

Overview of 2016 Summer Climate over South Korea

Climate Prediction Division, Climate Science Bureau, KMA

08 Nov, 2016

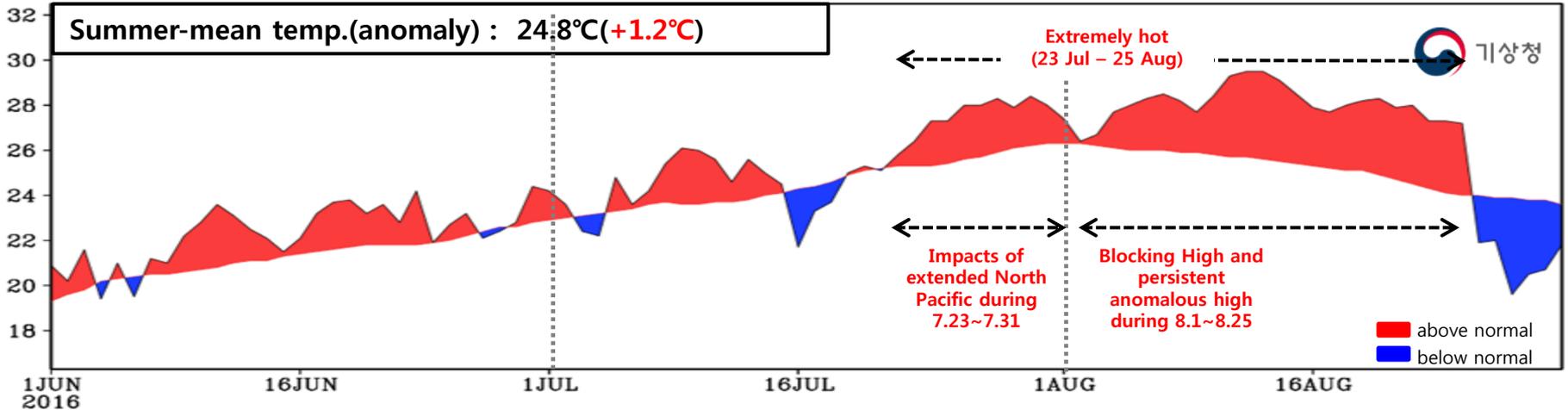
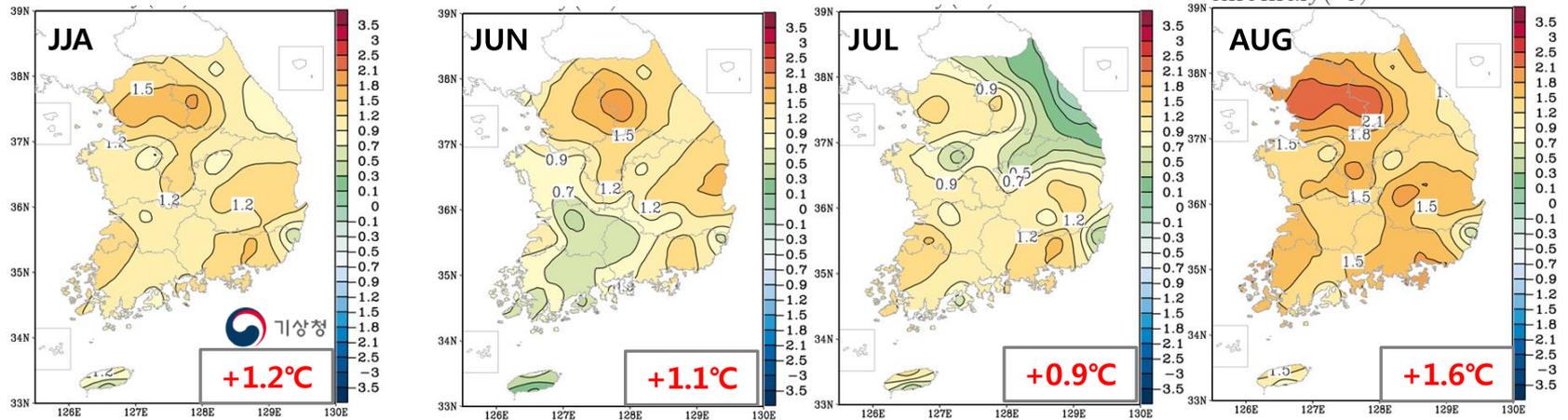
So-Young Yim, Hee-Young Cho, and Hyun-kyung Kim



기상청

Temperature anomalies over South Korea

< Spatial and temporal temperature anomalies in JJA, JUN, JUL, and AUG >



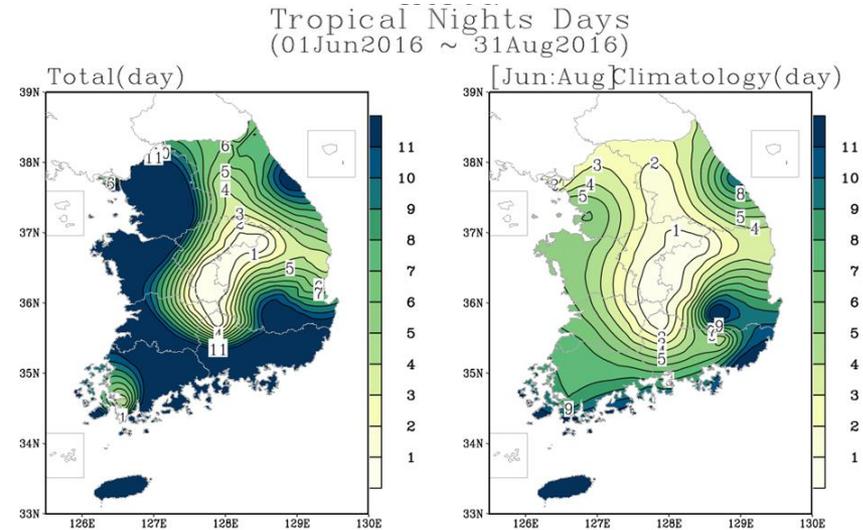
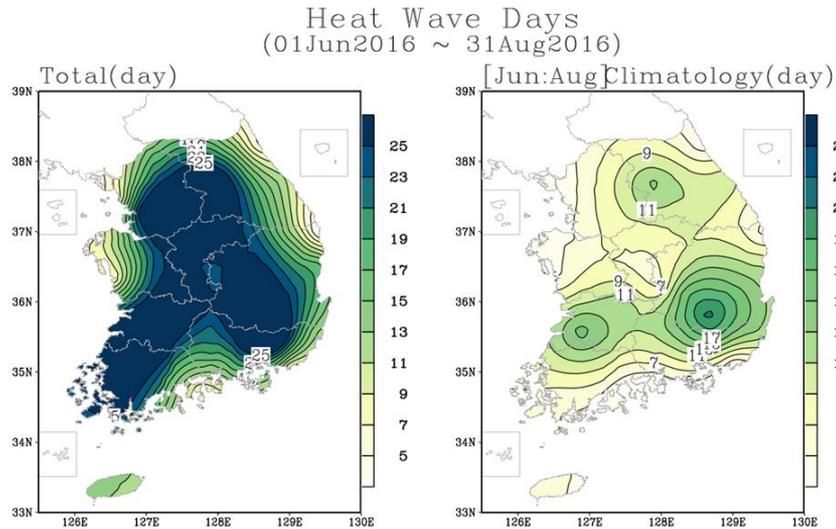
45 station data, normal: 1981-2010

	June	July	August
Normal (1981~2010)	21.2°C	24.5°C	25.1°C

Heat waves and tropical nights

< Number of heat wave days, normal: 9.8 days >

< Number of tropical night, normal: 5.1 days >

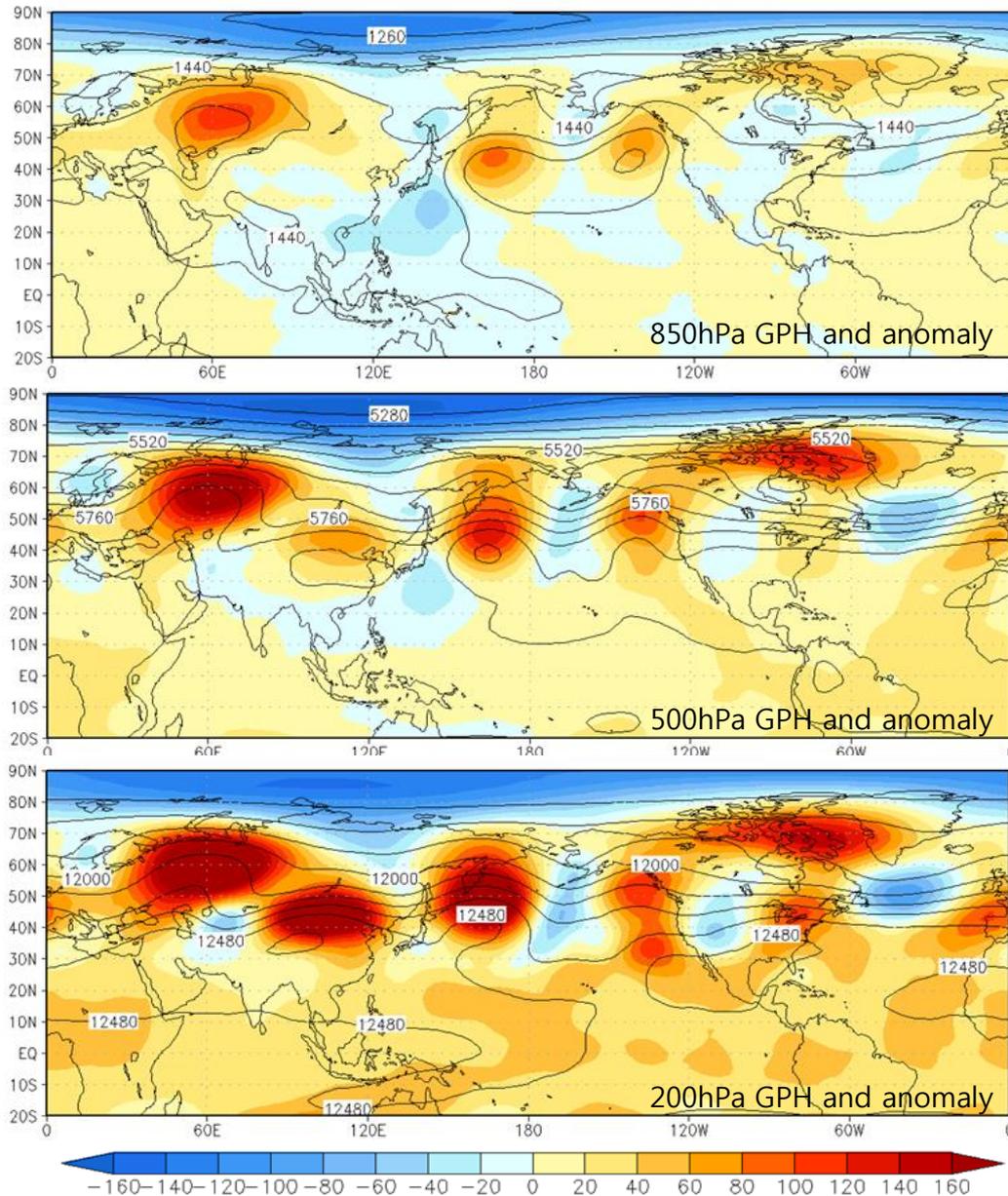


< Top five numbers of heat wave days and tropical nights during summer since 1973 >

Ranking	# of heat wave days		# of tropical nights	
1	1994	29.7	1994	36.0
2	2016	22.4	2013	32.0
3	2013	18.2	2010	23.0
4	1990	17.0	2016	20.0
5	1996	16.8	2012	17.0

- Heat wave: when the daily maximum temperature reaches 33°C
- Tropical night: when the minimum temperature during night time reaches 25°C

Atmospheric pattern during heat wave(1~25)



- ✓ Blocking High over Ural mountain and Bering Sea
- ✓ Persistent anomalous High over northeastern China
- ✓ Easterly winds

Questions

- ✓ La Nina impact?
- ✓ Blocking Highs over Ural mountain and Bering Sea?
- ✓ What caused Persistent anomalous High over northeastern China to be maintained?

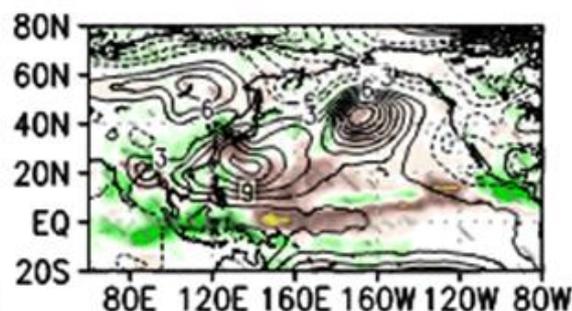
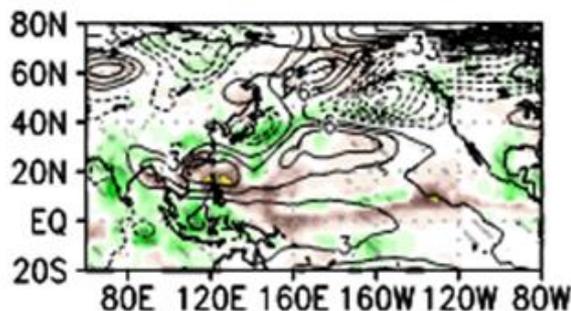
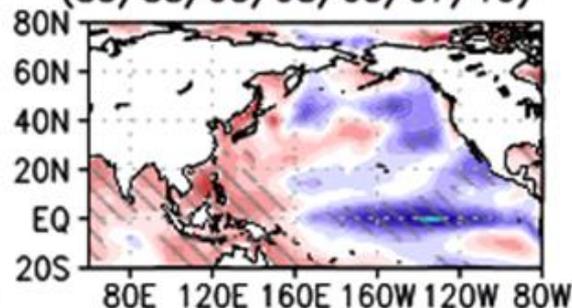
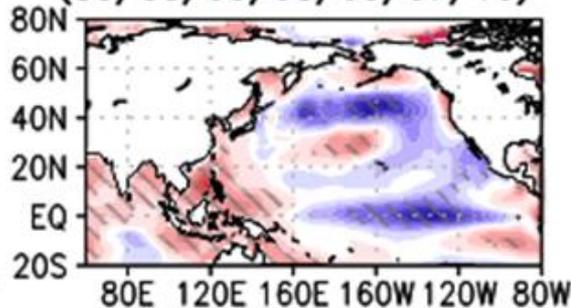
Characteristics in a decaying phase of El Nino

July

August

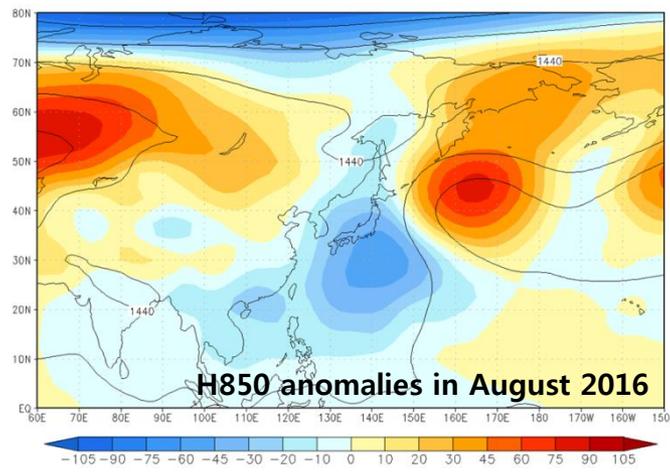
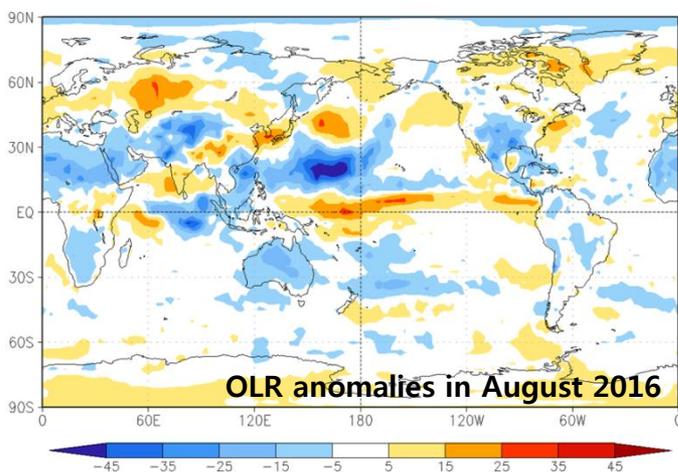
(83/88/95/98/05/07/10)

(83/88/95/98/05/07/10)



✓ July: La Niña-like SST
East-west extension of WNPSH
Location of main rainfall band:
southern part of Korean Penin.
→ Dry tendency

✓ August: La Niña-like SST
Warm and moist air toward
South Korea along the flank of
WNPSH
→ Wet tendency



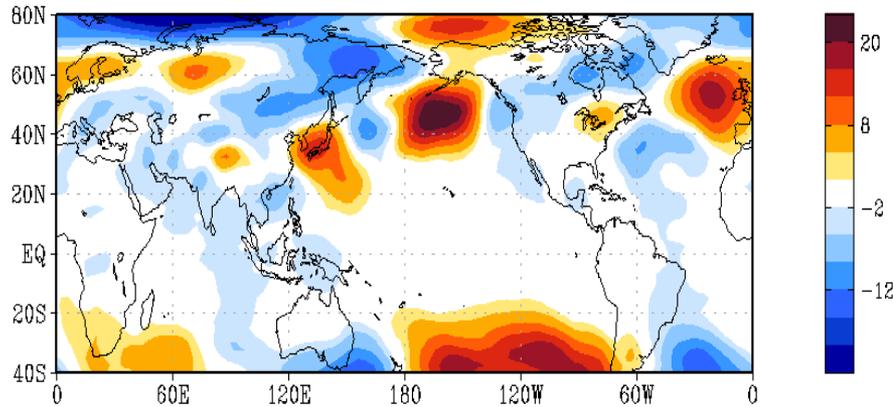
➤ The atmospheric response is different from composite patterns of El Niño decaying.

General features when South Korea is hot in August

- Composite analysis:
August temperature anomaly averaged over South Korea $> +1$ standard dev.

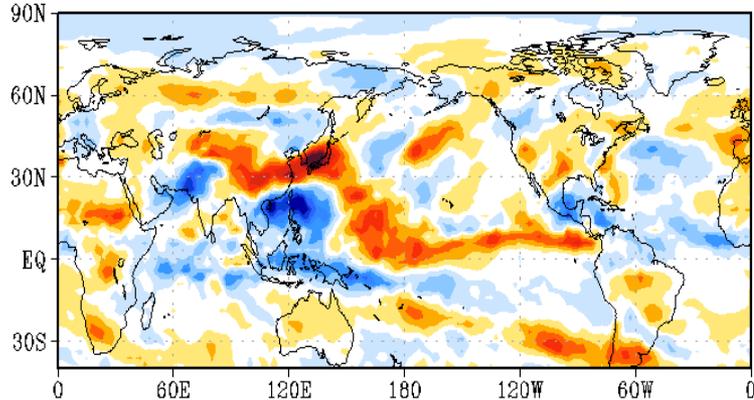
H850

a) Comp. GPH850 August for positive Temp August



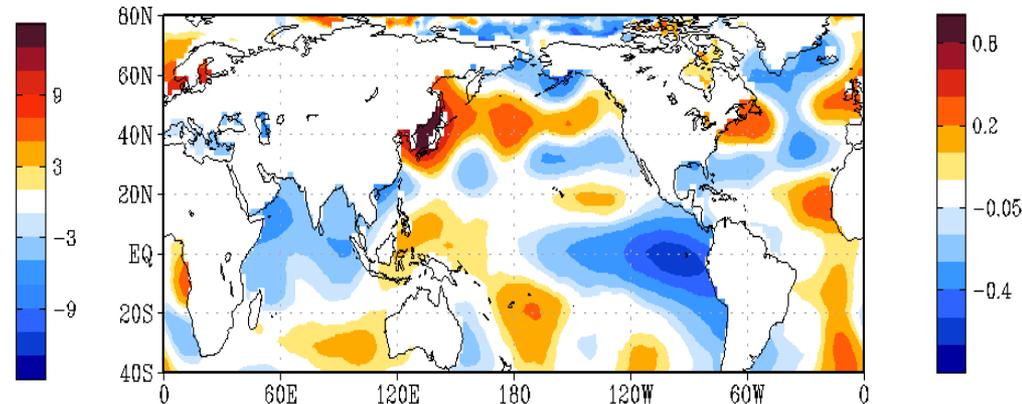
OLR

a) Comp. OLR August for positive Temp August



SST

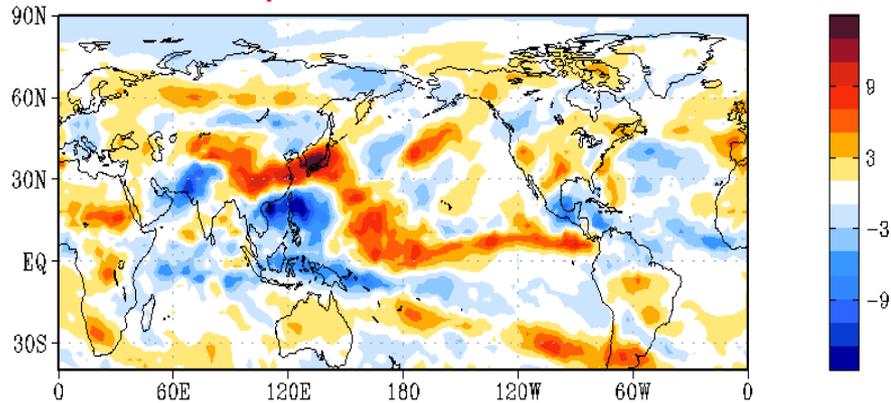
a) Comp. SST August for positive Temp August



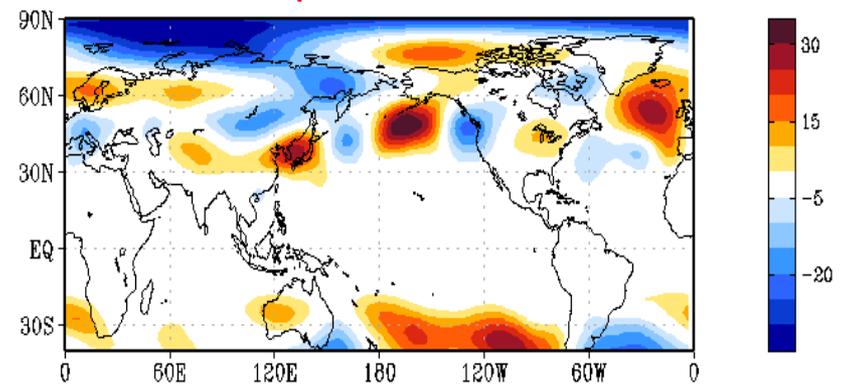
Courtesy of Prof. Sang-Wook Yeh (HangYang Univ.)

General features vs 2016

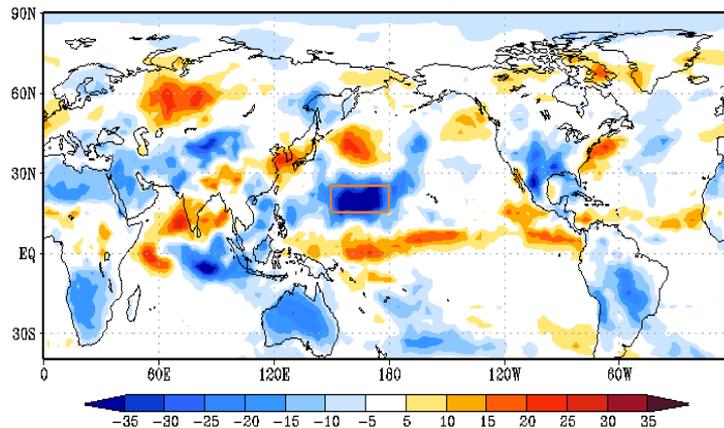
OLR Composite



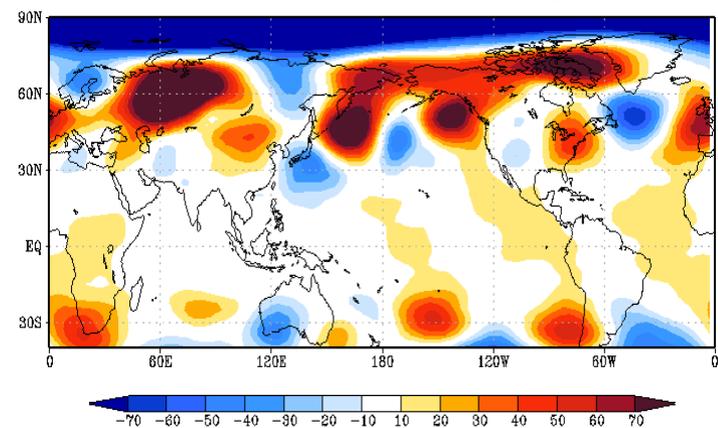
500hPa Composite



OLR anomalies in August 2016

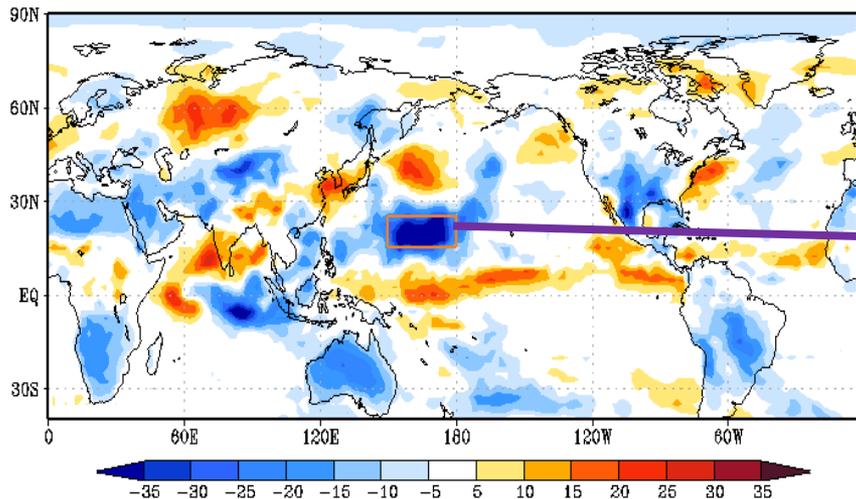


500hPa-GPH anomalies in August 2016



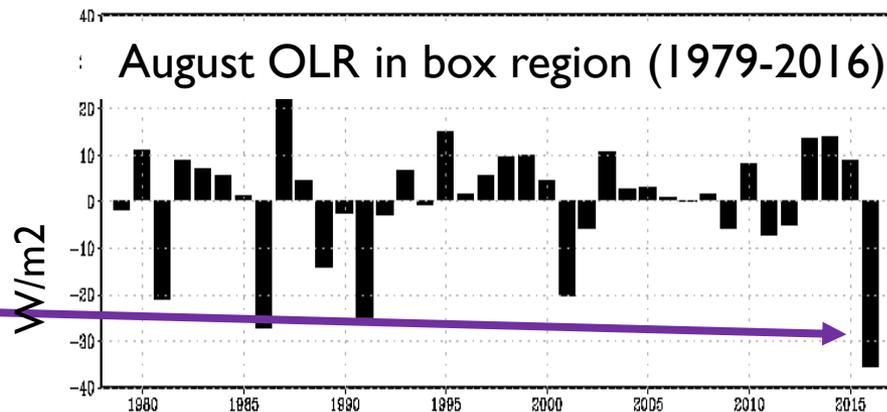
Potential factors: convective activities

OLR anomalies in August 2016



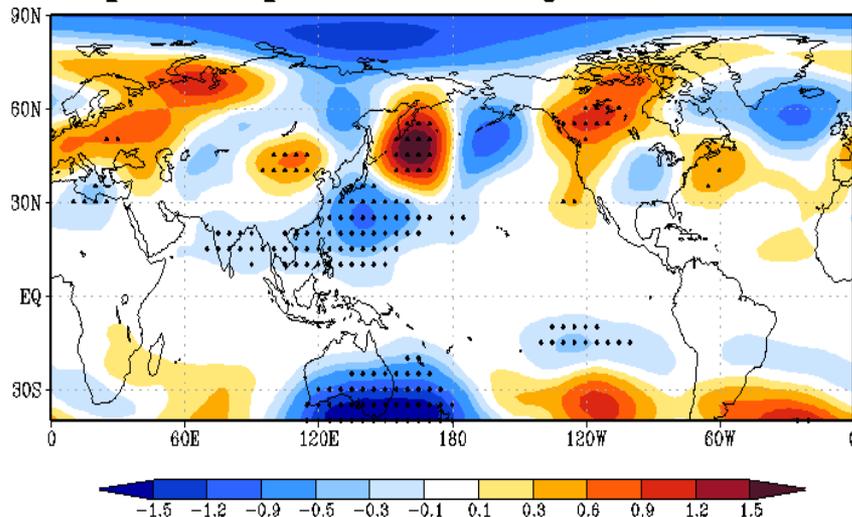
OLR August (150-180E, 15-25N)

August OLR in box region (1979-2016)



Regressed 500hPa GPH against with the OLR in the subtropical region

Reg. GPH500 August onto OLR Index August

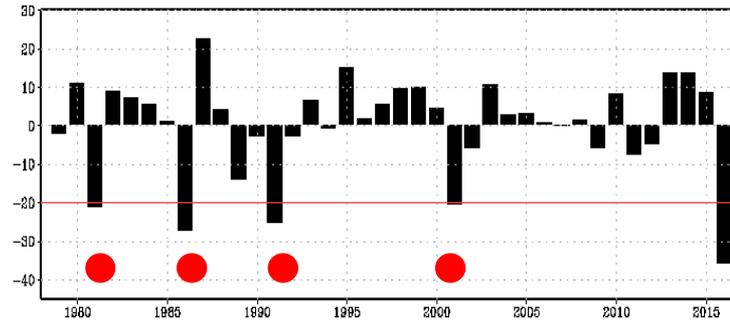


Early August
Strong Convection

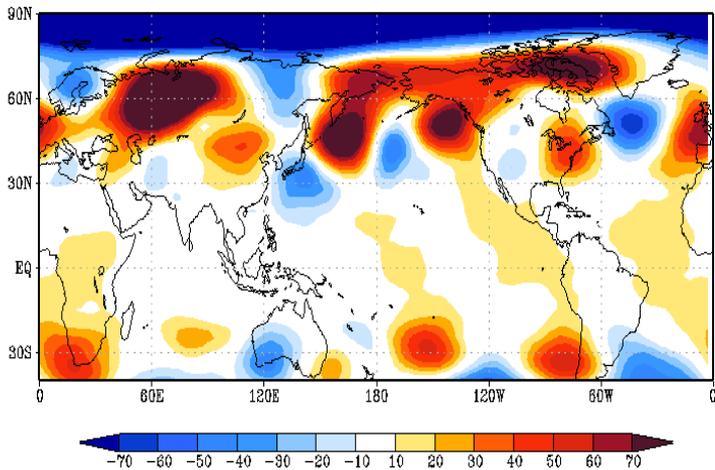
Atmospheric Teleconnections

Anomalous High
around Bering Sea (Blocking)

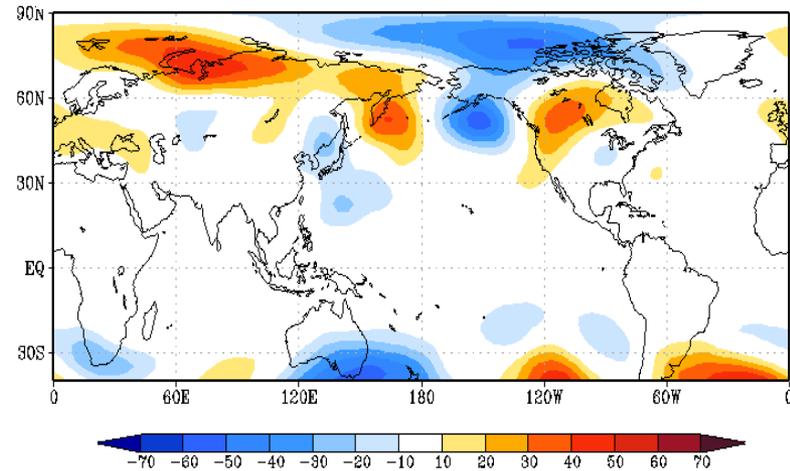
OLR (150-180E, 15-25N) August



500 GPH in August 2016

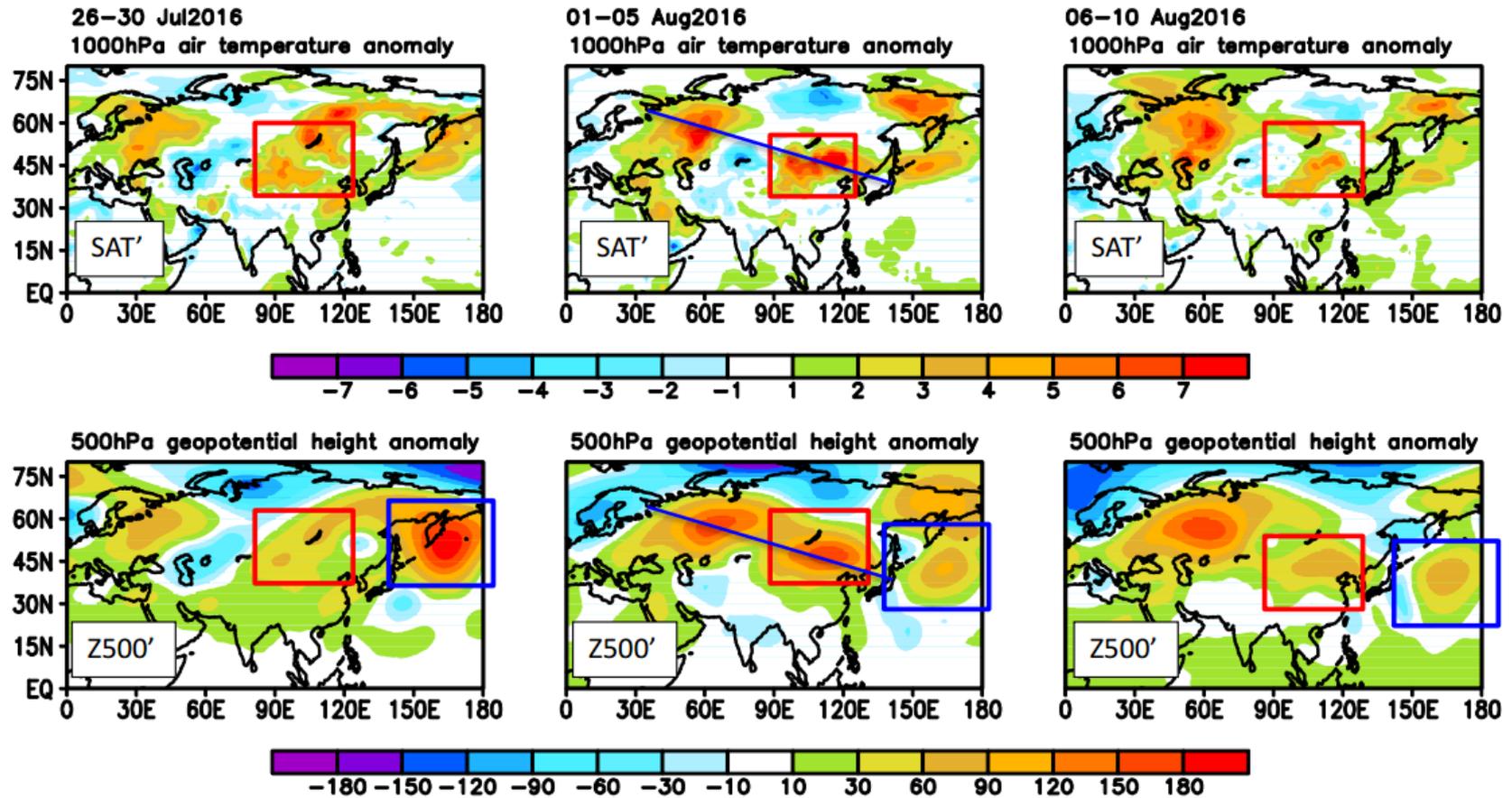


Composite 500hPa GPH



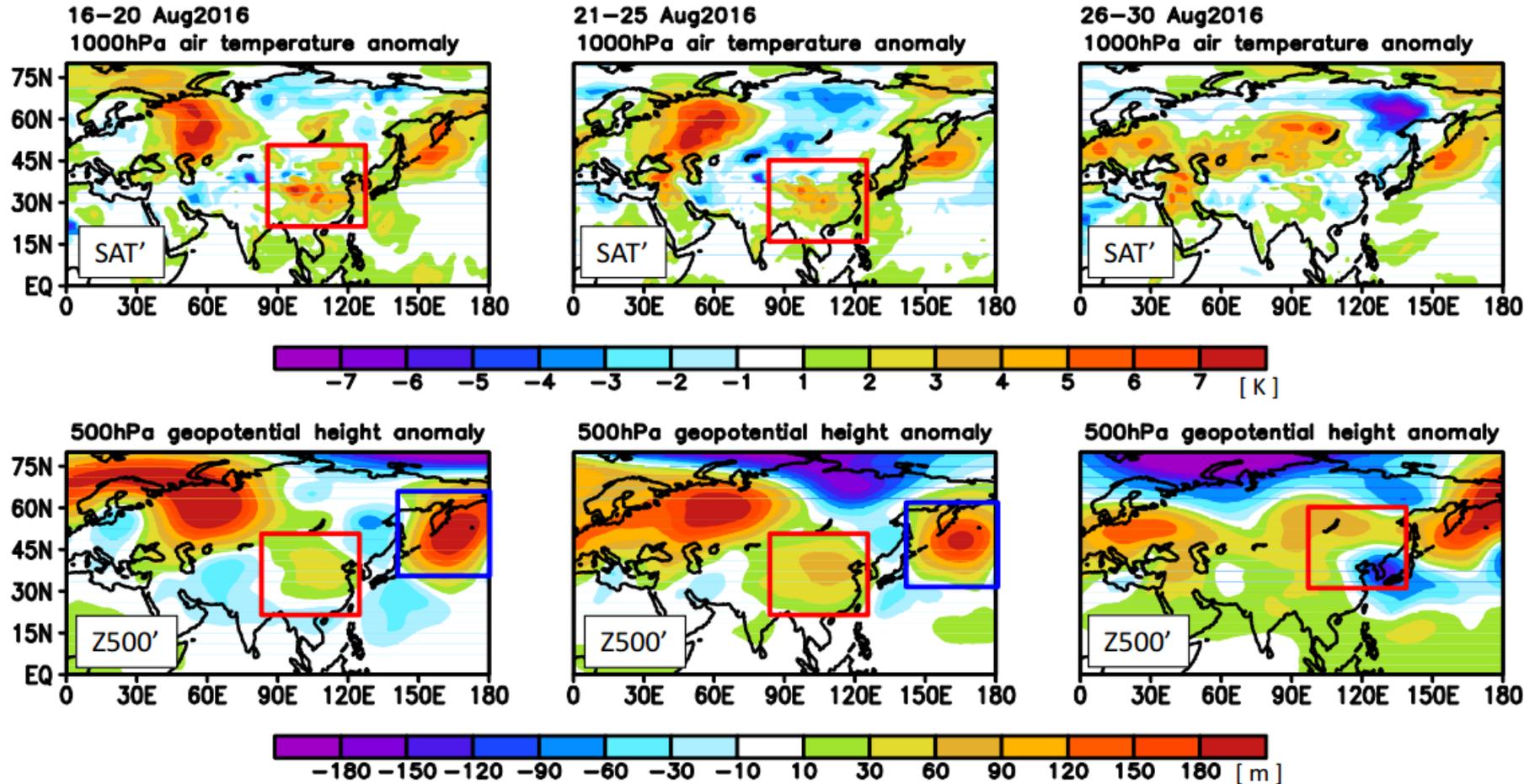
Atmospheric pattern in the extratropics (7.26~8.10)

- 5-day mean 1000hPa-air temperature and 500hPa-GPH anomalies

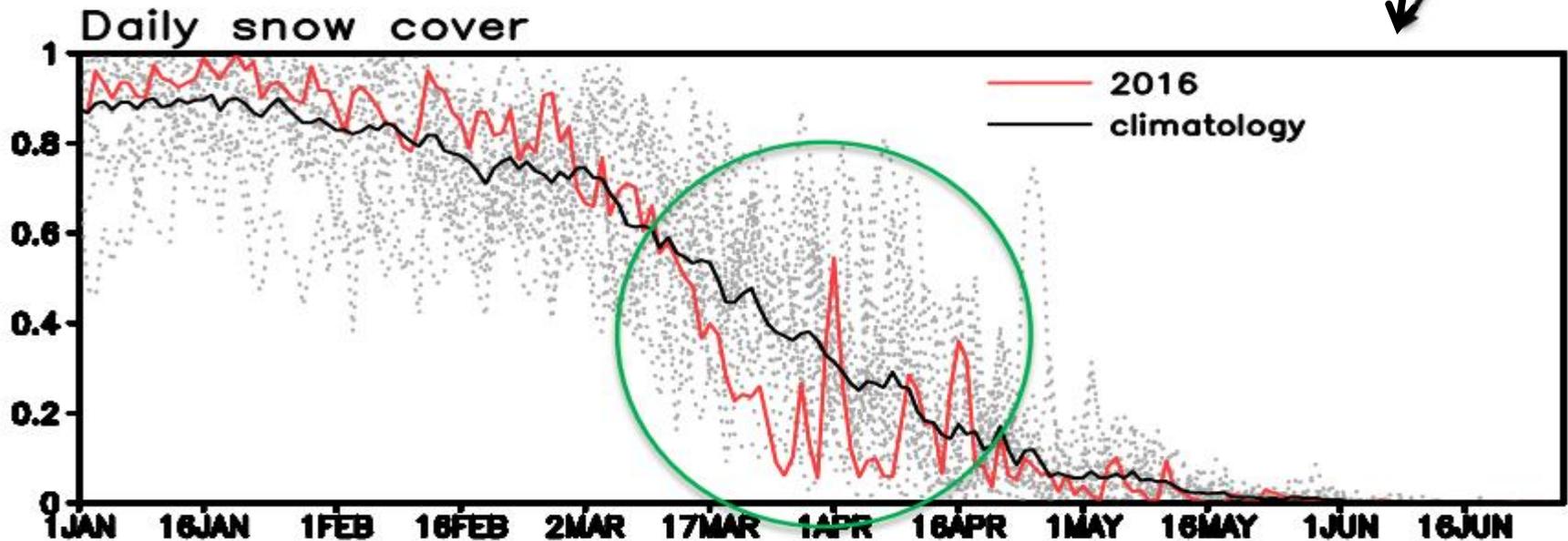
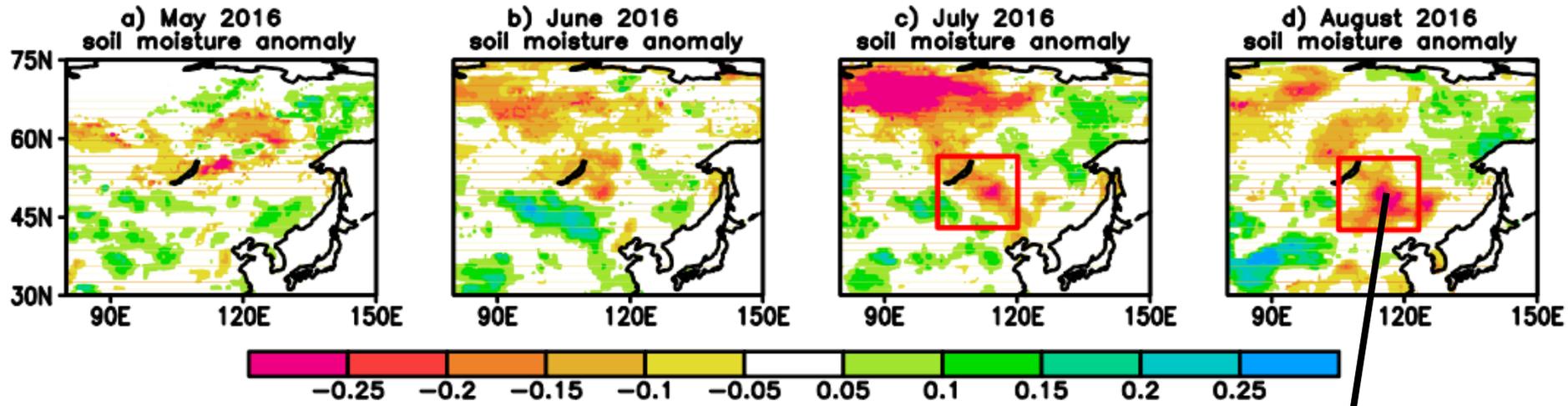


Atmospheric pattern in the extratropics (8.16~8.30)

- 5-day mean 1000hPa air temperature and 500hPa GPH anomalies



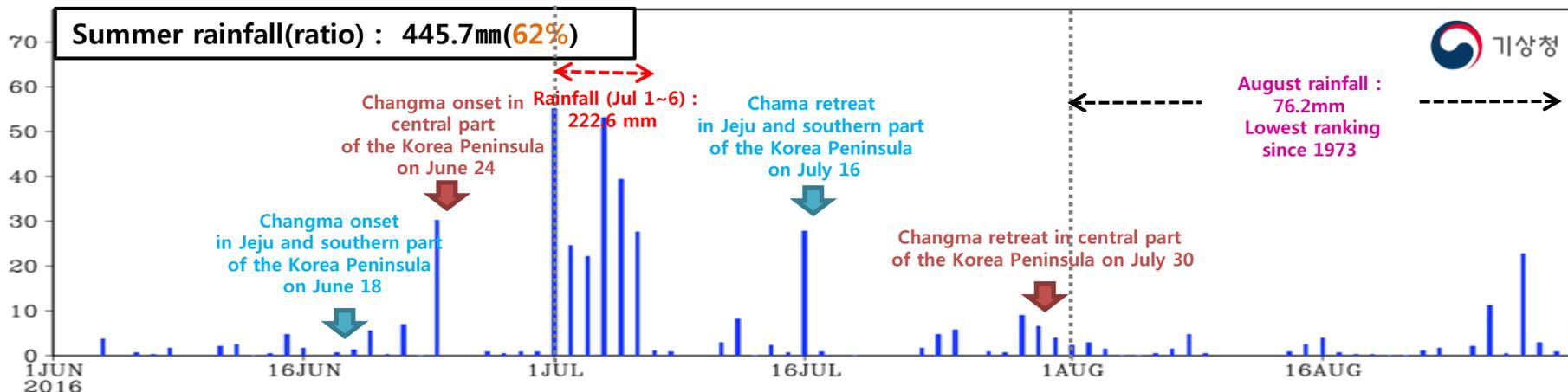
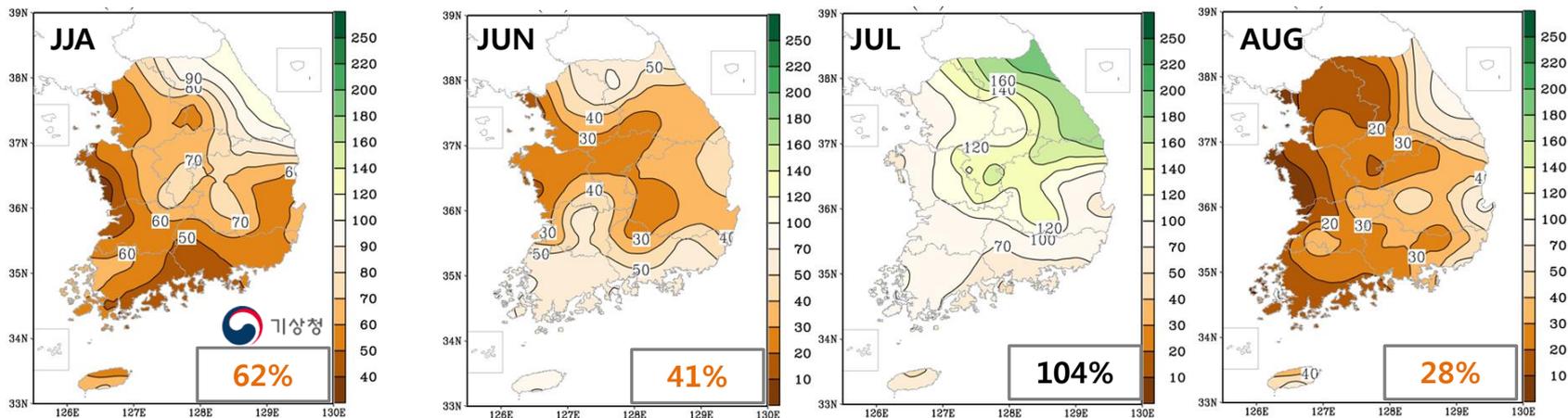
Potential factor: snow and soil moisture



Courtesy of Prof. Jee-Hoon Jeong (Chonam National Univ.)

Rainfall amounts and ratios

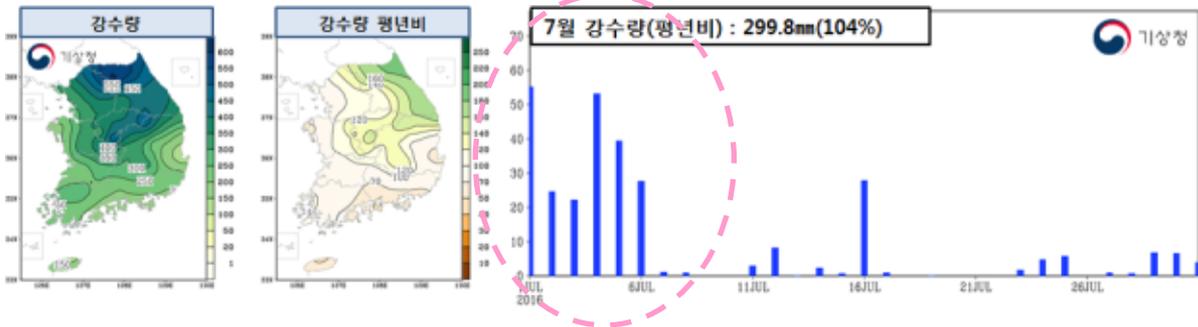
< Spatial and temporal precipitation amounts and ratios in JJA, JUN, JUL, and AUG >



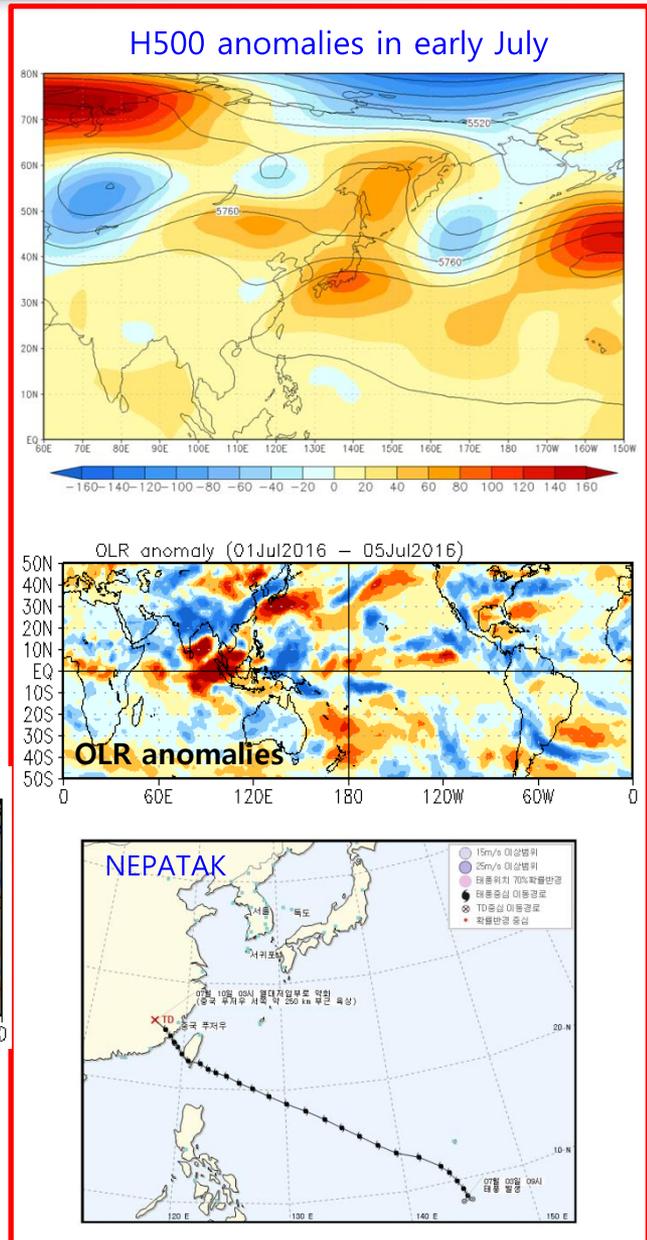
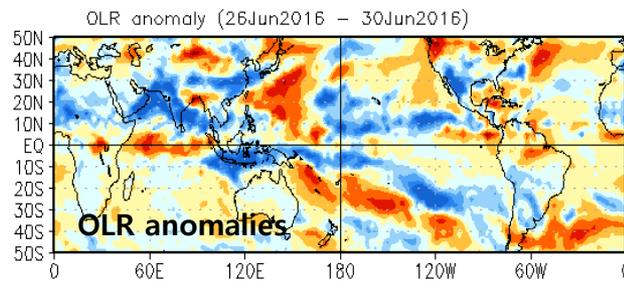
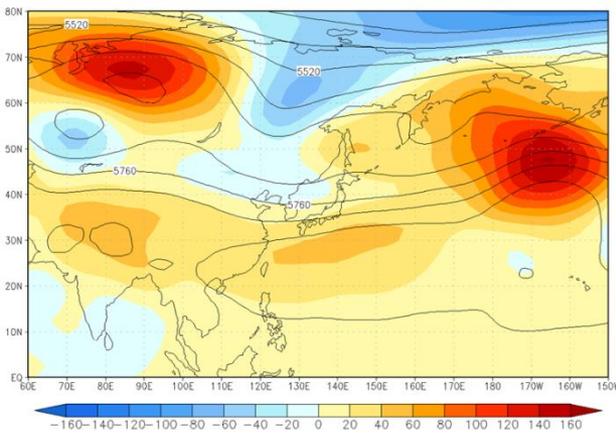
	June	July	August
Normal (1981~2010)	158.6mm	289.7mm	274.9mm

Heavy Rainfall in early July (7.1~6)

Rainfall amounts was 222.6 during 6 days from Jul 1 to 6, which corresponds to about 74% of July normal rainfall.



H500 anomalies in late June



Typhoon activities in summer 2016

- ✓ Total number of typhoons occurred in summer 2016: 11
- ✓ Number of Typhoon to affect South Korea directly: None

Normal : 11.2(2.2)

Summary

- ✓ South Korea experienced above-normal temperature and below-normal rainfall in summer 2016.
 - Extreme heat waves were observed during the late July to late August.
- ✓ This extreme event was mainly caused by an in flow of hot air from the anomalous high formed over northeastern China while a blocking High was being over Bering Sea.
 - Potential factors: Strong convection activities over subtropics and dry condition associated with less snow/soil moisture
- ✓ Need to be further studied about blocking system, air-sea interaction, and land-atmosphere process in observations and models.

Thank you !

A decorative blue background with overlapping circles in various shades of blue, located in the bottom right corner of the slide.