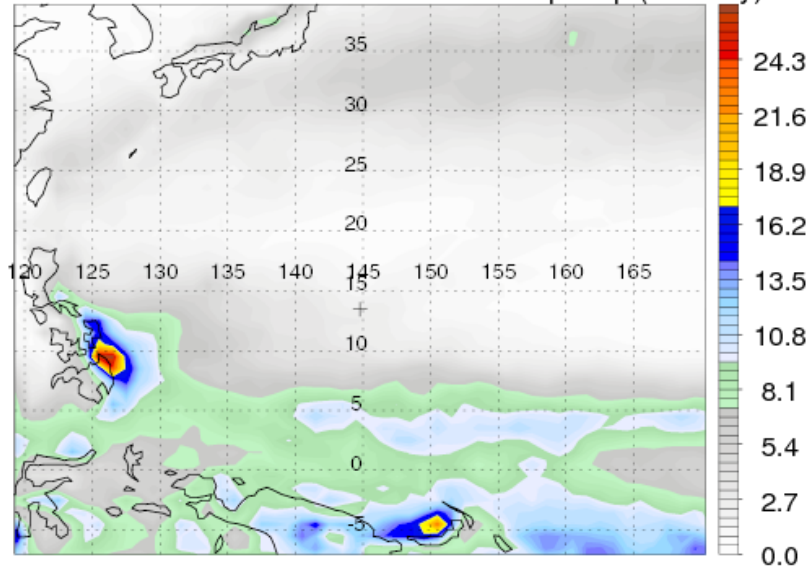


Jan-Feb 2014 is **wetter** than normal “around” Guam



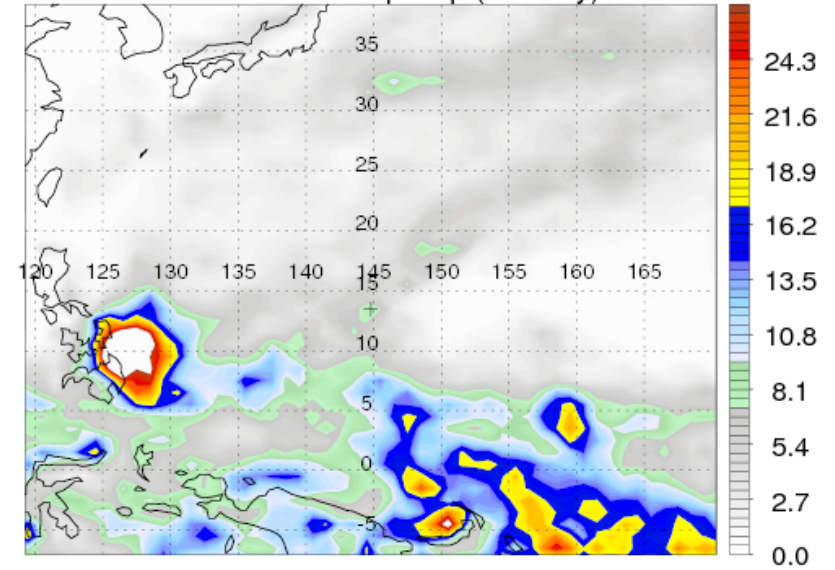
Mean precipitation

2003-2013 mean Jan-Feb TRMM 3B43 precip (mm/day)



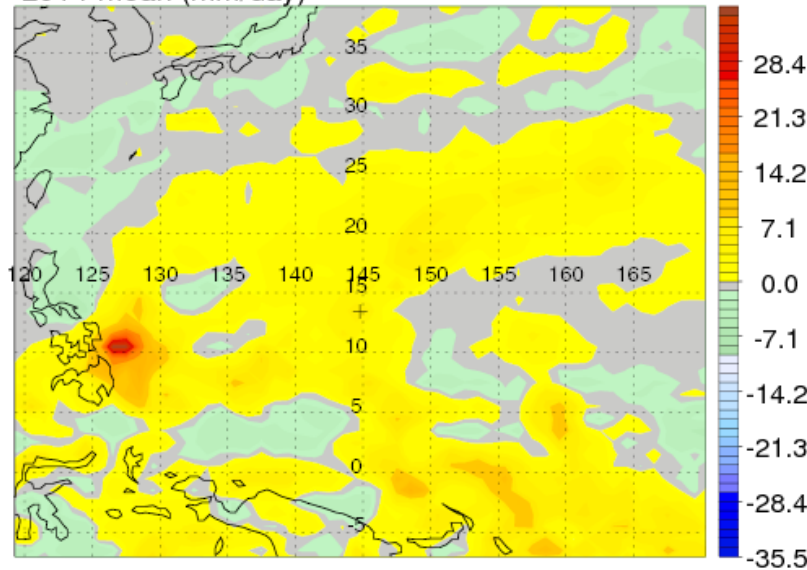
2014

2014 mean Jan-Feb 3B43 precip (mm/day)



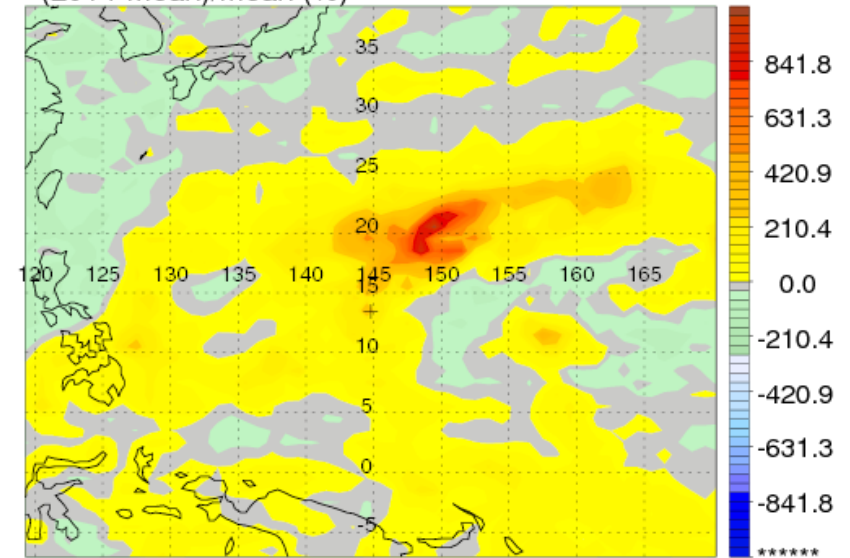
2014-mean

2014-mean (mm/day)

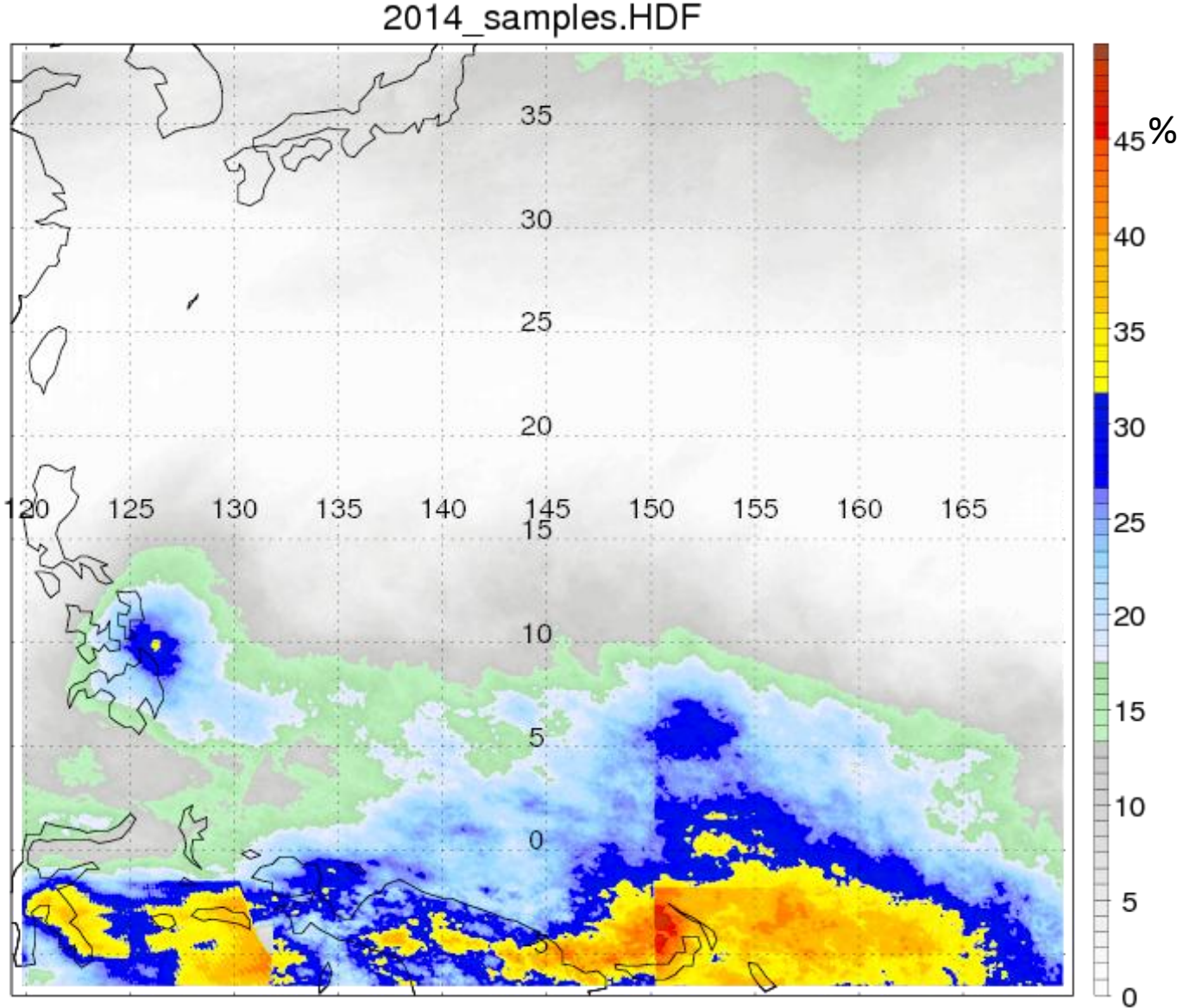


(2014-mean) / mean

(2014-mean)/mean (%)

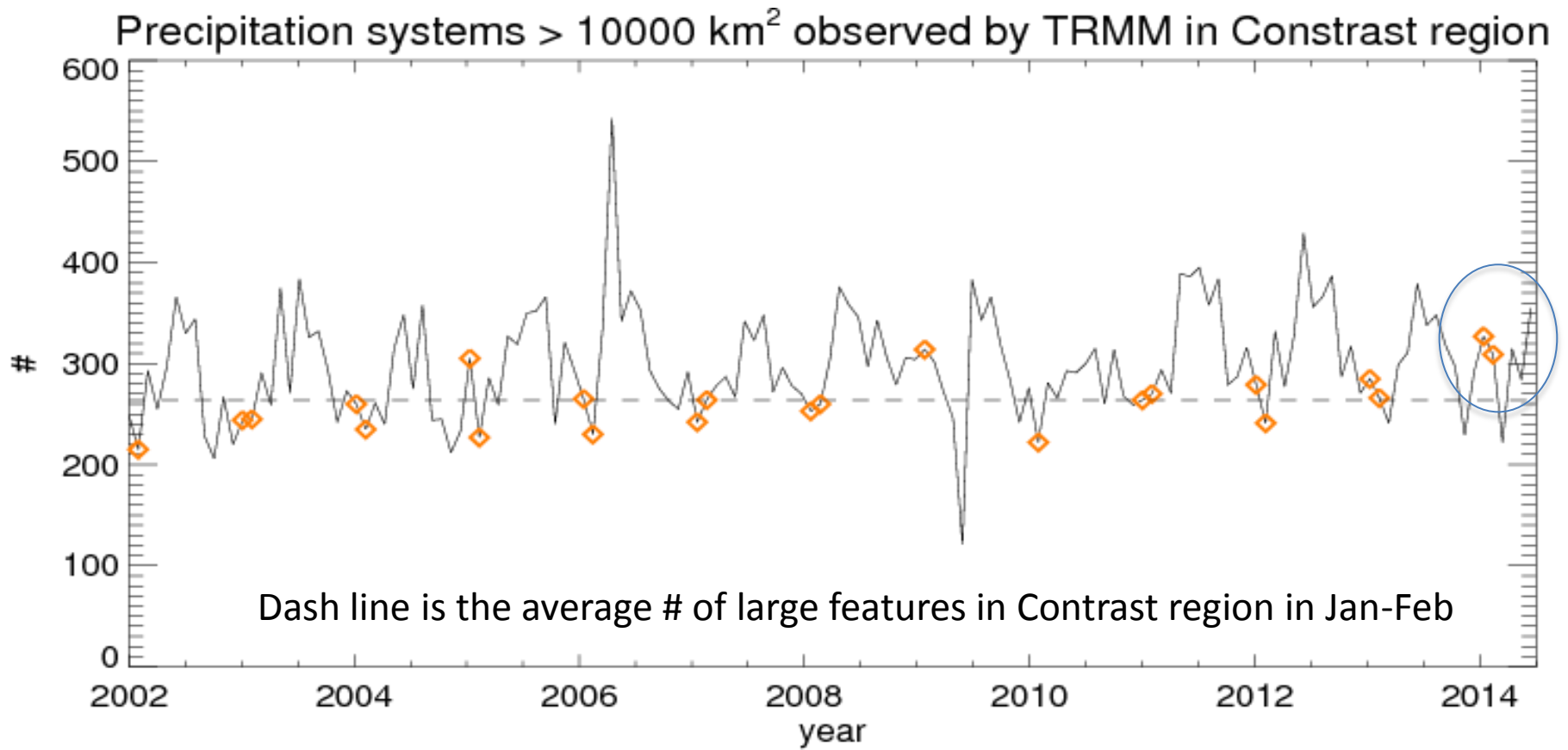


Fractional occurrence of the Infrared TB colder than 235 K in Jan-Feb

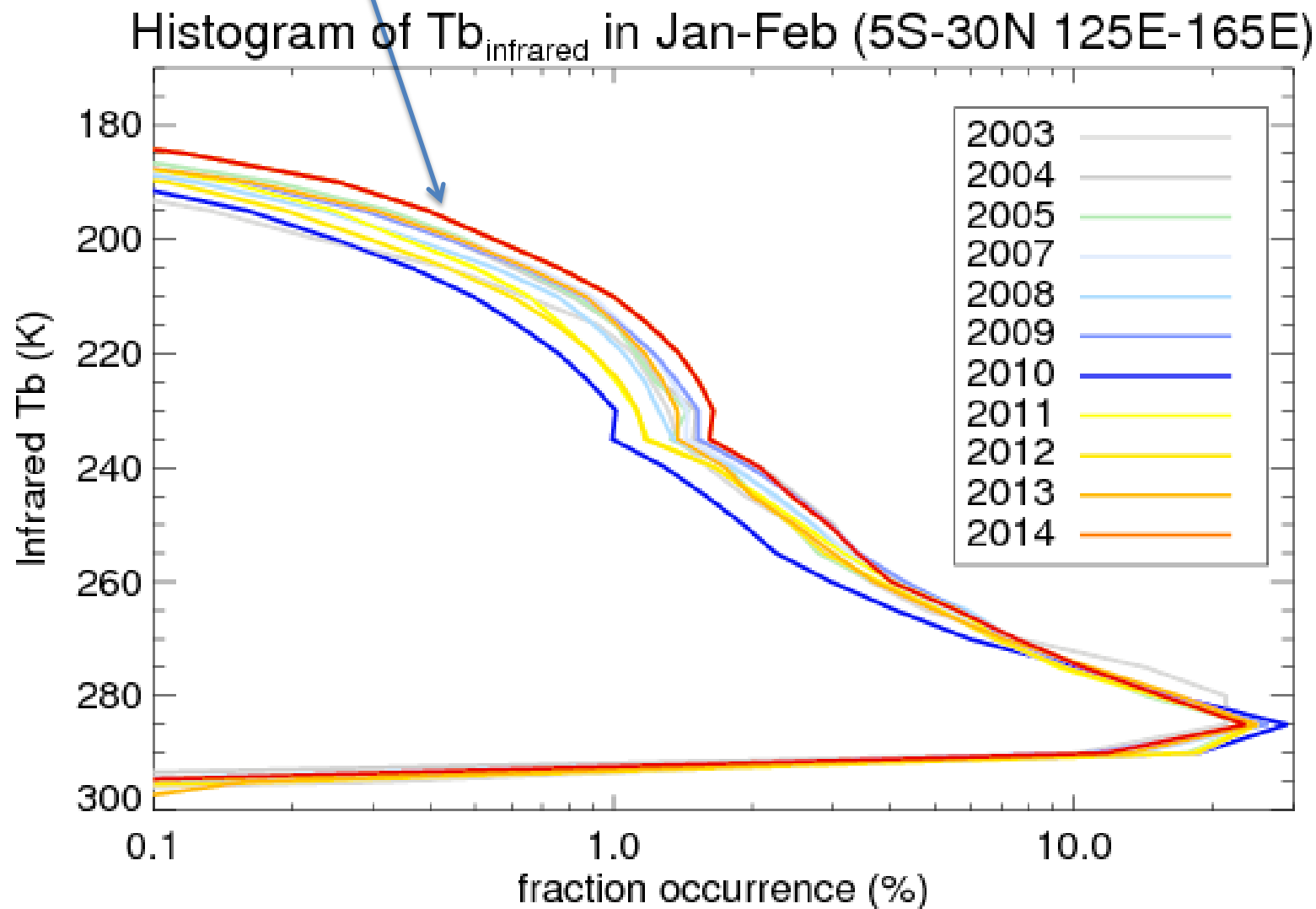


Courtesy Chuntao Liu

More organized precipitation systems than normal in Jan-Feb 2014

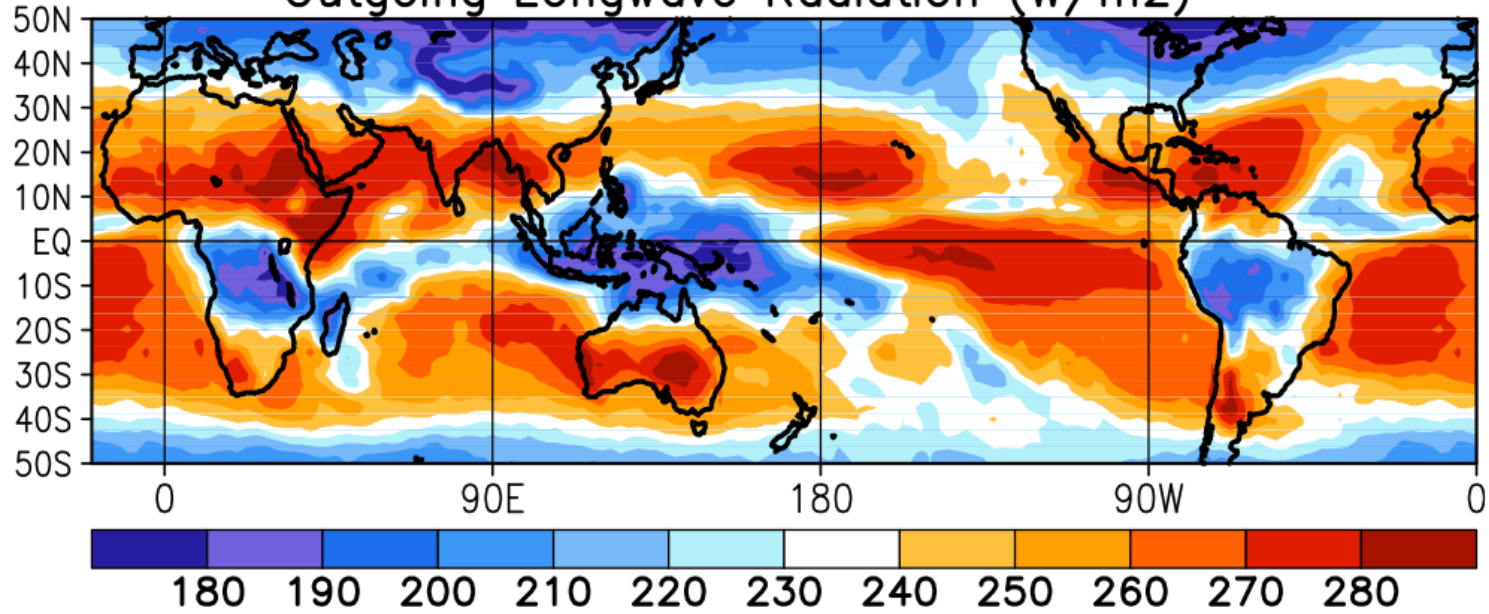


Jan-Feb 2014 (red) had more cold clouds than normal

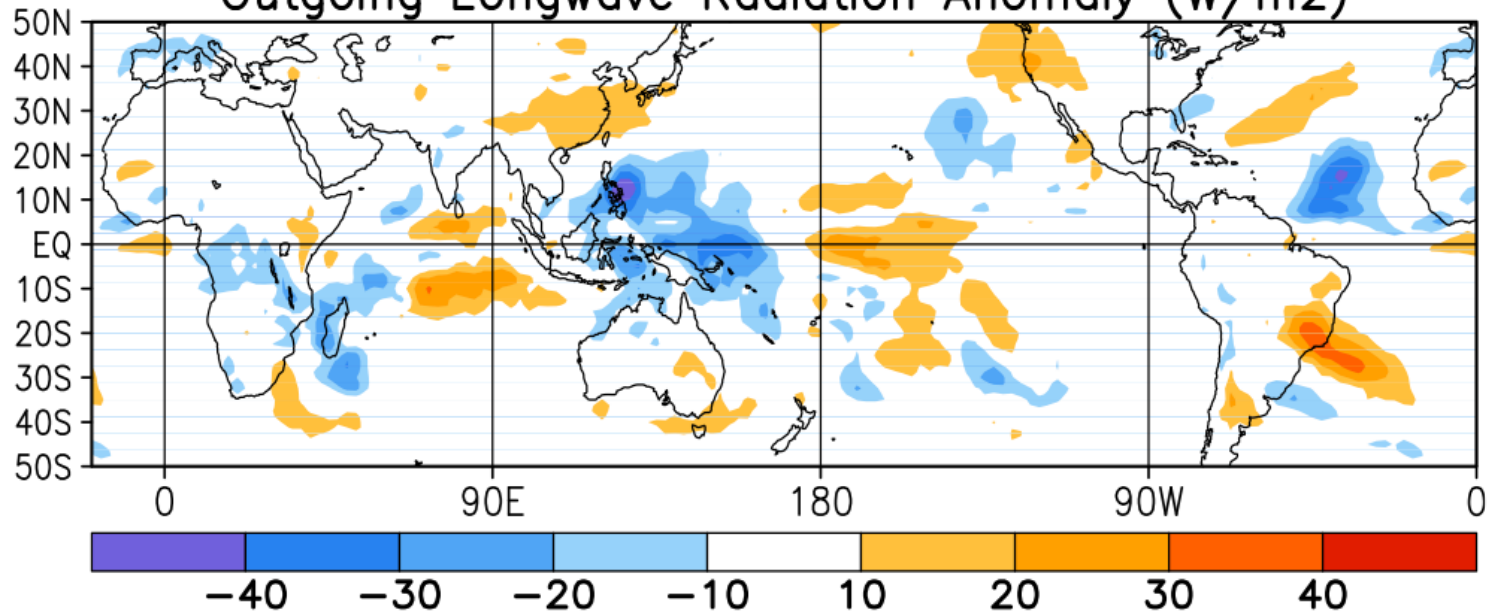


January 2014

Outgoing Longwave Radiation (W/m²)

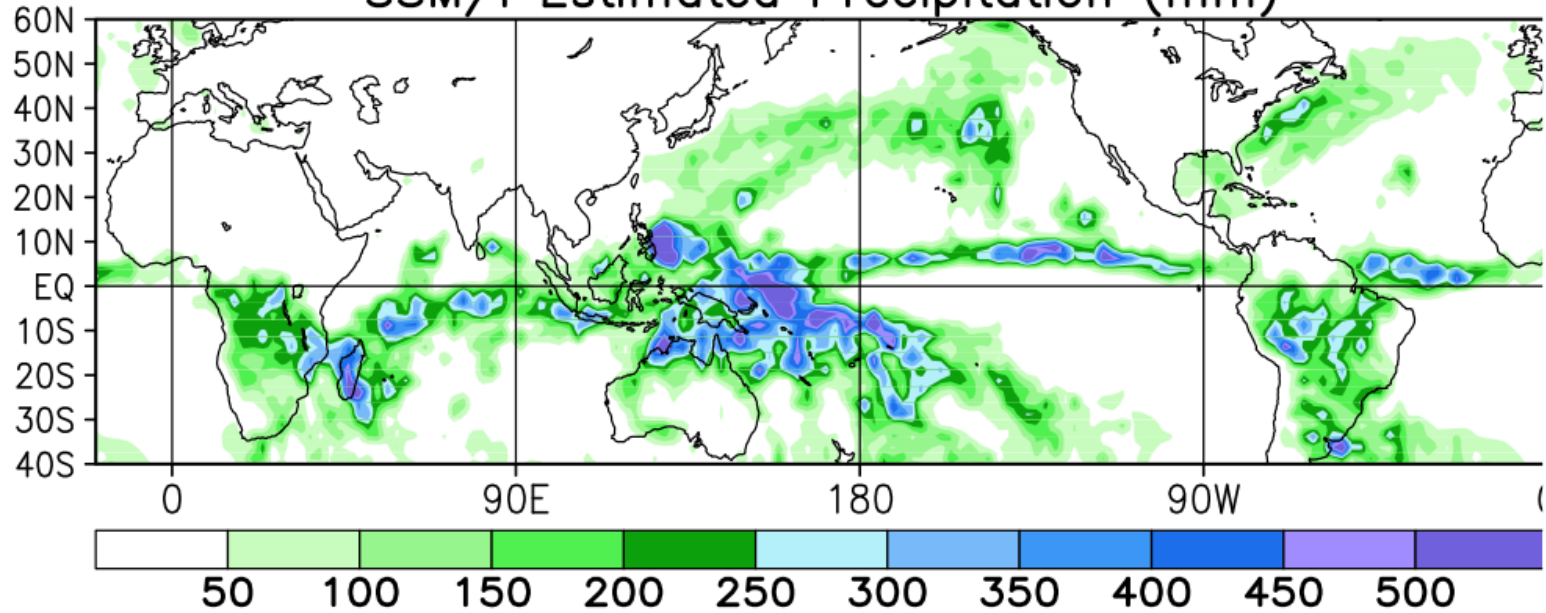


Outgoing Longwave Radiation Anomaly (W/m²)

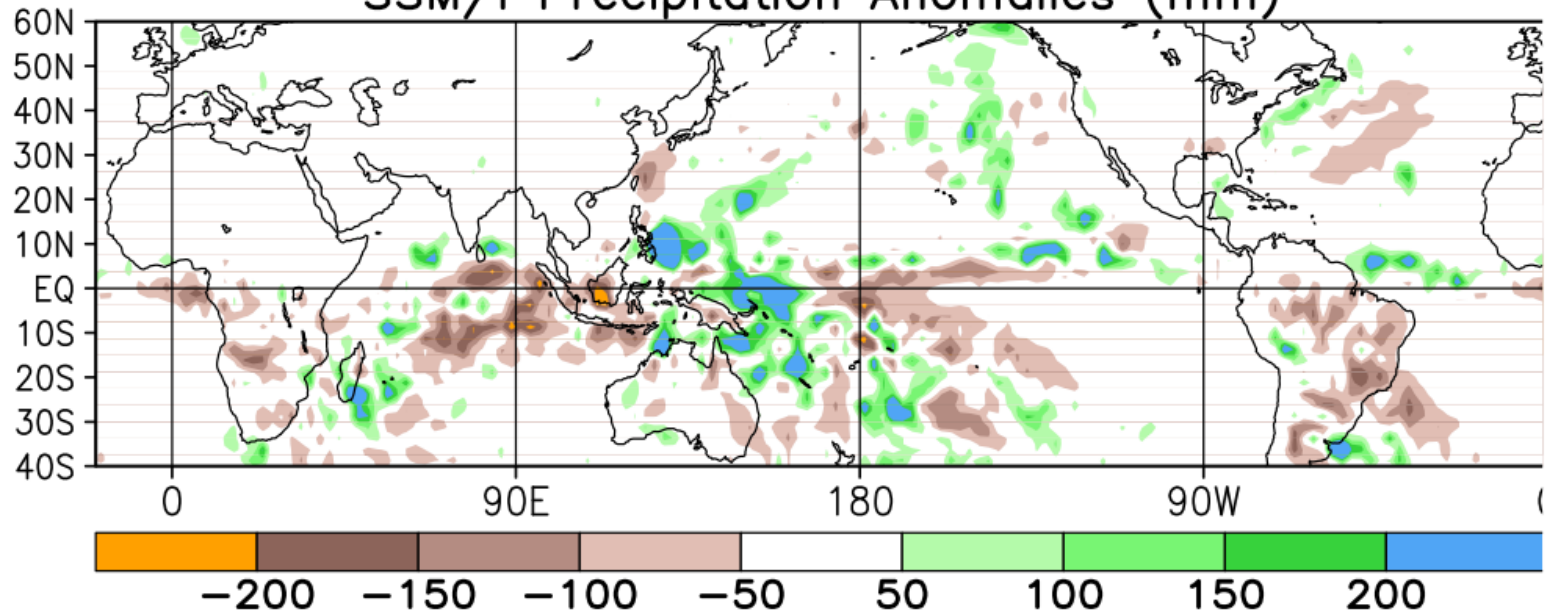


January 2014

SSM/I Estimated Precipitation (mm)



SSM/I Precipitation Anomalies (mm)





MIND YOUR HEAD

Swagelok
OPEN

EXHAUST
SEMI

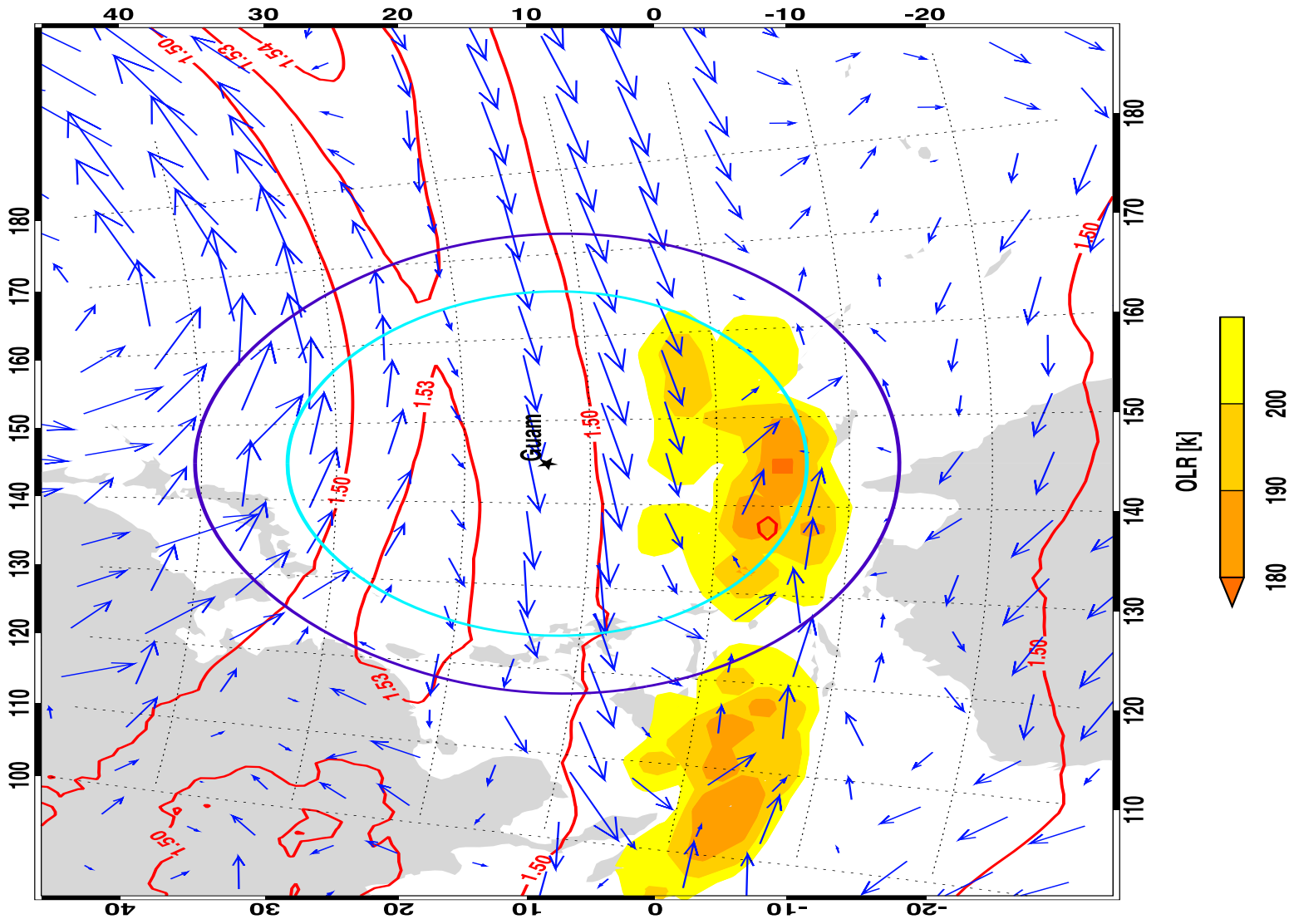
500005

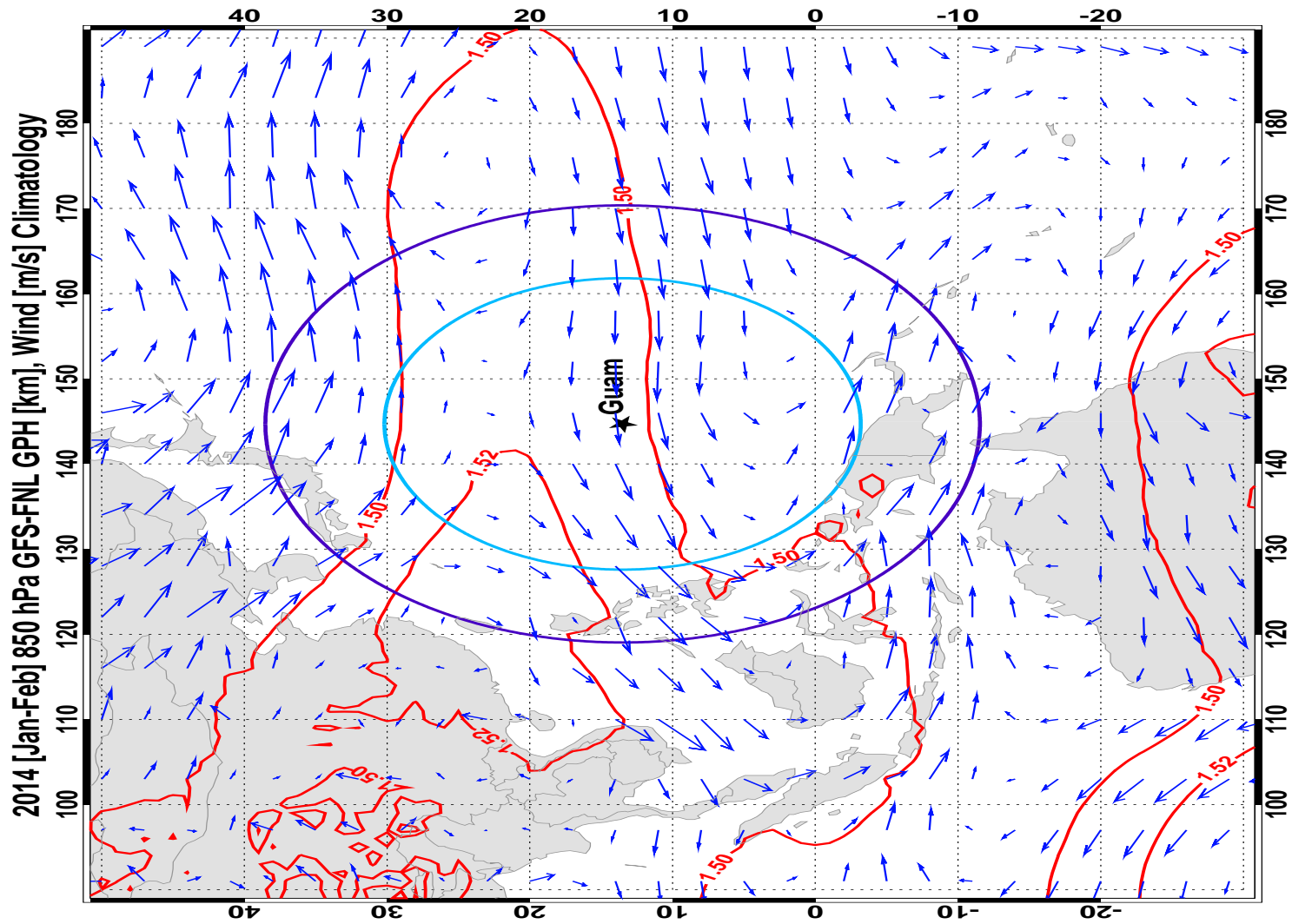
500005

500005

500005

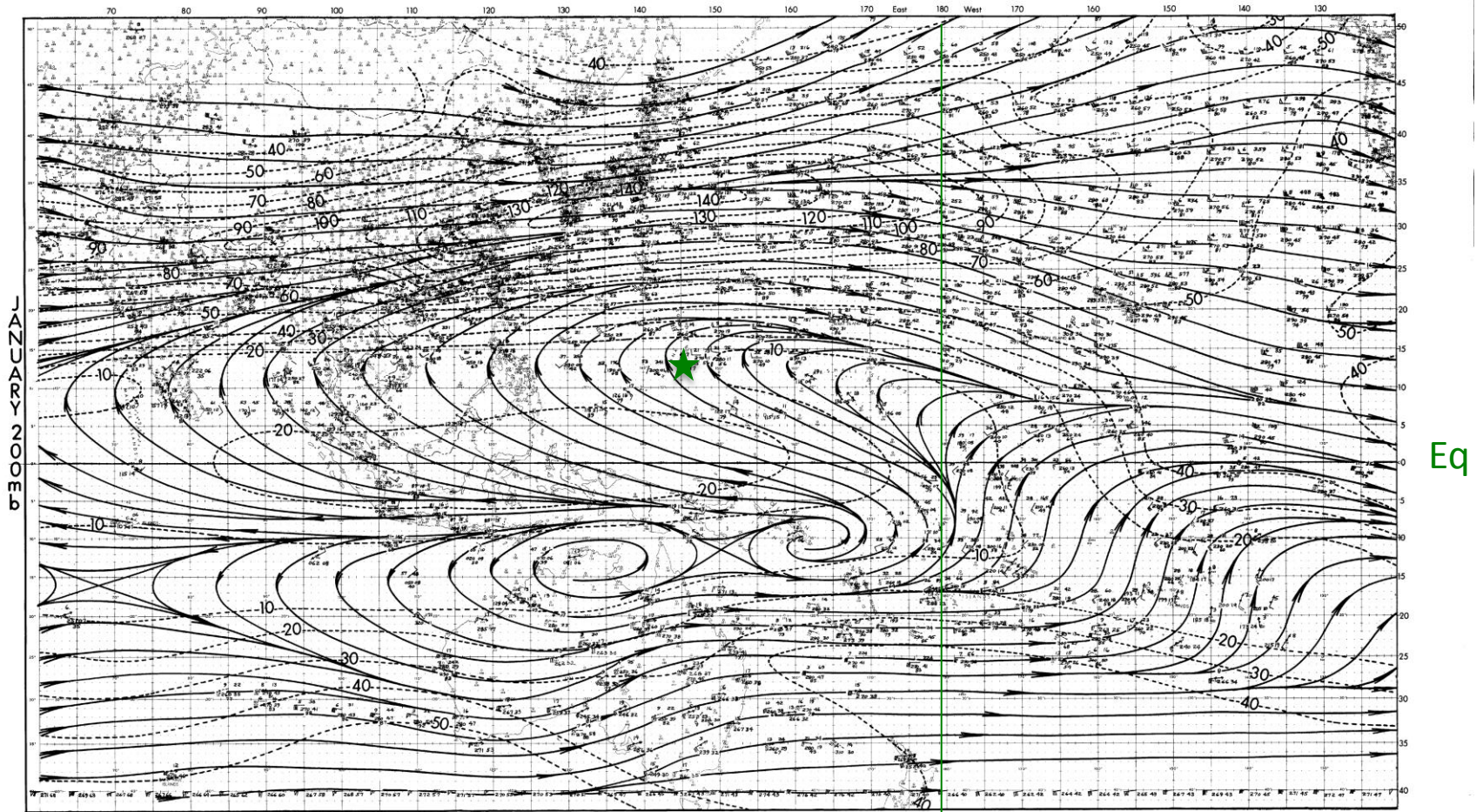
Mean 850 hPa GFS-FNL GPH [km], Wind [m/s] & NOAA OLR Jan-Feb 2013





Courtesy Shawn Honomichi

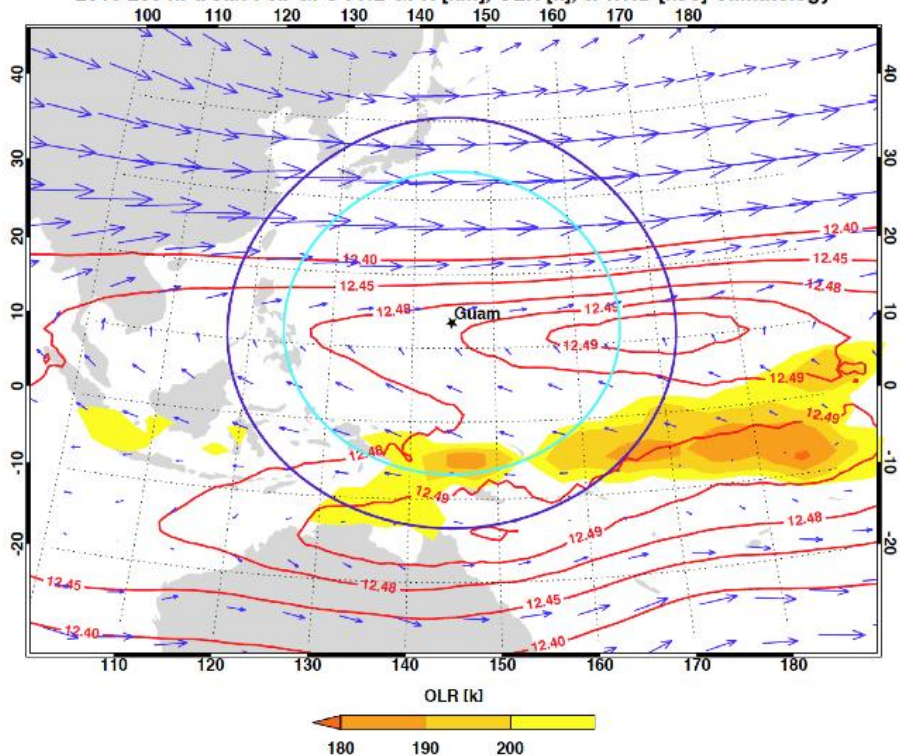
January 200 mb streamline climatology (Sadler 1975)



Ridge axis along Guam's latitude. Southeasterly cross-equatorial flow in the CONTRAST region.

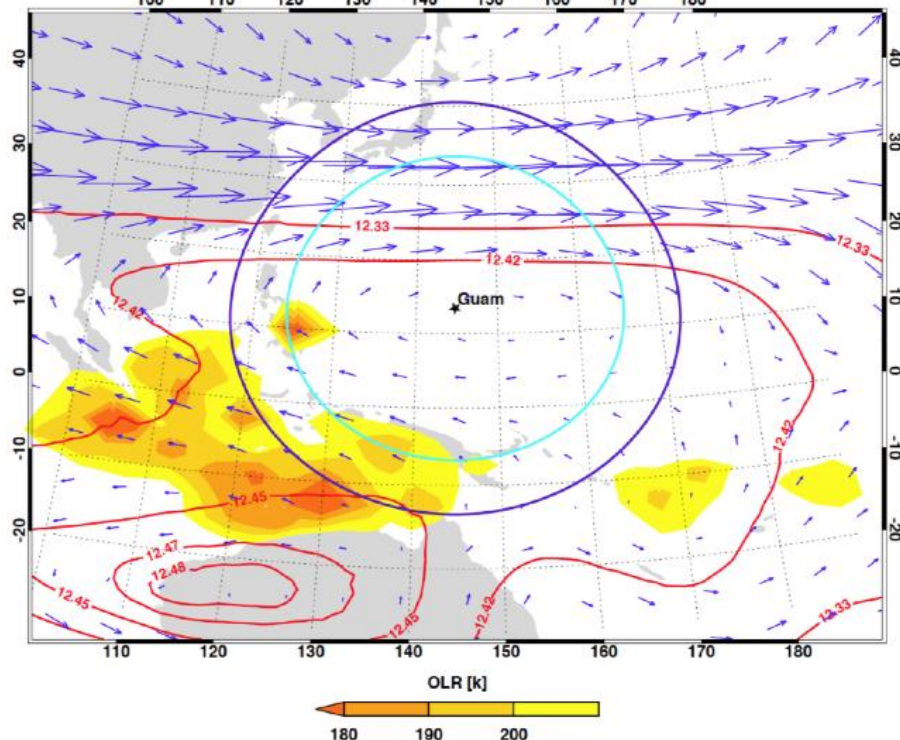
2010 JF mean, ONI: **1.6**

2010 200 hPa Jan-Feb GFS-FNL GPH [km], OLR [k], & WND [m/s] Climatology



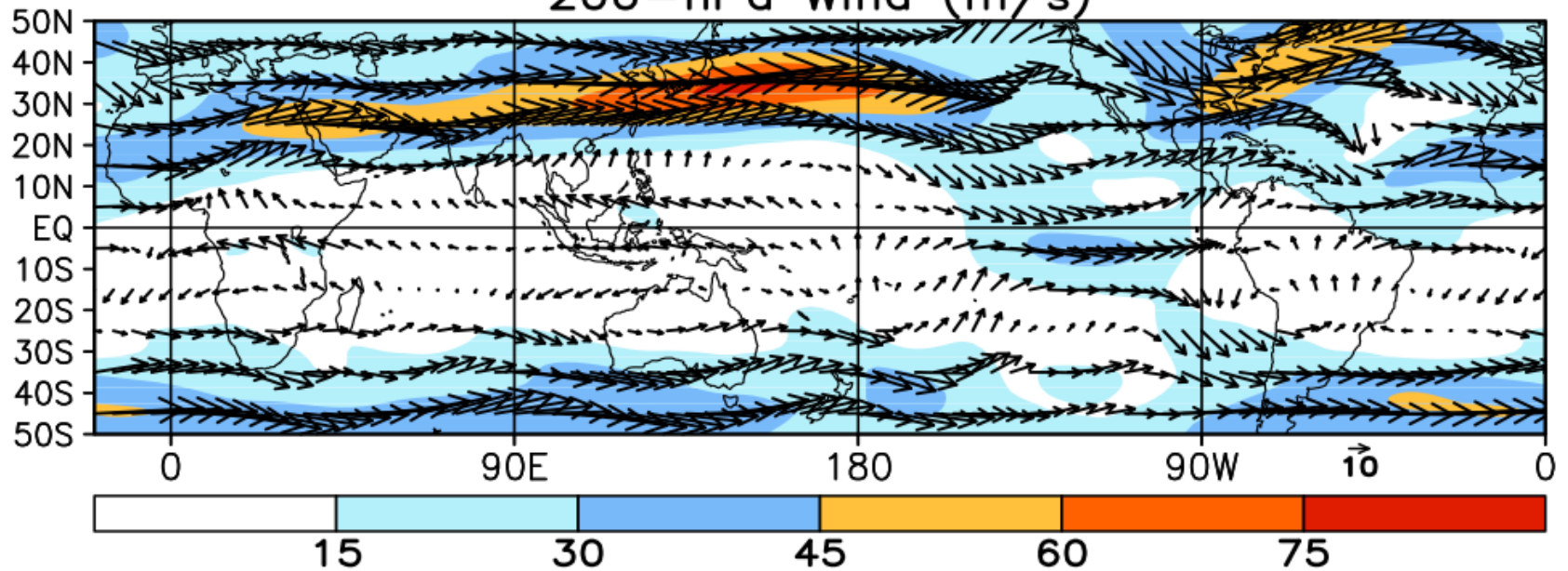
2011 JF mean, ONI: **-1.4**

2011 200 hPa Jan-Feb GFS-FNL GPH [km], OLR [k], & WND [m/s] Climatology

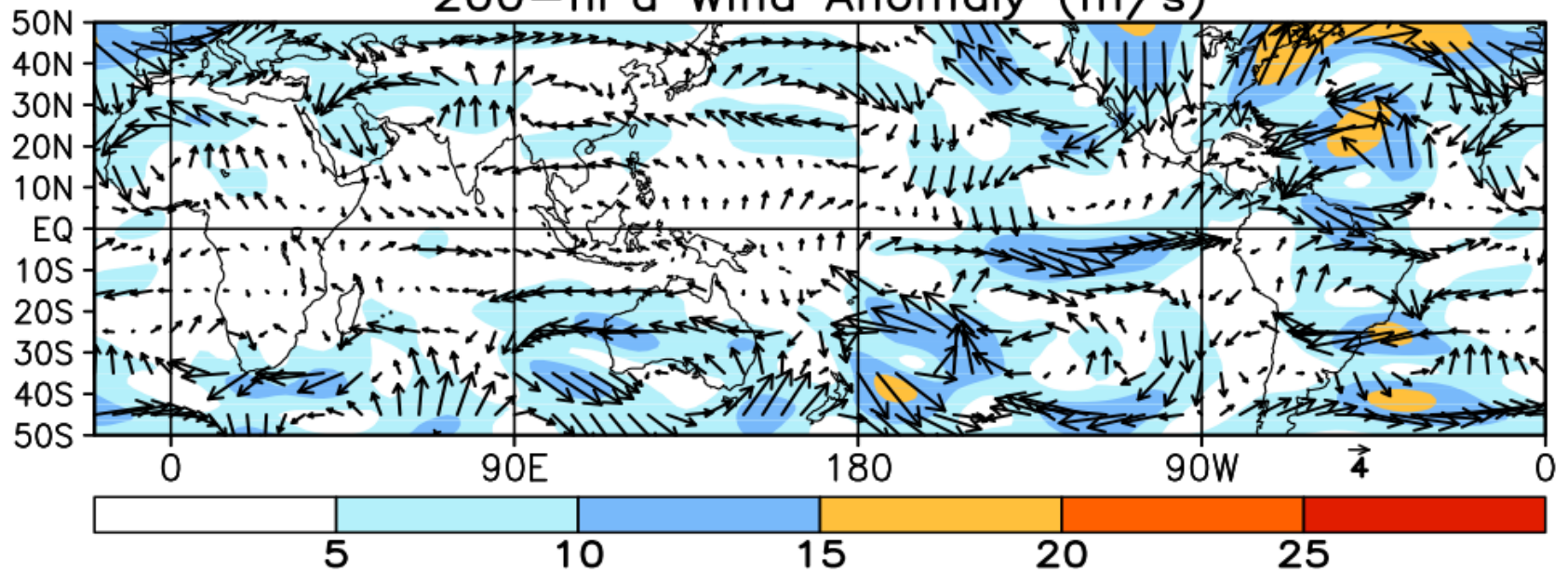


January 2014

200-hPa Wind (m/s)



200-hPa Wind Anomaly (m/s)



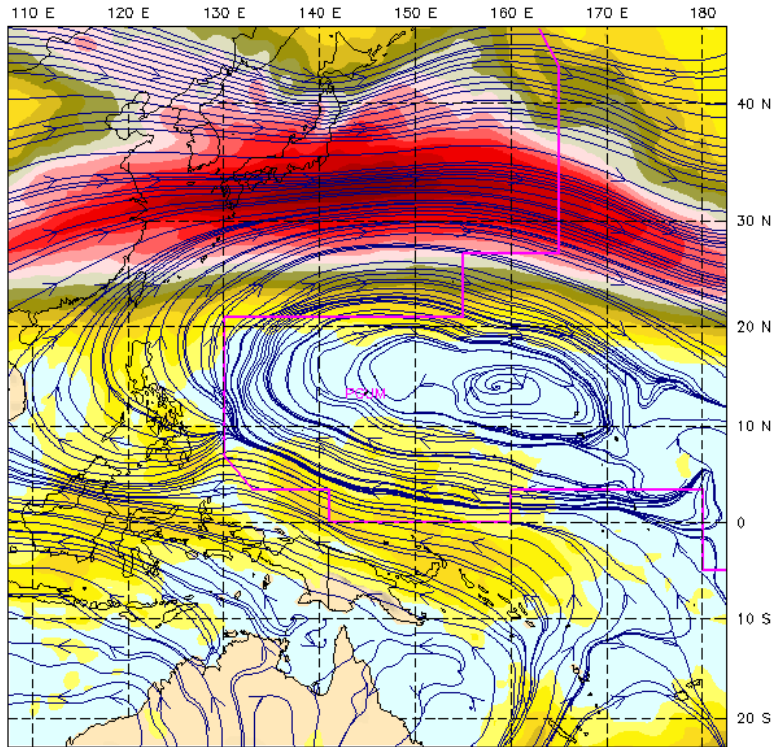
200 mb wind speed (shaded) and streamlines

NCEP GFS 0.5 degree
Fcst: 0 h
Horizontal wind speed
Horizontal wind streamlines

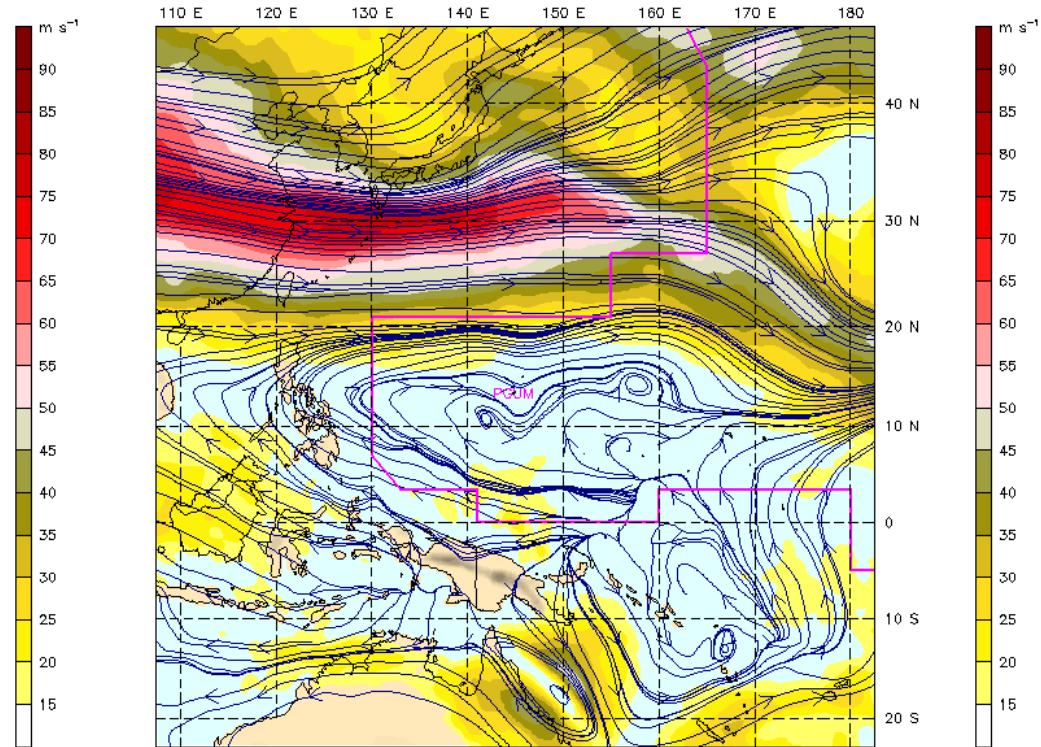
NCAR/MMM
Valid: 00 UTC Fri 31 Jan 14 (10 LST Fri 31 Jan 14)
at pressure = 200 hPa
sm= 1

Init: 00 UTC Fri 31 Jan 14 NCEP GFS 0.5 degree
Fcst: 0 h
Horizontal wind speed
Horizontal wind streamlines

NCAR/MMM
Valid: 00 UTC Sat 15 Feb 14 (10 LST Sat 15 Feb 14)
at pressure = 200 hPa
sm= 1



31 January

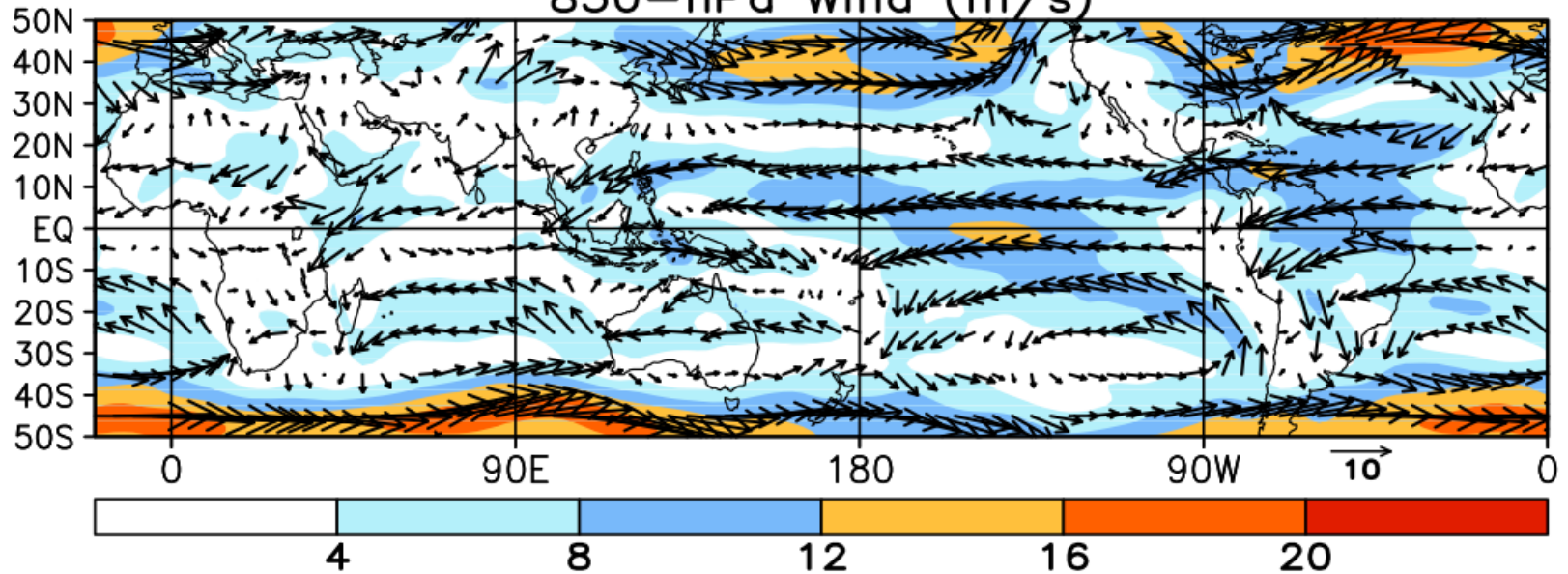


15 February

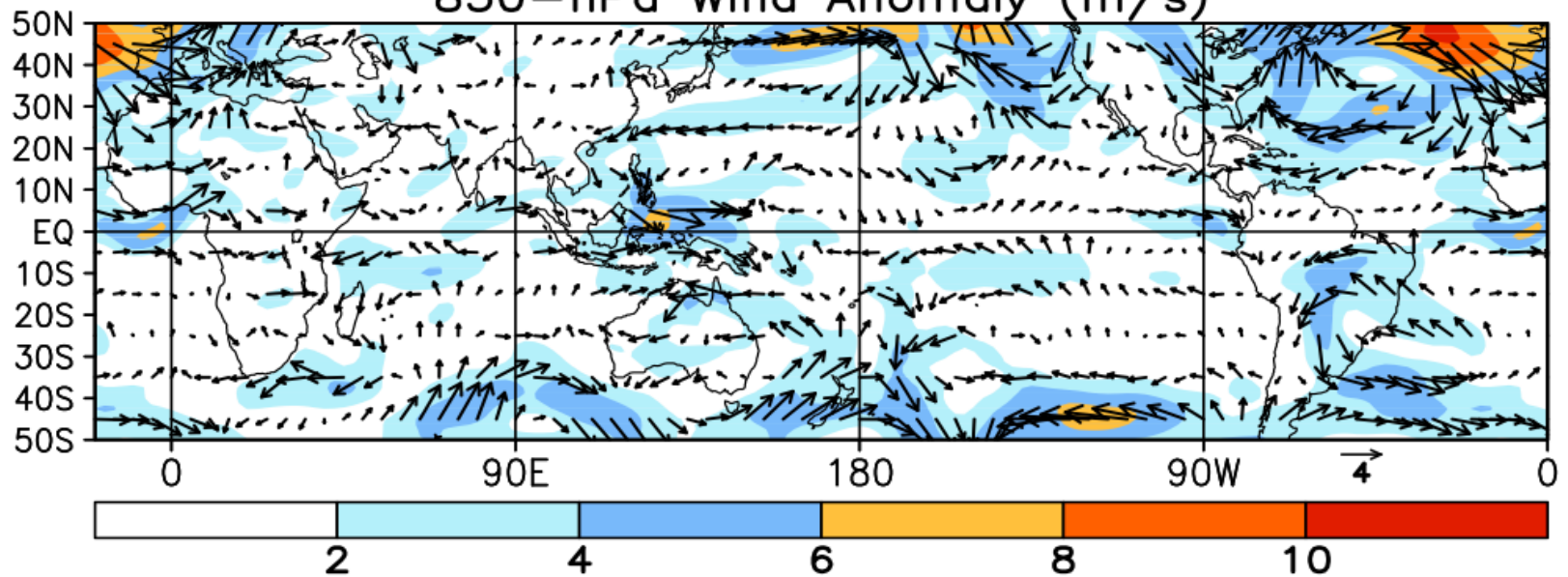
Cross-equatorial flow near Manus was highly variable

January 2014

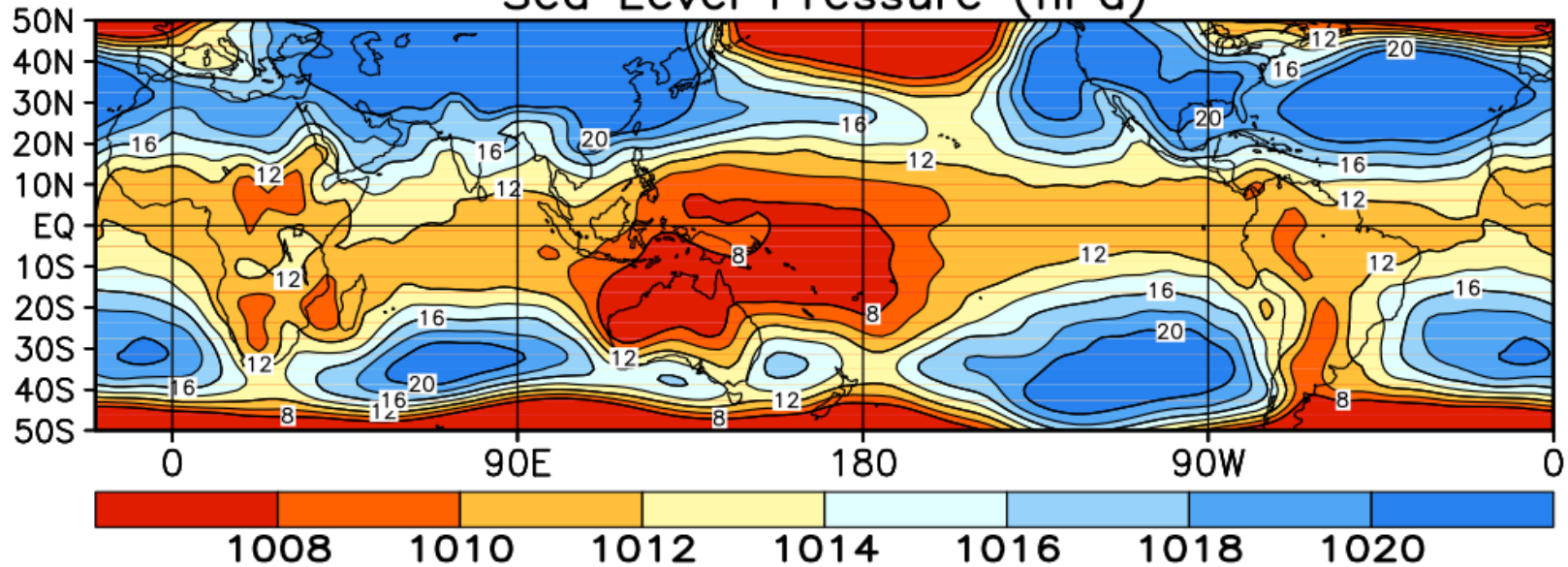
850-hPa Wind (m/s)



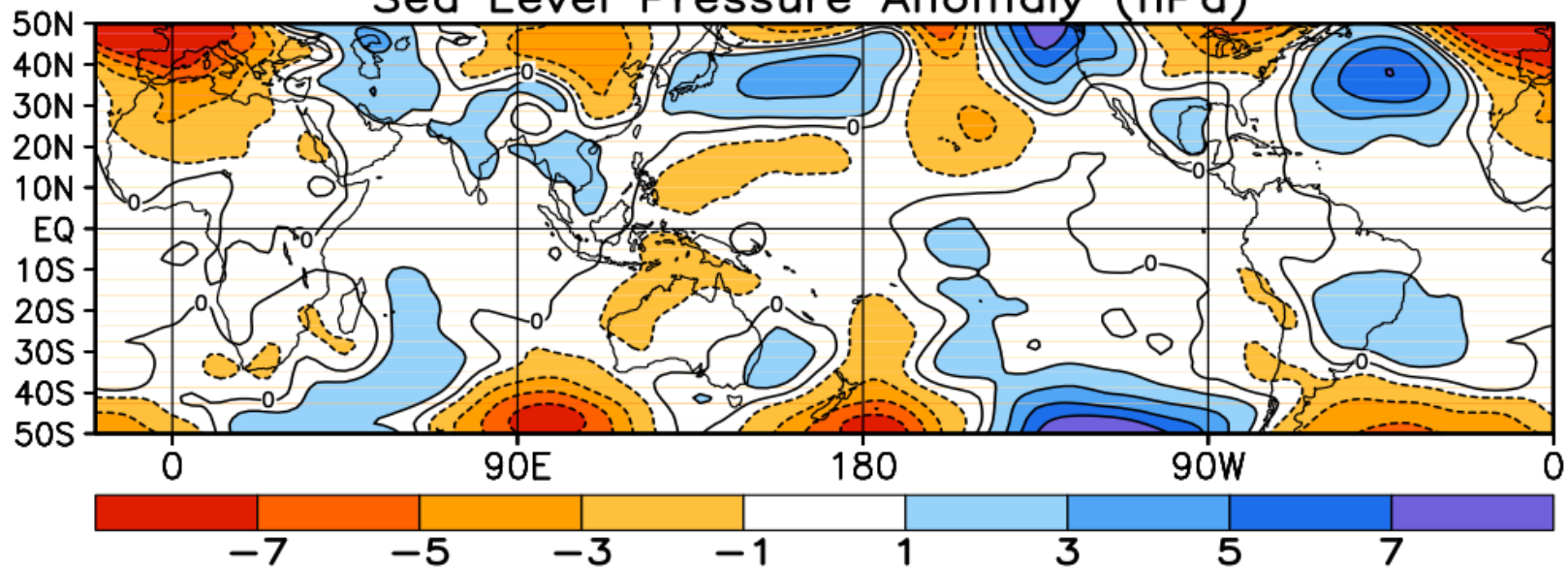
850-hPa Wind Anomaly (m/s)



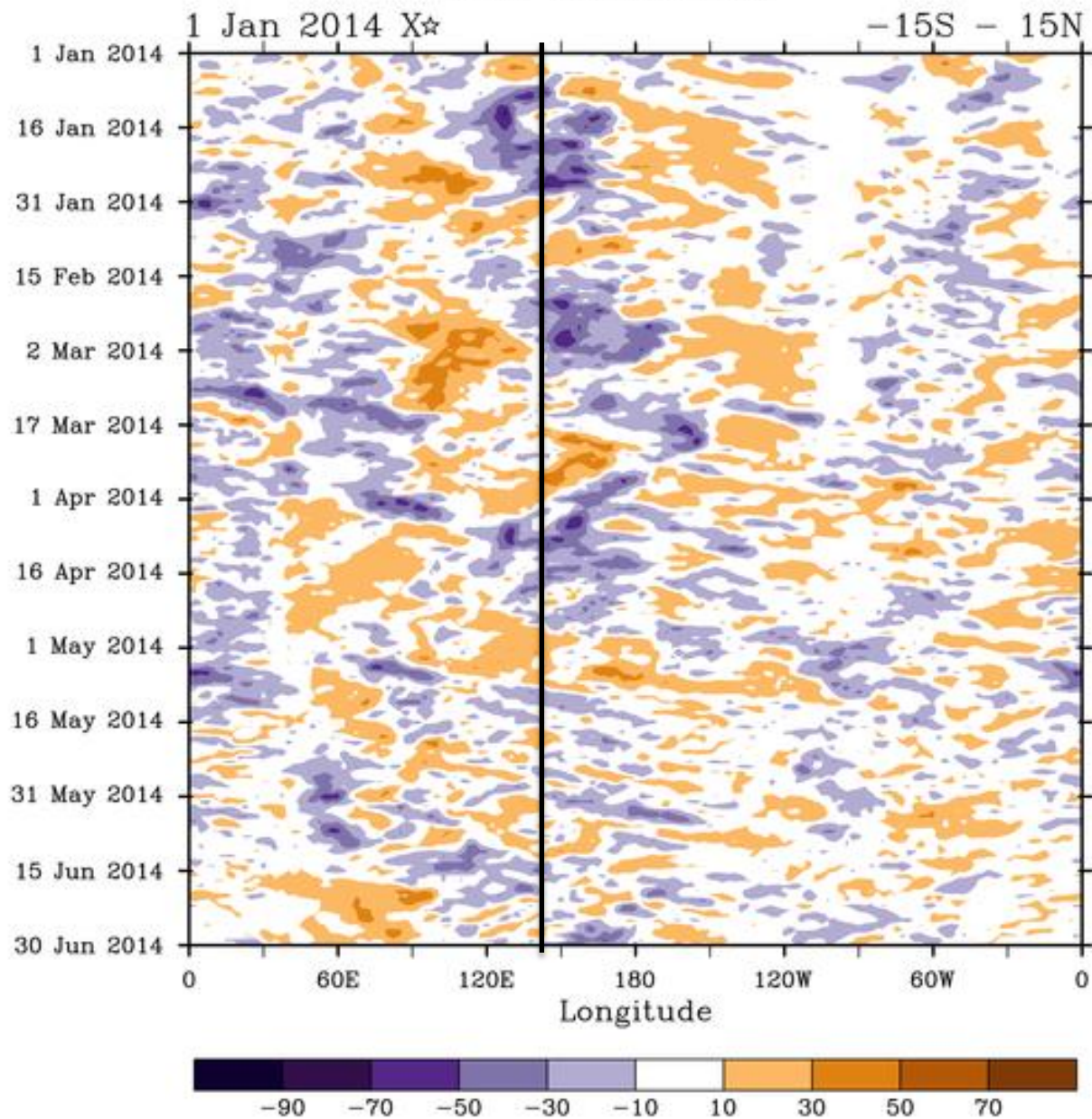
January 2014
Sea Level Pressure (hPa)



Sea Level Pressure Anomaly (hPa)

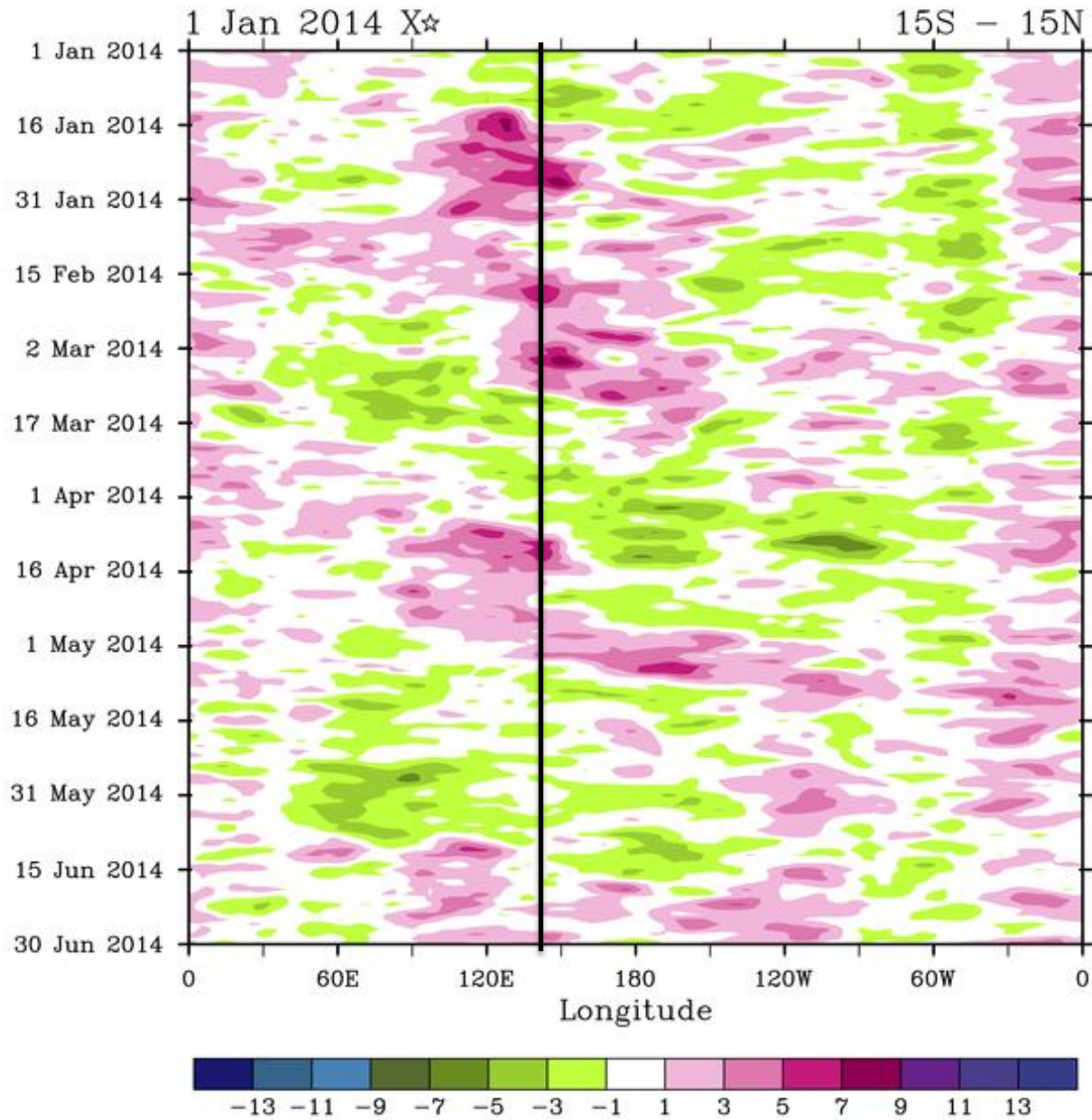


OLR Anomalies ^B

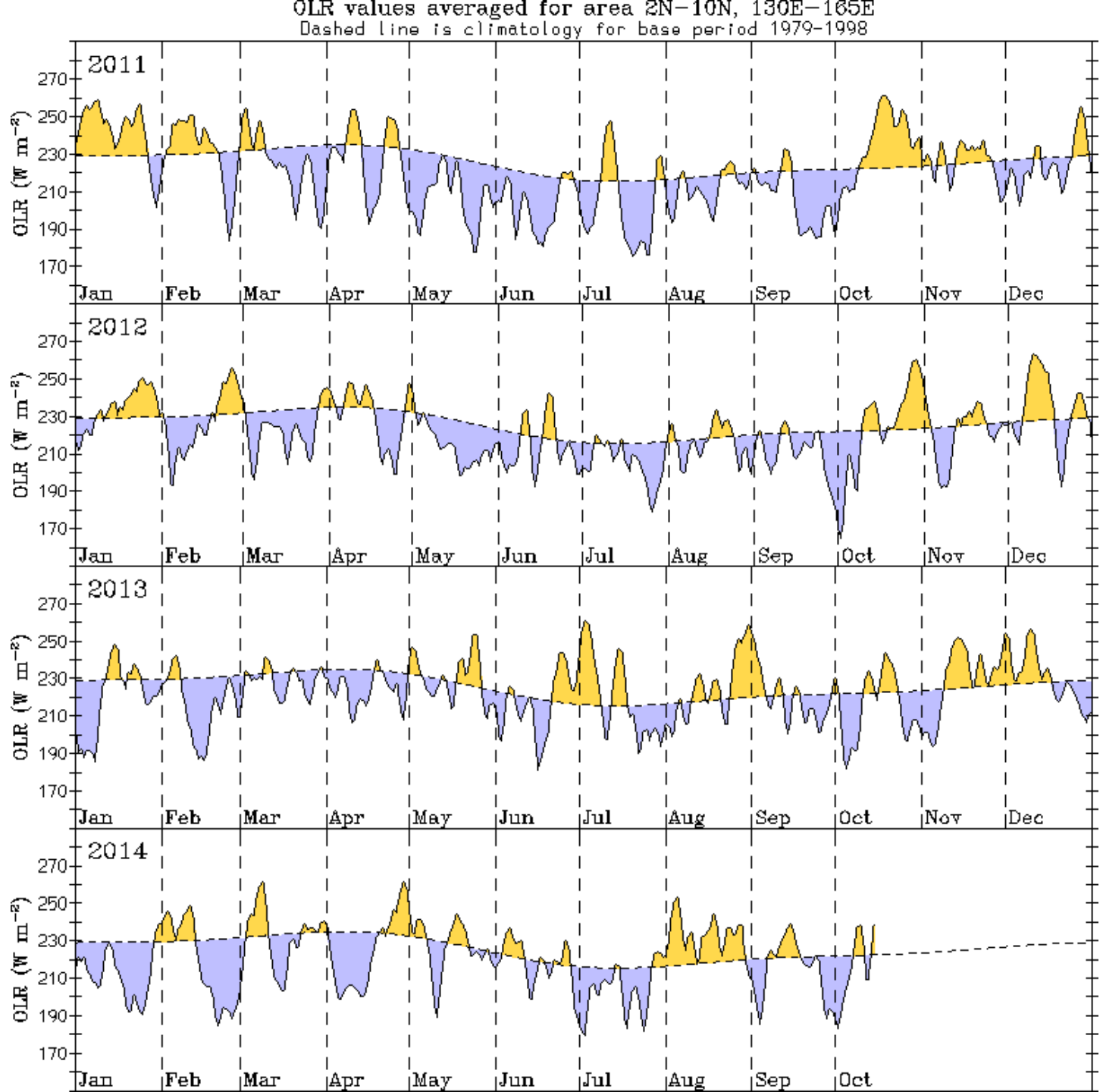


850 hPa

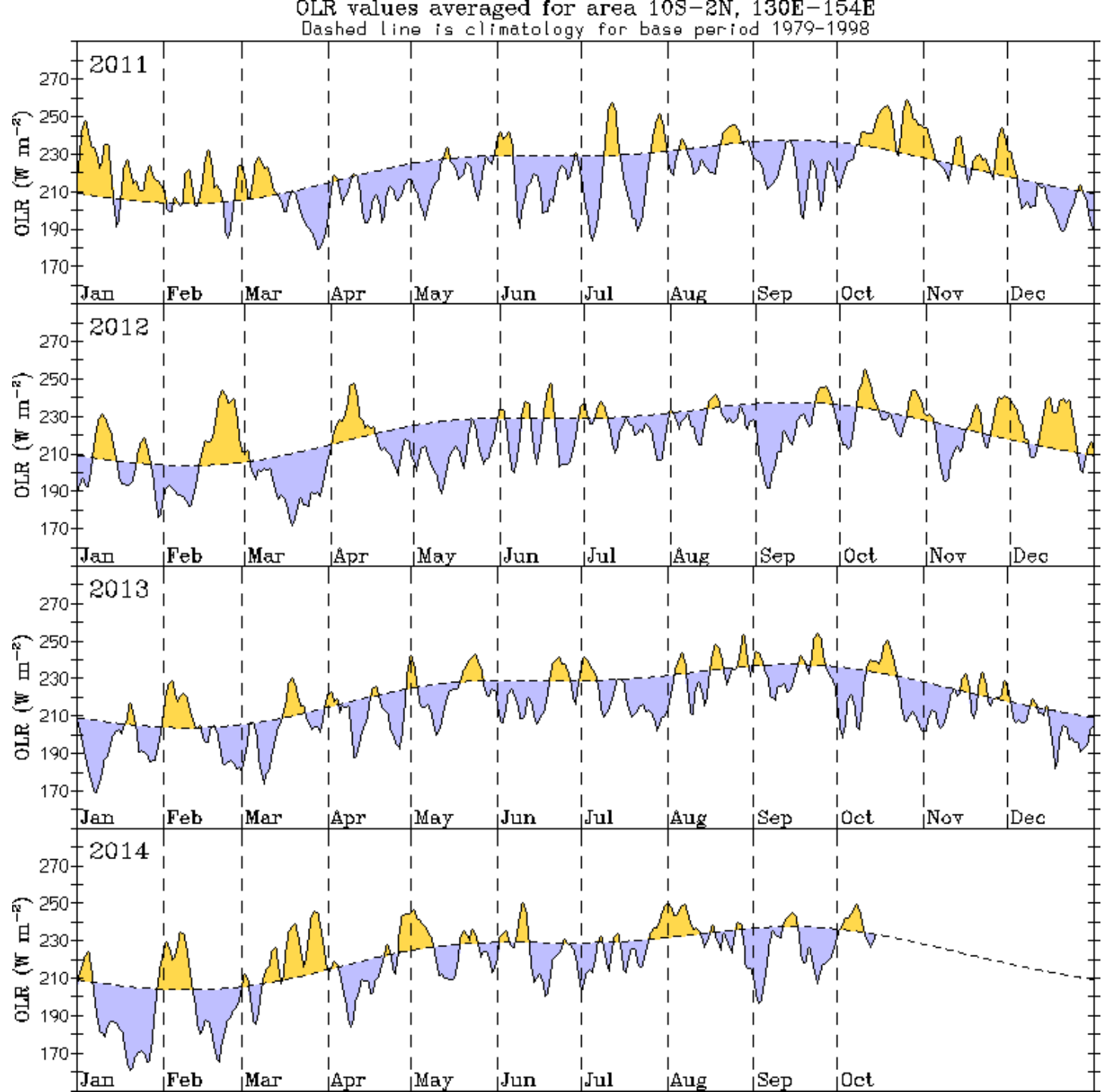
Westerly Wind Anomalies

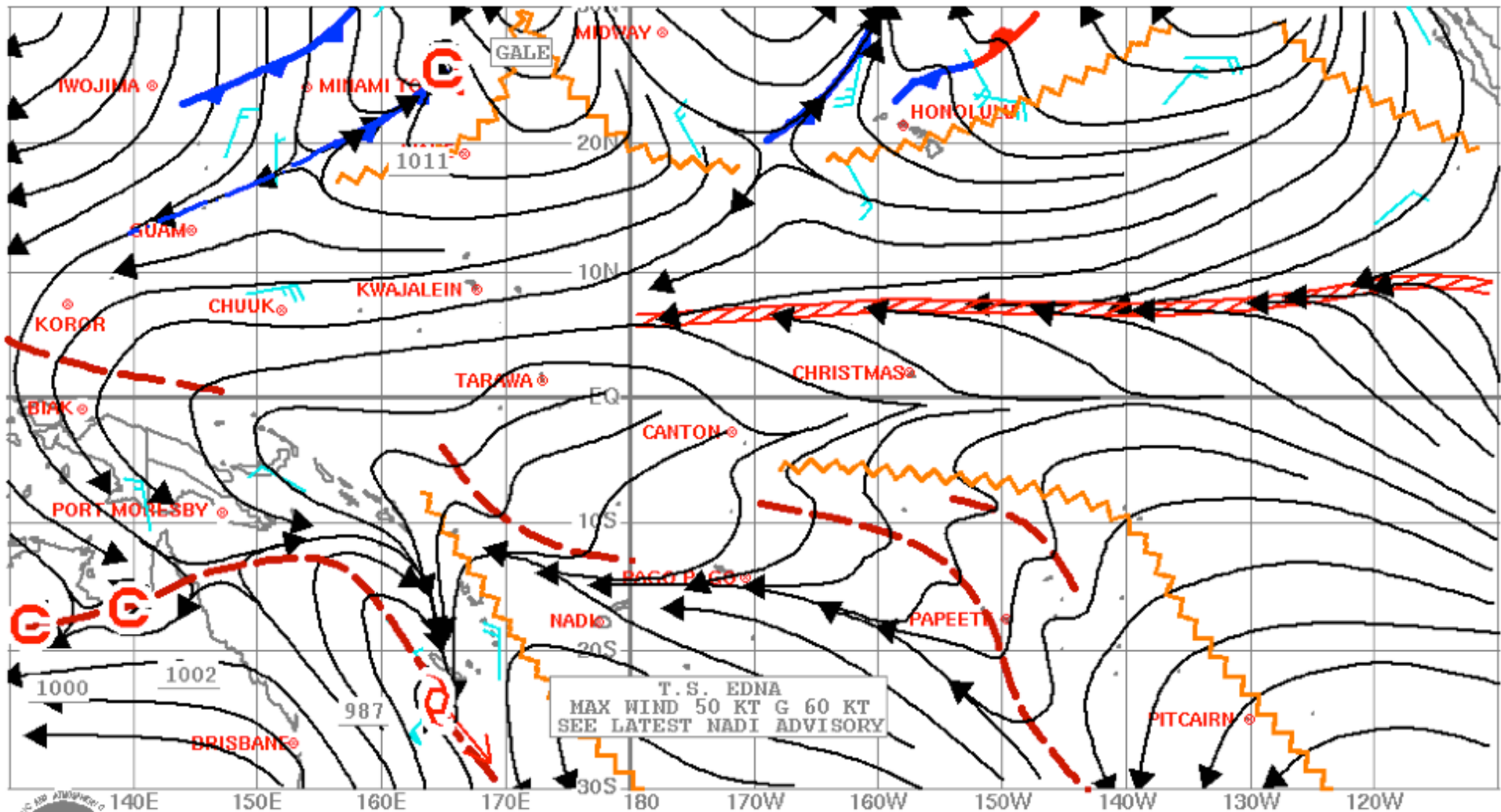


Micronesia



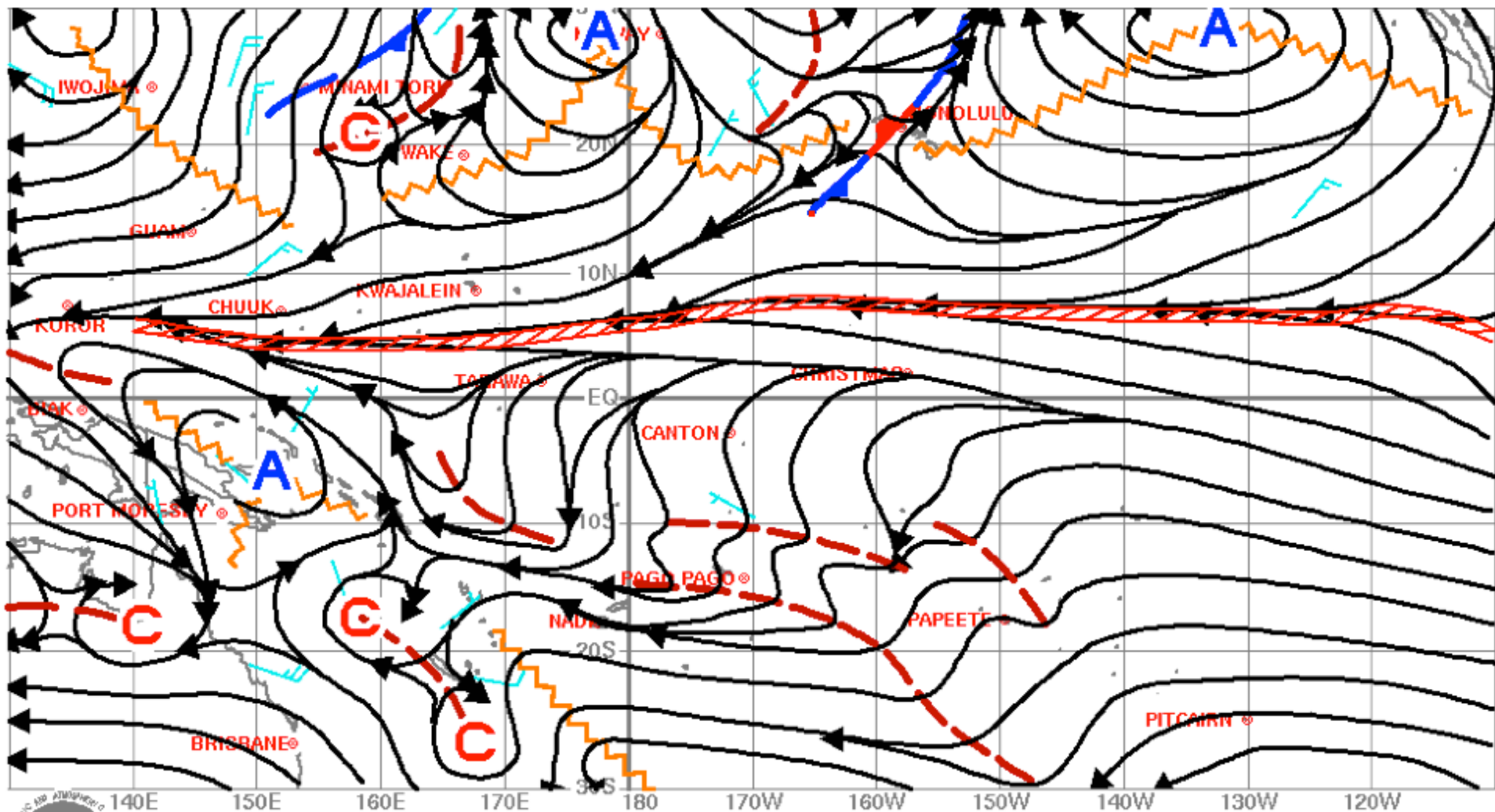
New Guinea





PACIFIC STREAMLINE ANALYSIS - FEB 05 2014 - 12 UTC
 KVM-70 U.S. Dept. of Commerce/NOAA/National Weather Service Honolulu, Hawaii

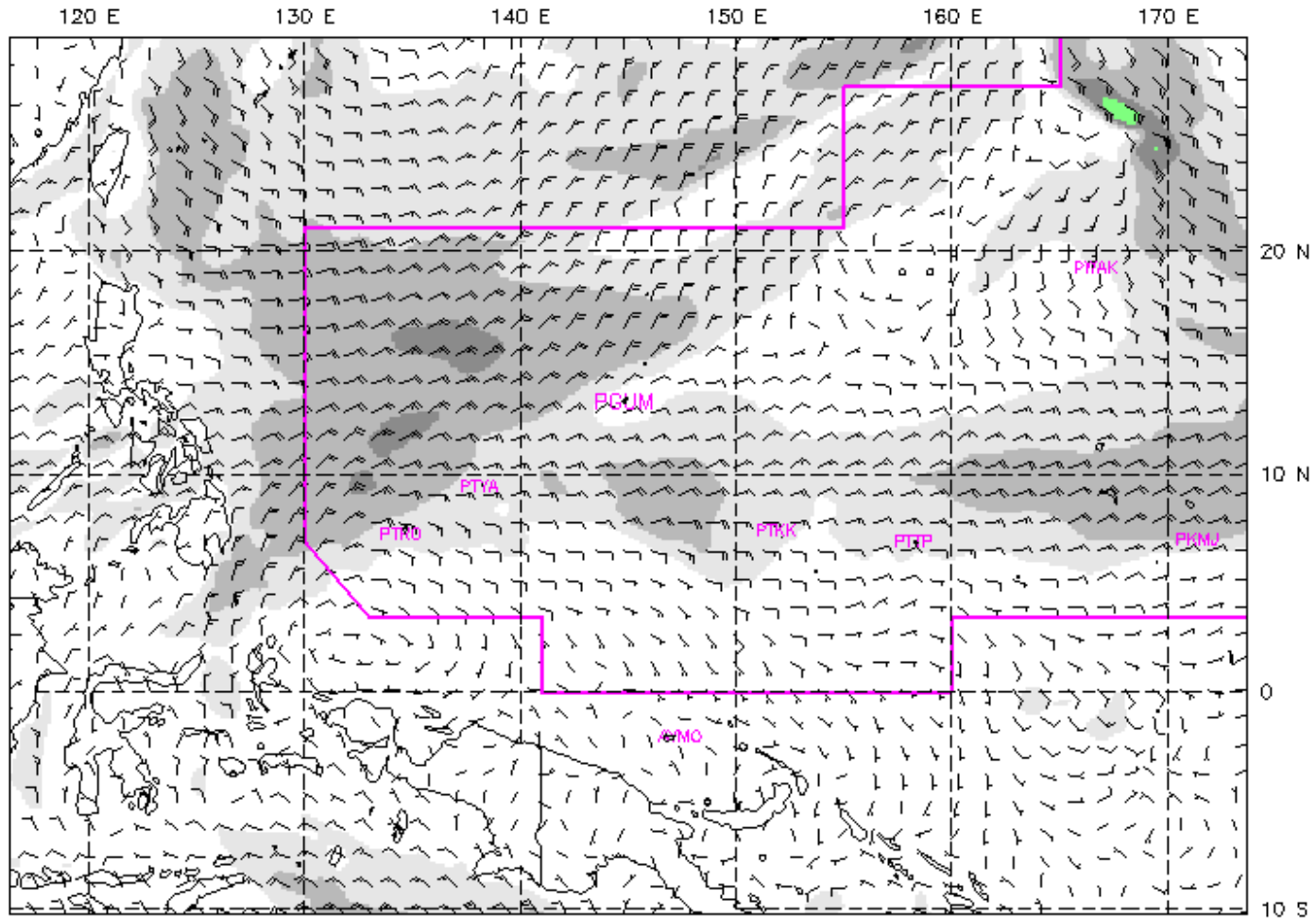


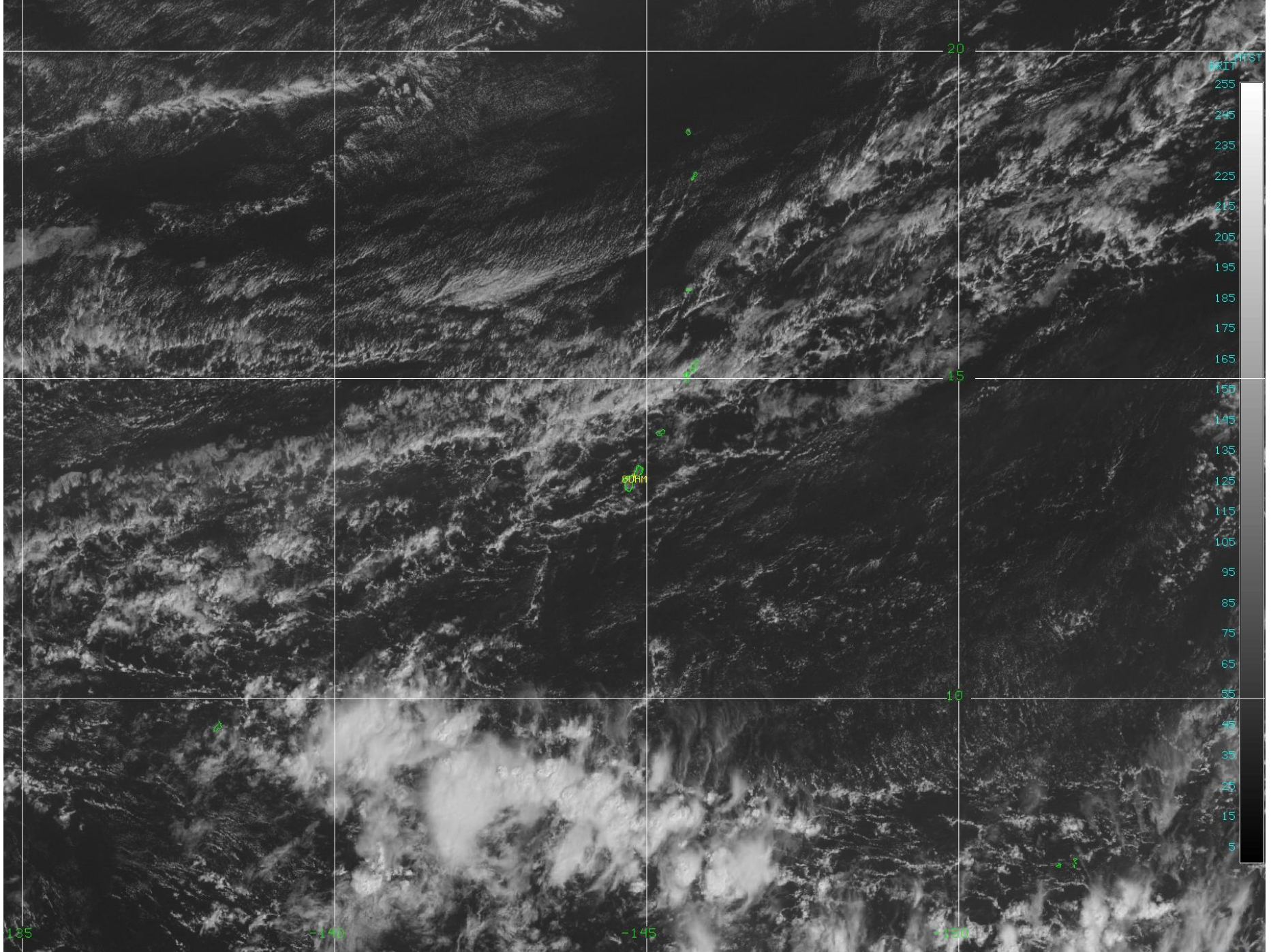


PACIFIC STREAMLINE ANALYSIS - FEB 06 2014 - 12 UTC
 KVM-70 U.S. Dept. of Commerce/NOAA/National Weather Service Honolulu, Hawaii



CONTRAST 15km ARW-GFS init NCAR/MMM Init: 00 UTC Thu 06 Feb 14
 Fcst: 0 h Valid: 00 UTC Thu 06 Feb 14 (10 ChT Thu 06 Feb 14)
 Horizontal wind speed at k-index = 39 sm= 1
 Horizontal wind vectors at k-index = 39 sm= 1





BT (K)

255

245

235

225

215

205

195

185

175

165

155

145

135

125

115

105

95

85

75

65

55

45

35

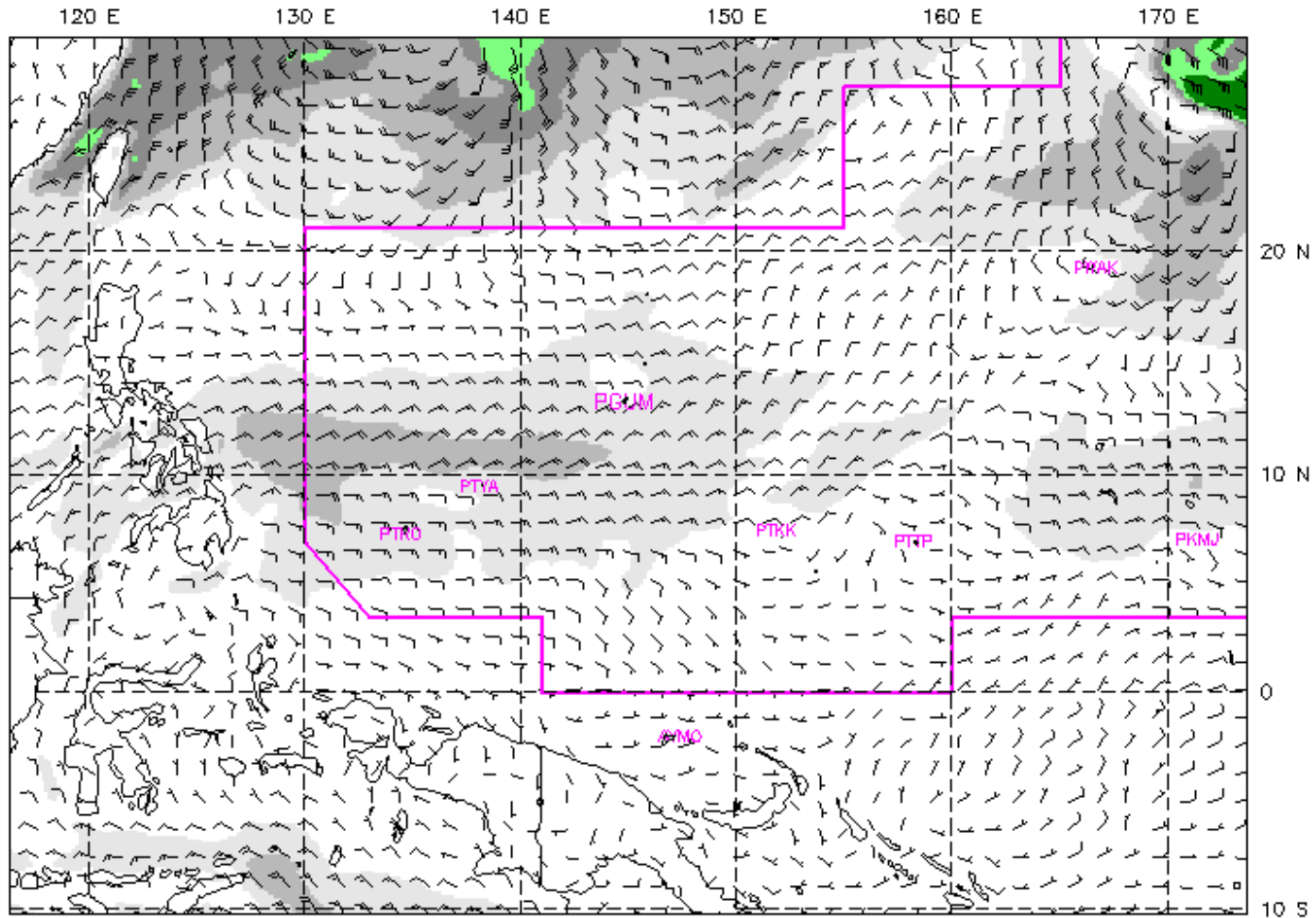
25

15

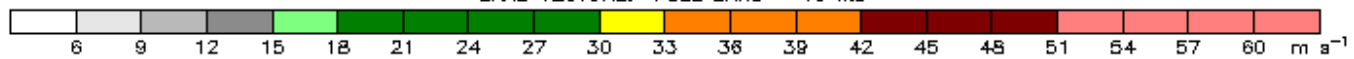
5

135 -140 -145 -150

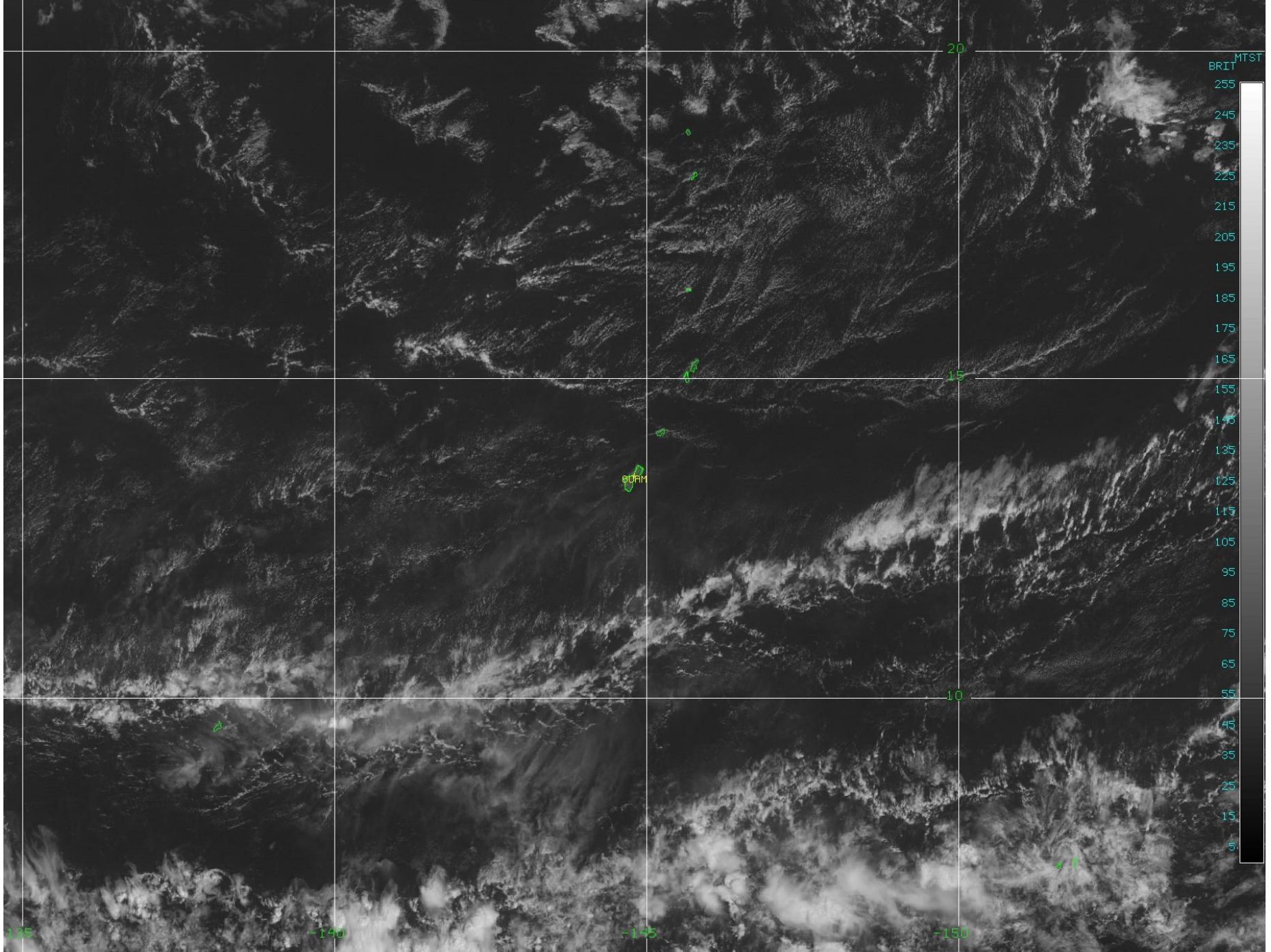
CONTRAST 15km ARW-GFS init NCAR/MMM Init: 00 UTC Sat 08 Feb 14
 Fcst: 0 h Valid: 00 UTC Sat 08 Feb 14 (10 ChT Sat 08 Feb 14)
 Horizontal wind speed at k-index = 39 sm= 1
 Horizontal wind vectors at k-index = 39 sm= 1



BARB VECTORS: FULL BARB = 10 kts



Model Info: V3.5.1 CU: G3 MP: Thompson PBL: YSU SF: Noah LSM 15 km 39 levels 90 sec
 LW: RRTMG SW: RRTMG DIFF: simple KM: 3D Smagor DAMP: Rayleigh3 SFLAY: Rev MM5



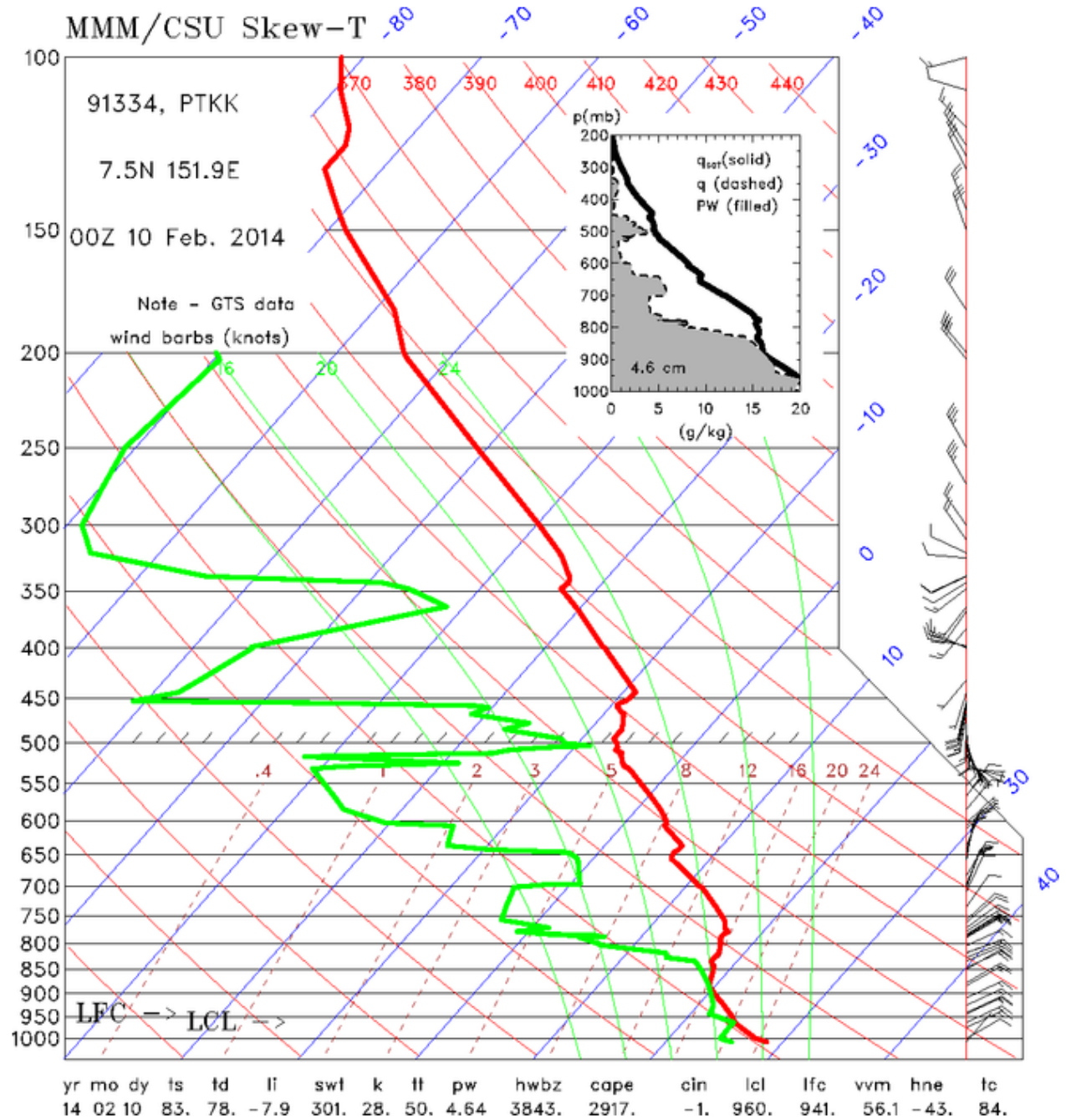
135

-140

-145

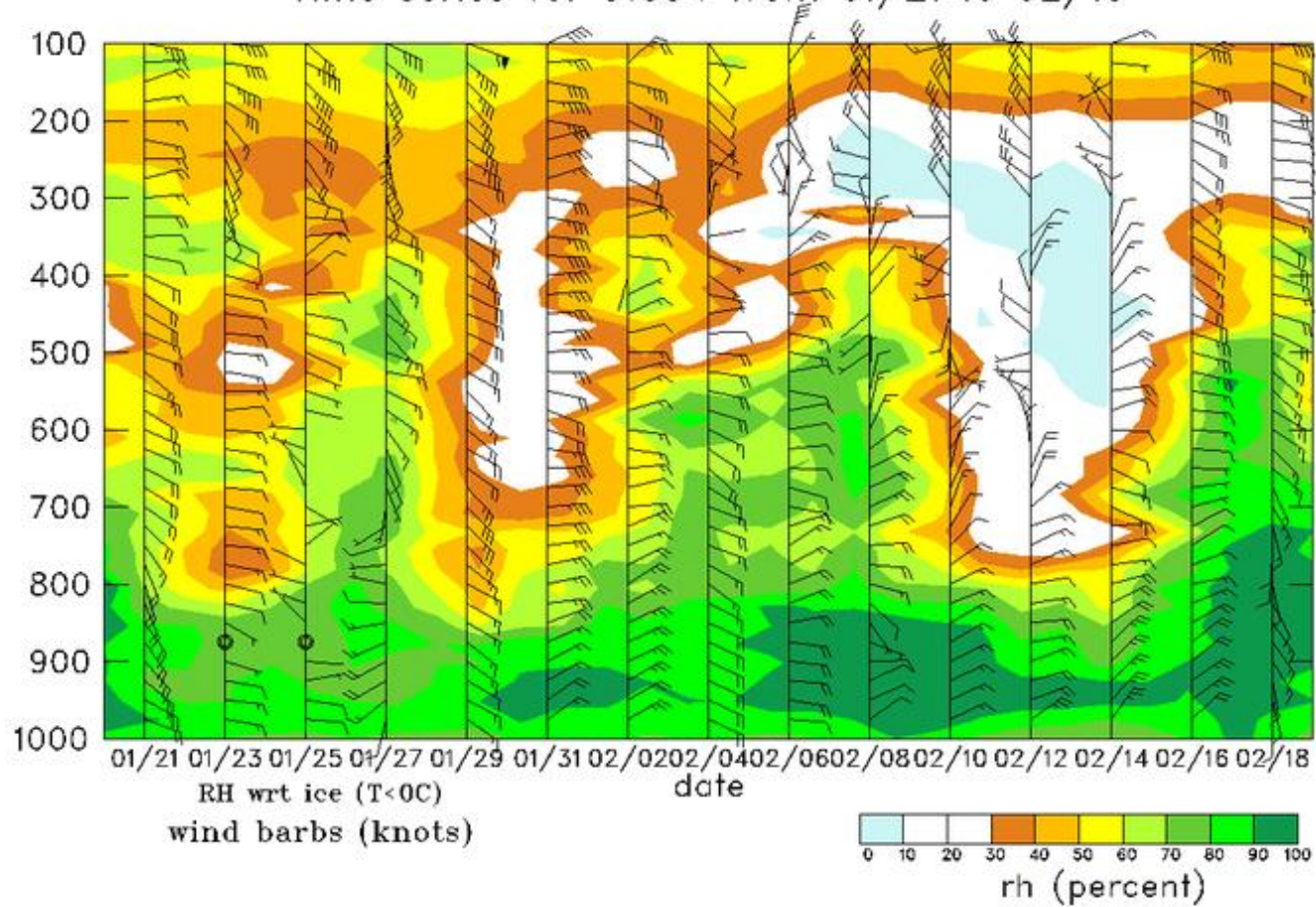
-150

Chuuk



Chuuk

Time series for 91334 from 01/21 to 02/19



Episodes of dry air at relatively low altitudes

Summary of notable tropospheric features during CONTRAST

- Frequent occurrence or passage of cold fronts/shear lines in the CONTRAST domain.
- Above normal rainfall. Above normal occurrence of cold clouds ($<235\text{K}$).
- Two distinct MJO episodes in the CONTRAST domain: approximately 16-31 January and 20 February to 4 March.

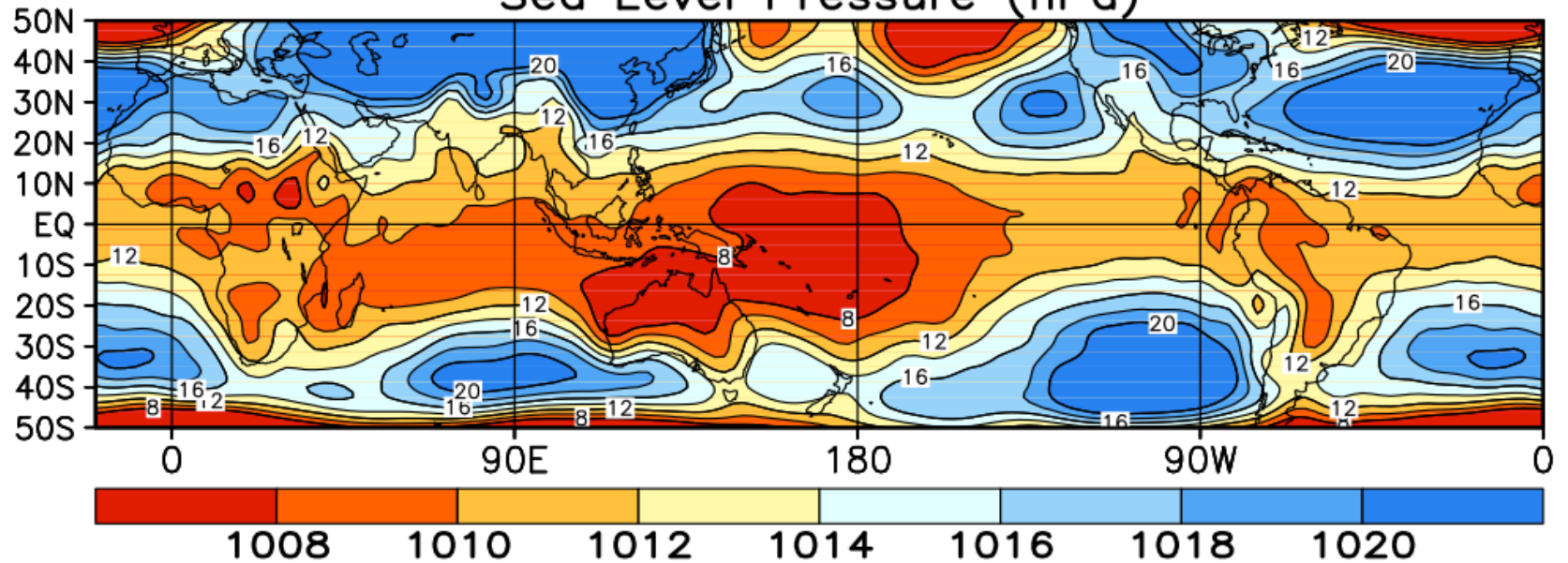
Summary of notable tropospheric features during CONTRAST

- One typhoon and two tropical storms.
- Dry air intrusions into low latitudes. Sounding time series show 3 significant dry intrusions extending south of 10 N.
- Low-level boundaries in low latitudes were present (remnant shear lines, ITCZ, near-equatorial trough).

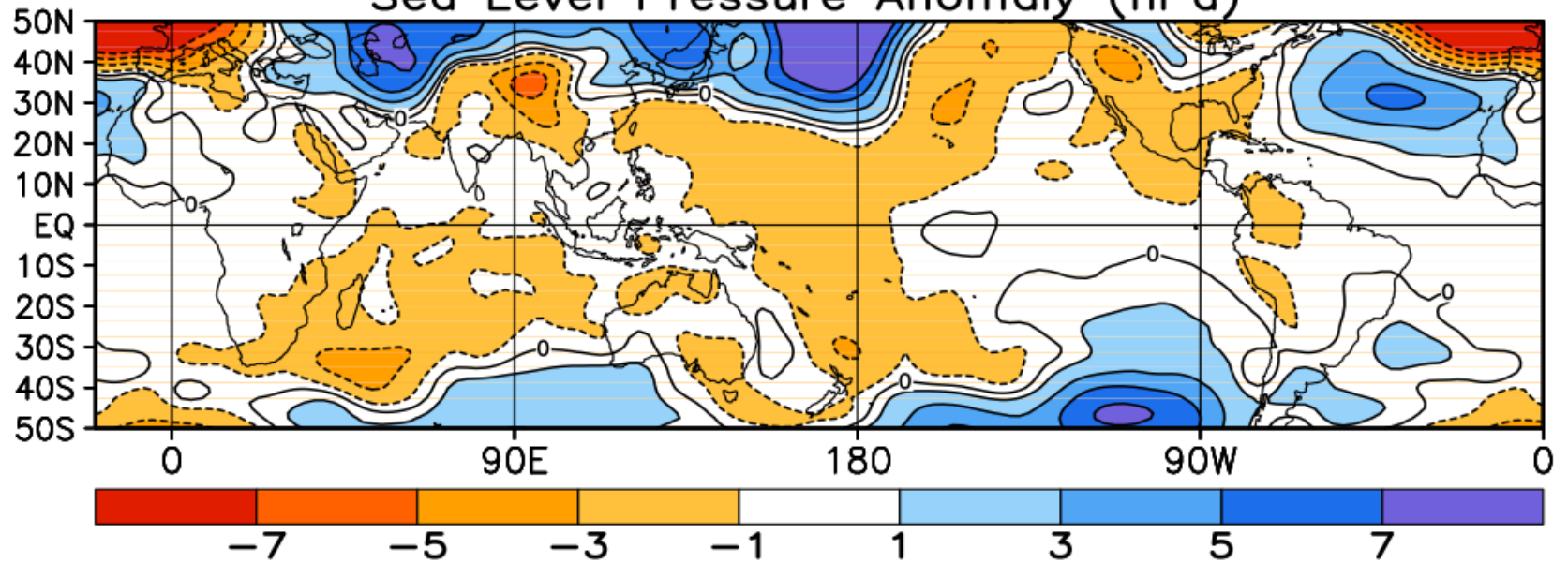
Thank you!



February 2014 Sea Level Pressure (hPa)

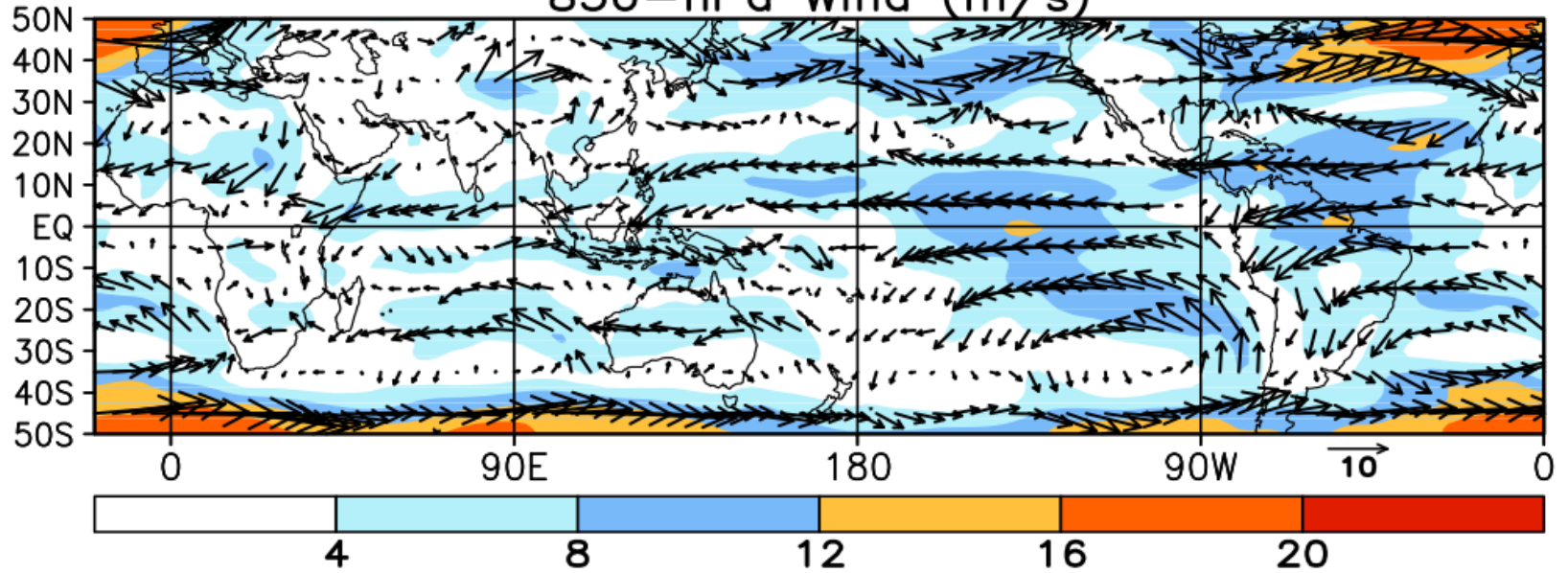


Sea Level Pressure Anomaly (hPa)

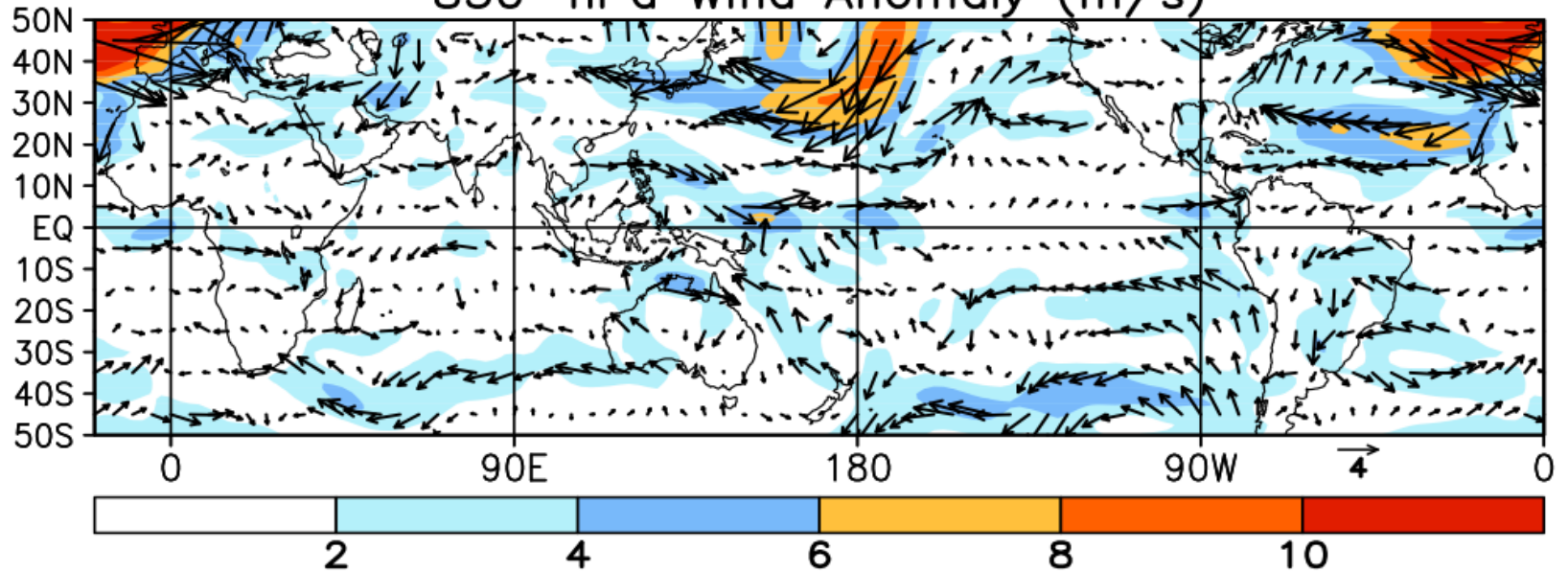


February 2014

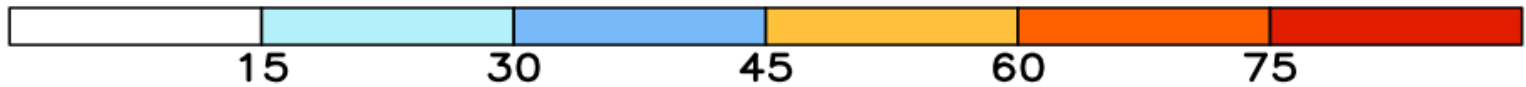
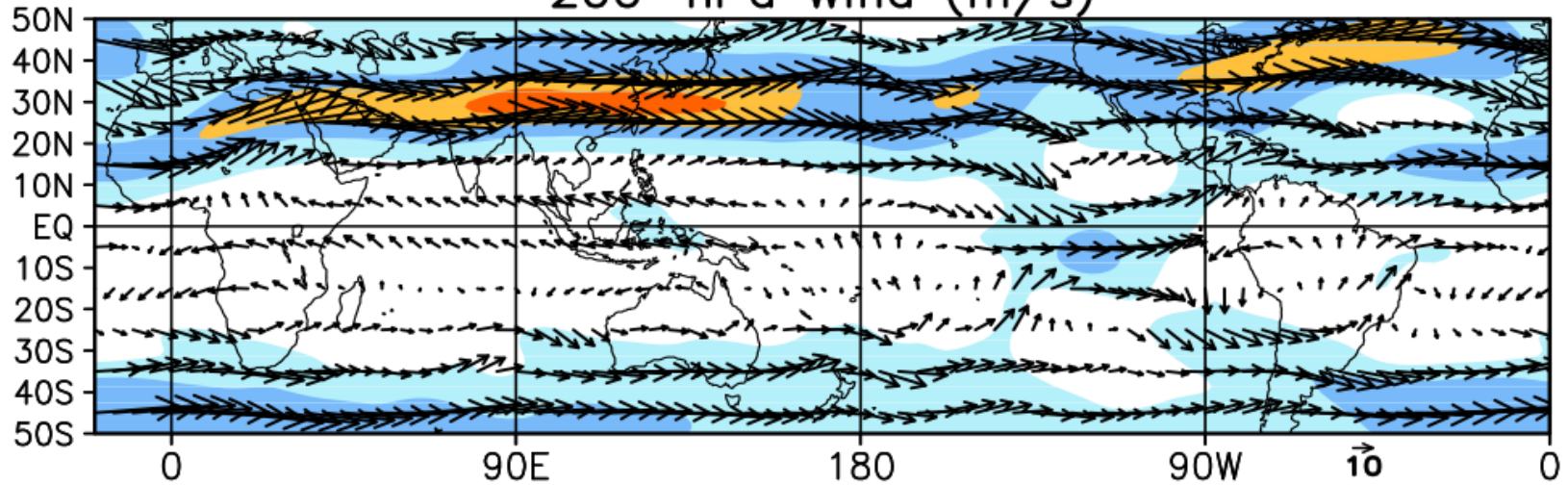
850-hPa Wind (m/s)



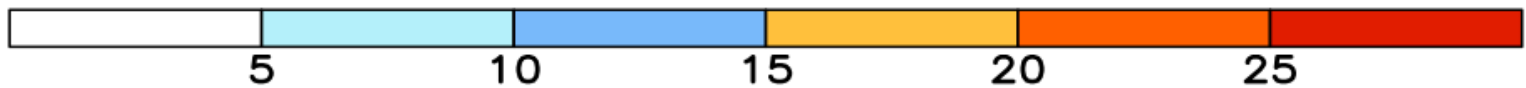
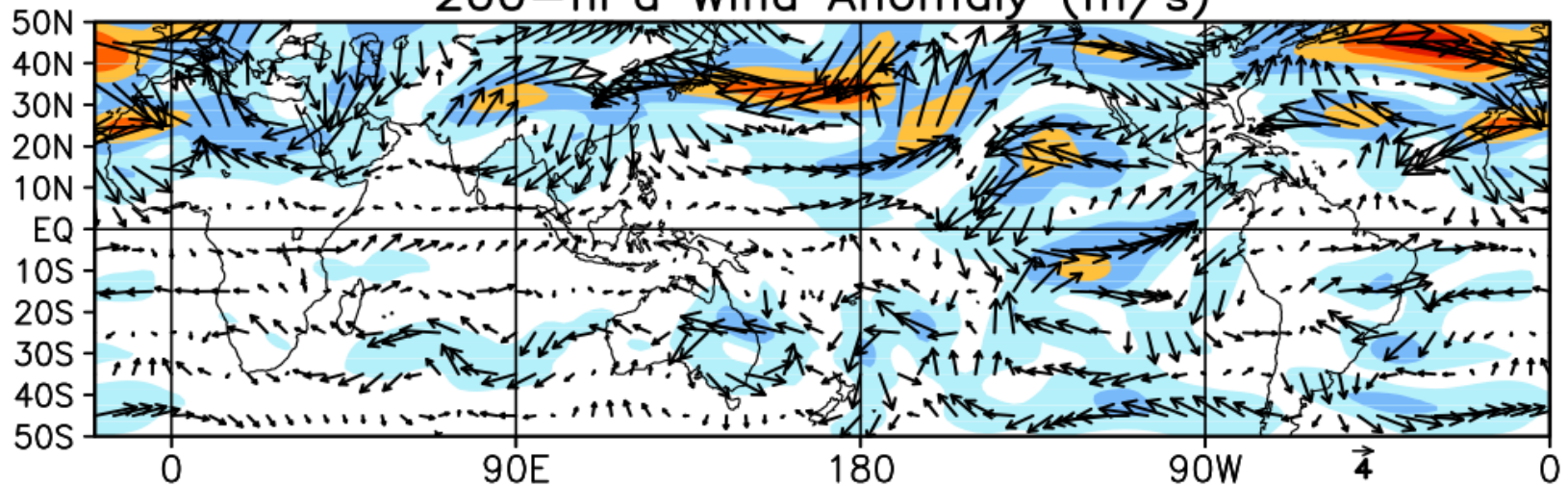
850-hPa Wind Anomaly (m/s)



February 2014
200-hPa Wind (m/s)

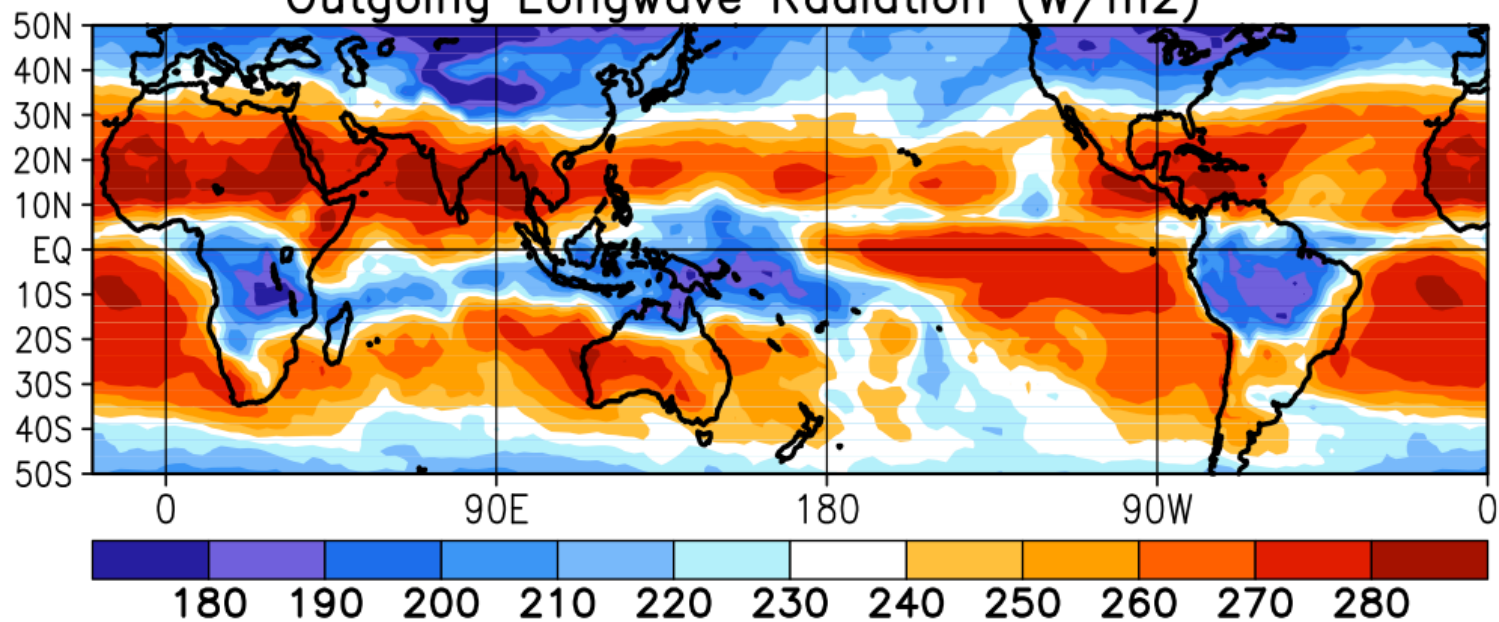


200-hPa Wind Anomaly (m/s)

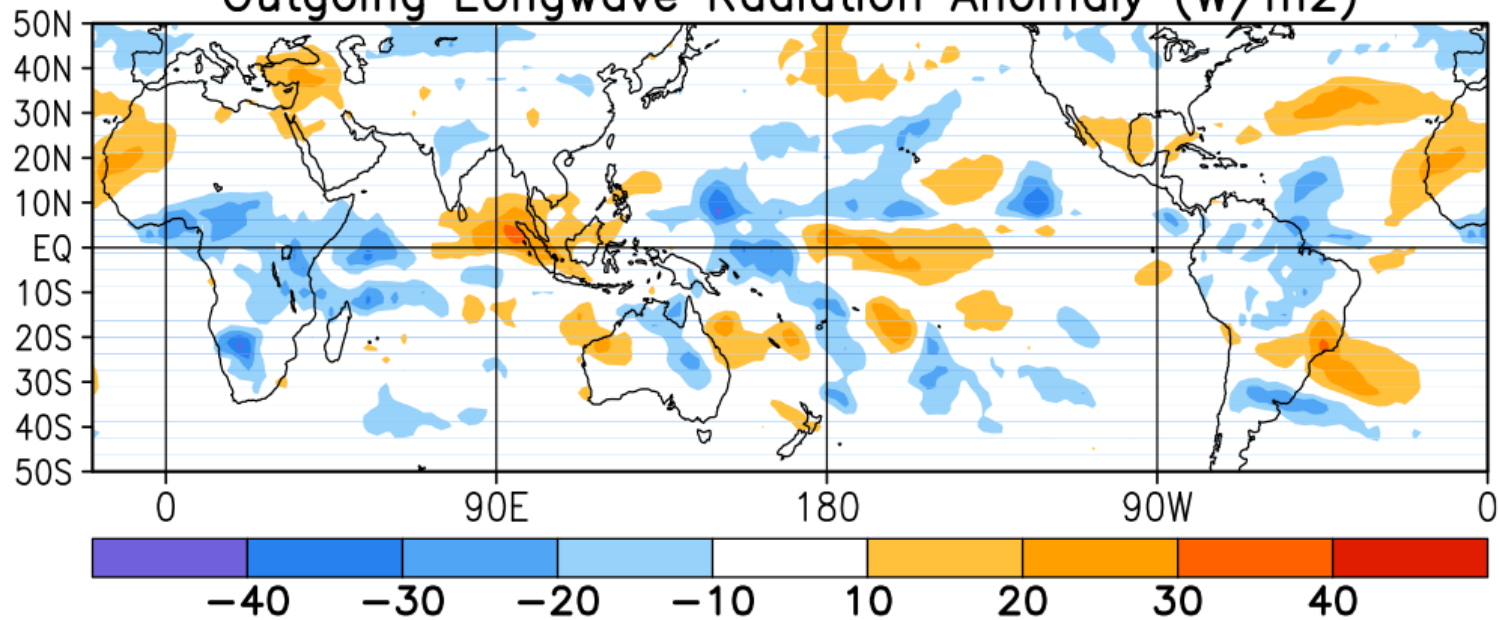


February 2014

Outgoing Longwave Radiation (W/m²)

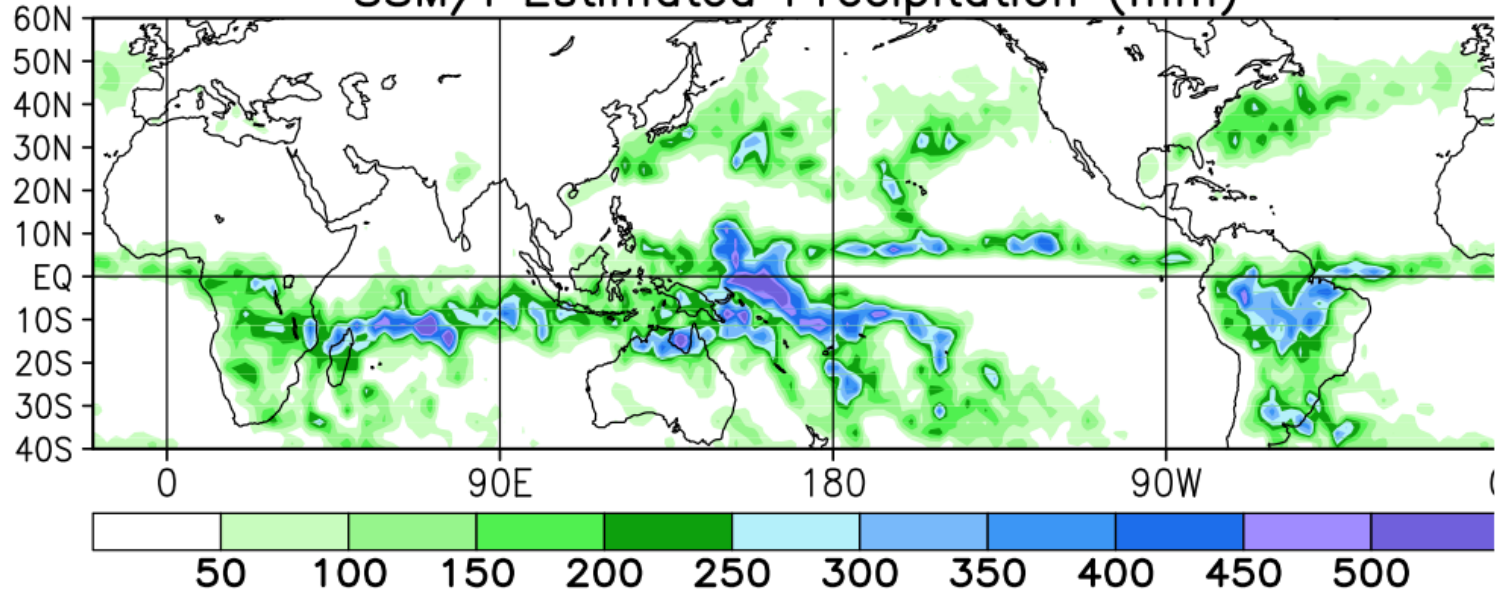


Outgoing Longwave Radiation Anomaly (W/m²)

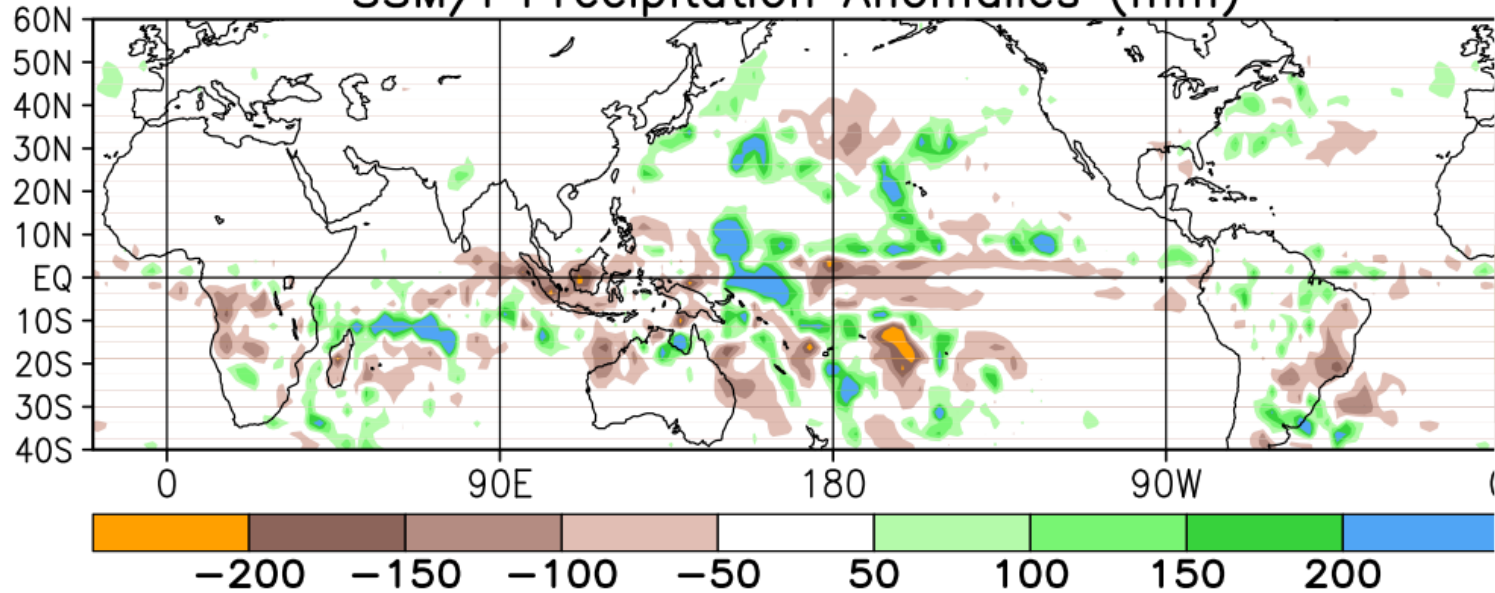


February 2014

SSM/I Estimated Precipitation (mm)

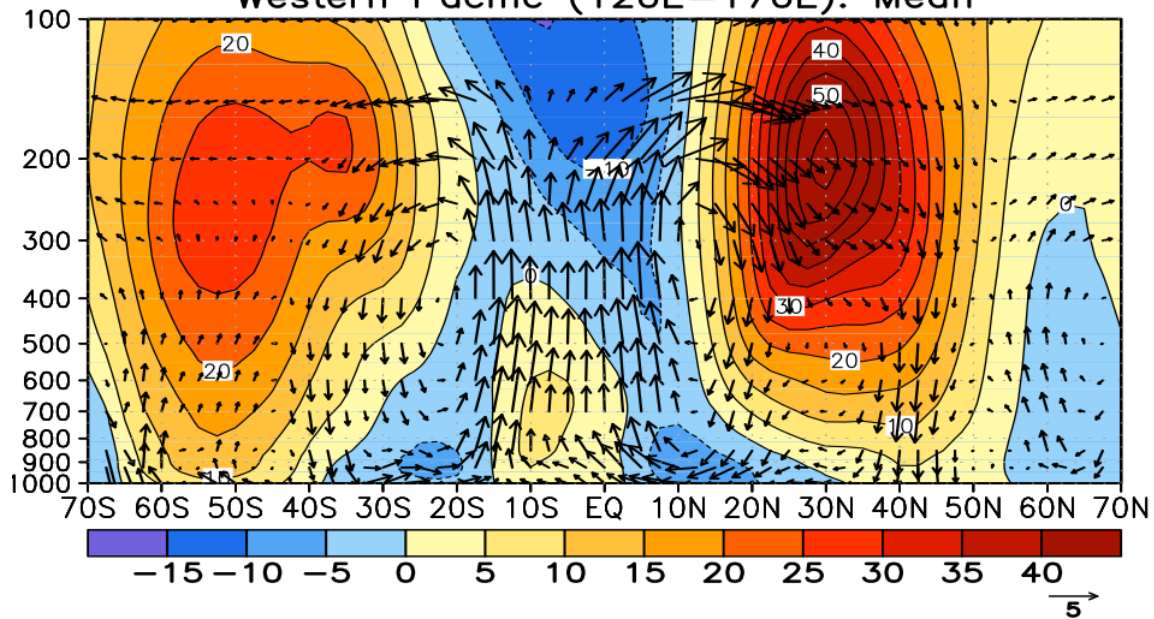


SSM/I Precipitation Anomalies (mm)

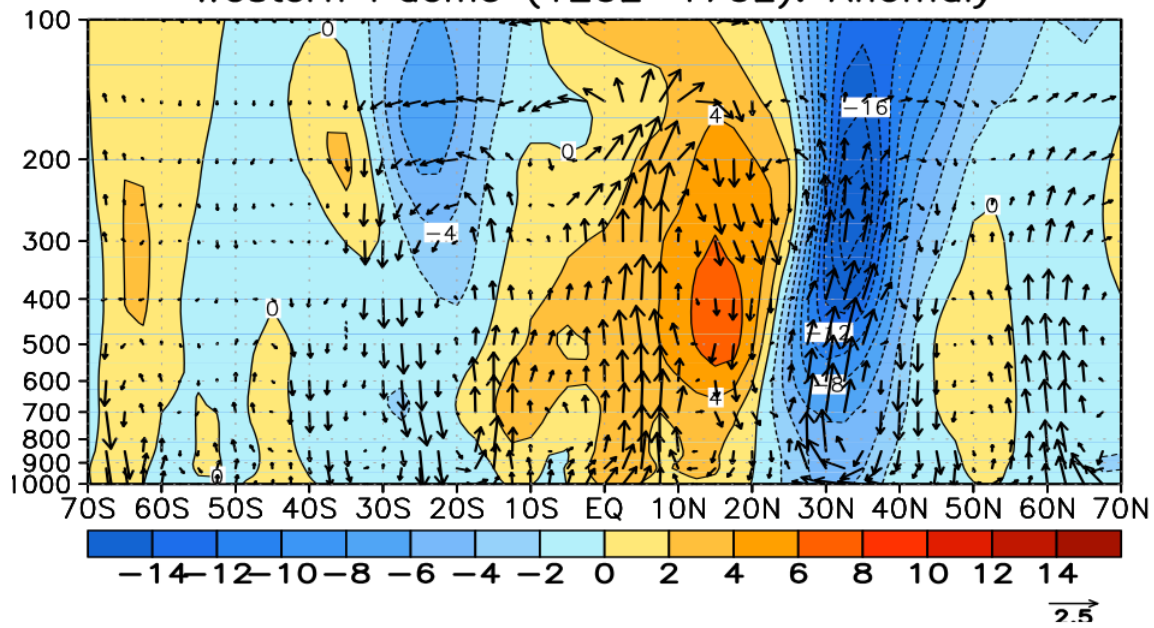


February 2014

Zonal Wind and N-S Divergent Circulation
Western Pacific (120E–170E): Mean

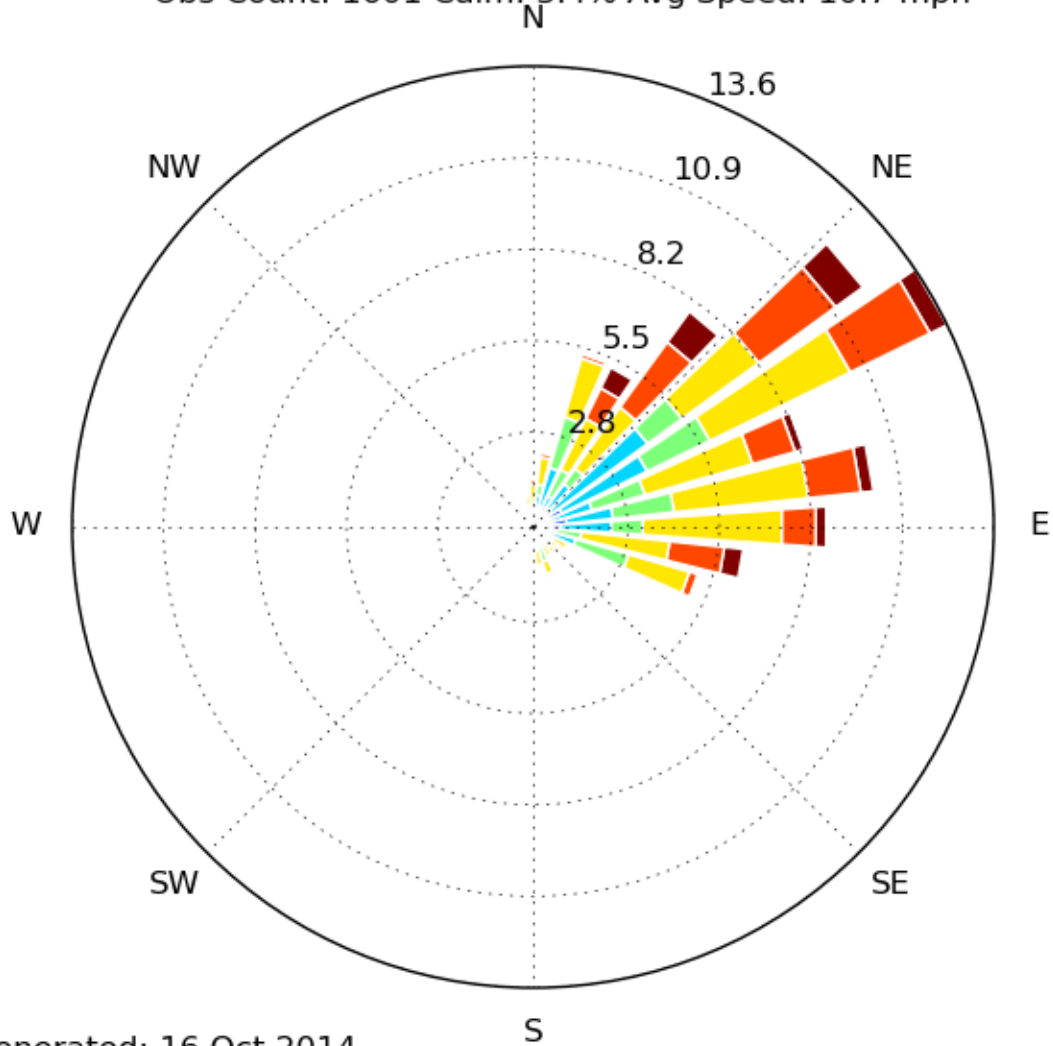


Western Pacific (120E–170E): Anomaly

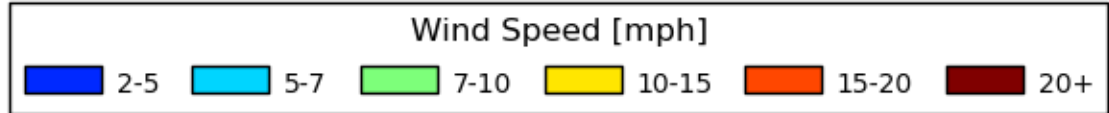




[PGUM] Agana
Windrose Plot [All Year]
Period of Record: 10 Jan 2014 - 28 Feb 2014
Obs Count: 1601 Calm: 3.4% Avg Speed: 10.7 mph

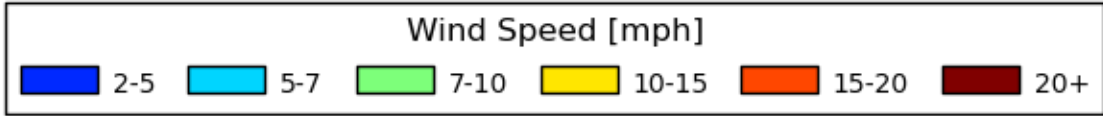
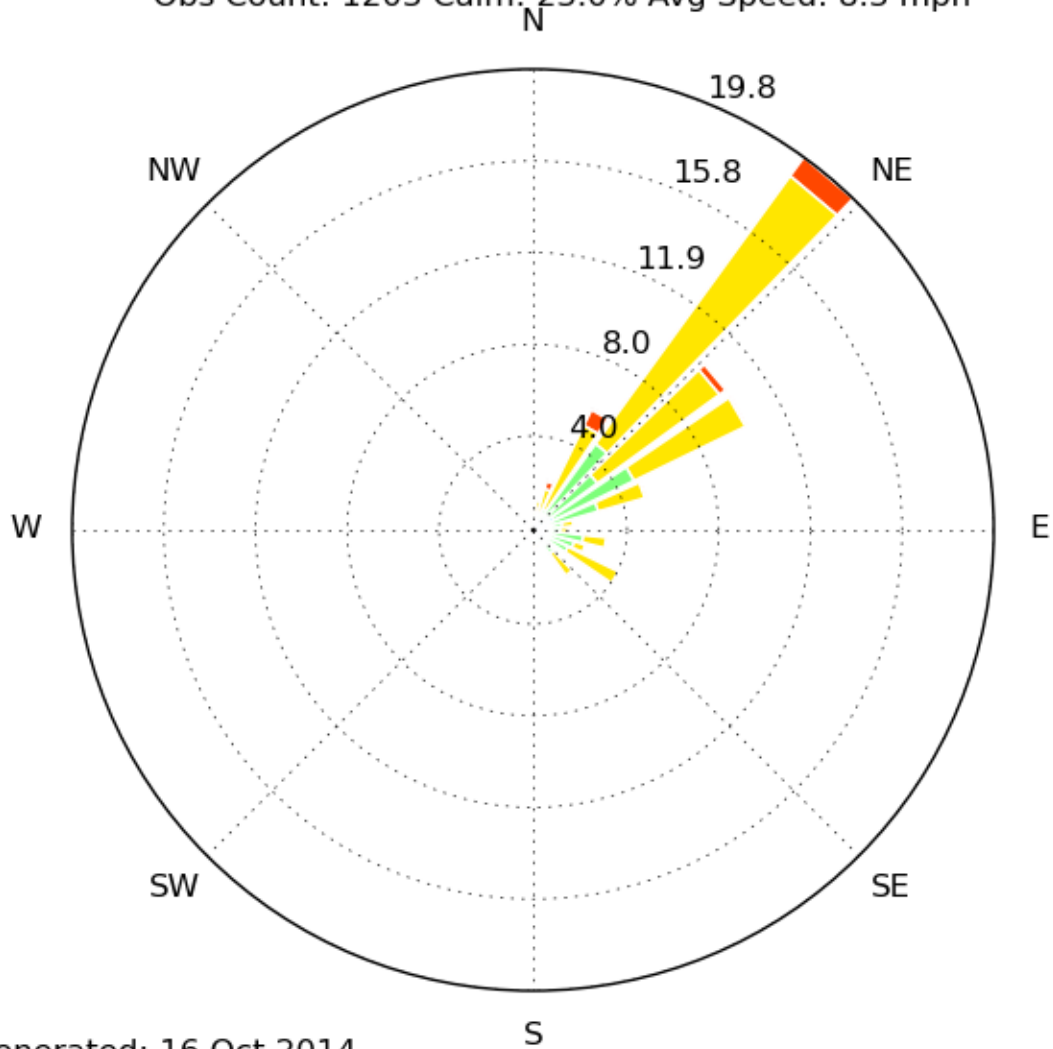


Generated: 16 Oct 2014



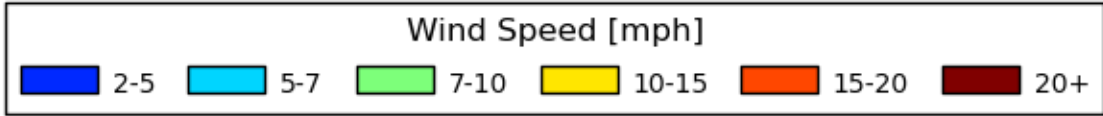
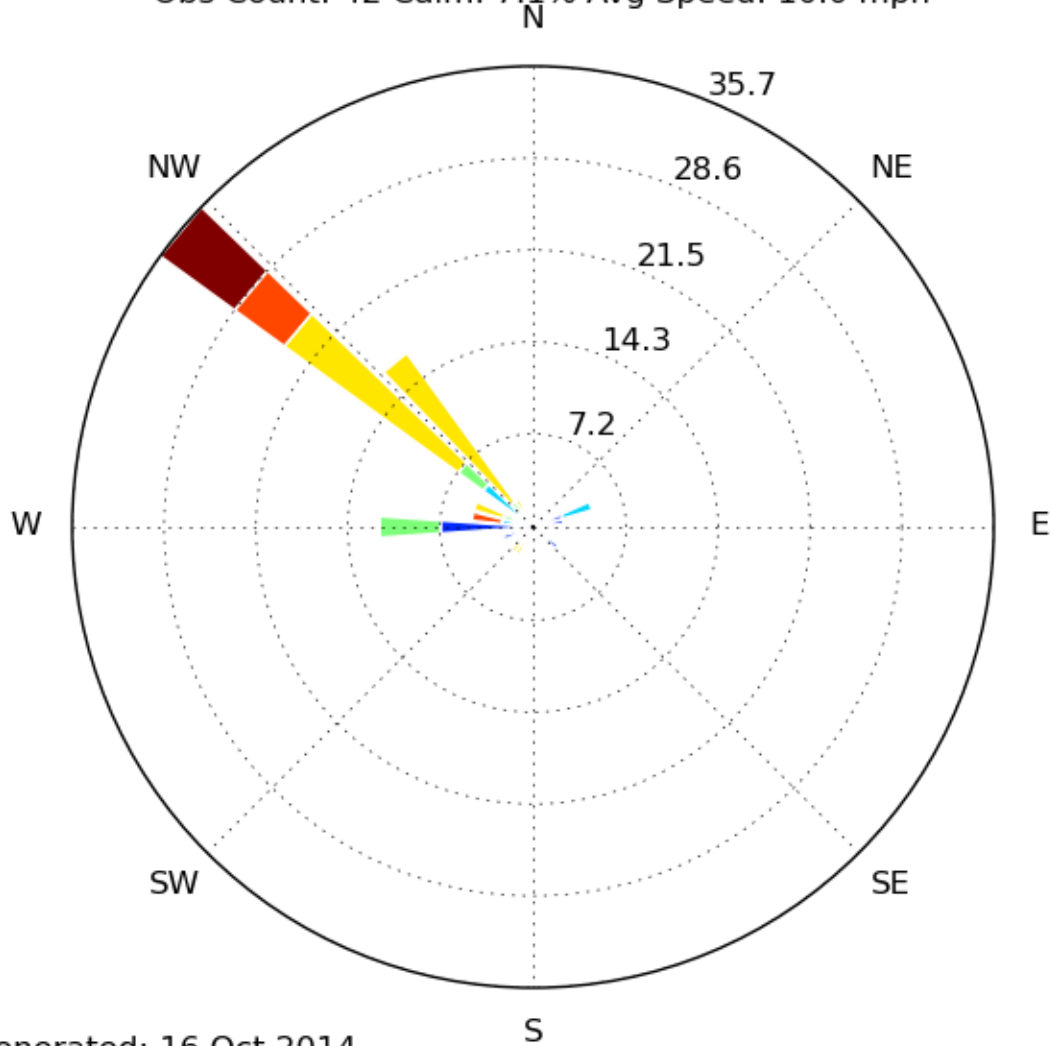


[PTKK] WENO IS/CHUUK
Windrose Plot [All Year]
Period of Record: 10 Jan 2014 - 28 Feb 2014
Obs Count: 1203 Calm: 23.0% Avg Speed: 8.3 mph





[AYMO] MOMOTE MANUS IS
Windrose Plot [All Year]
Period of Record: 10 Jan 2014 - 25 Feb 2014
Obs Count: 42 Calm: 7.1% Avg Speed: 10.0 mph



Summary

In Jan-Feb 2014 over the Contrast region,

- It was wetter than normal years.
- there were more cold clouds (< 235 K) than normal years.
- dominated by MJO phase 6-7, there were more organized precipitation systems than normal years
- though there were more cold clouds and precipitation, no excessive intense convection was found. Most of those intense convection was over land. This indicates more deep convection over ocean during the season.