Summary of the 2011 Asian Summer Monsoon

28 November 2011

Tokyo Climate Center, Japan Meteorological Agency

1. Monsoon activity and atmospheric circulation

Convective activity (inferred from outgoing longwave radiation (OLR)) was enhanced over southern Pakistan, the eastern Arabian Sea, the Bay of Bengal, the Indochina Peninsula, the Philippines and the western Pacific, while it was suppressed over the eastern Indian Ocean and Indonesia (Figure 1). In the upper troposphere, the Tibetan High was pronounced over a broad area (Figure 2 (a)). In the lower troposphere, a prominent monsoon trough was observed stretching from northern India to the Philippines, and westerly/southwesterly winds were stronger than normal over a large area from the Arabian Sea to the Philip pines (Figure 2 (b)). These characteristics of convective activity and atmospheric circulation indicate that the Asian summer monsoon was active.

From May to August, equatorial intraseasonal oscillations were observed propagating eastward with a period of less than 30 days (Figure 3). The areas of active convection originally enhanced by these oscillations were seen to propagate northward around India and east of the Philippines (Figure 4). In October, the active phase of a large-amplitude Madden-Julian Oscillation (MJO) propagated eastward from northern South America to the Indian Ocean (Figure 3), and convective activity over the western Pacific, which tended to be enhanced until September, was suppressed.

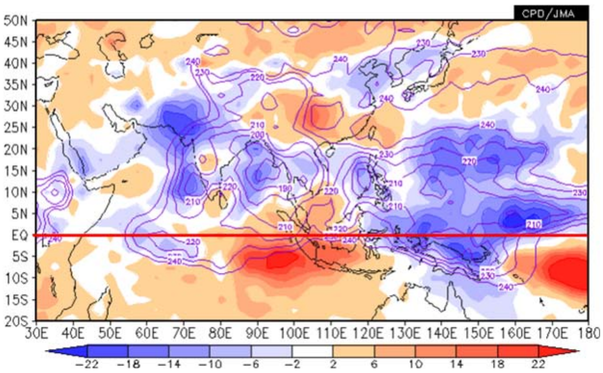

Figure 1 Four-month mean outgoing longwave radiation (OLR) and its anomaly for June – September 2011

The contours indicate OLR at intervals of 10 W/m^2, and the color shading denotes OLR anomalies from the normal (i.e., the 1981 – 2010 average). Negative (cold color) and positive (warm color) OLR anomalies show enhanced and suppressed convection compared to the normal, respectively. Original data provided by NOAA.

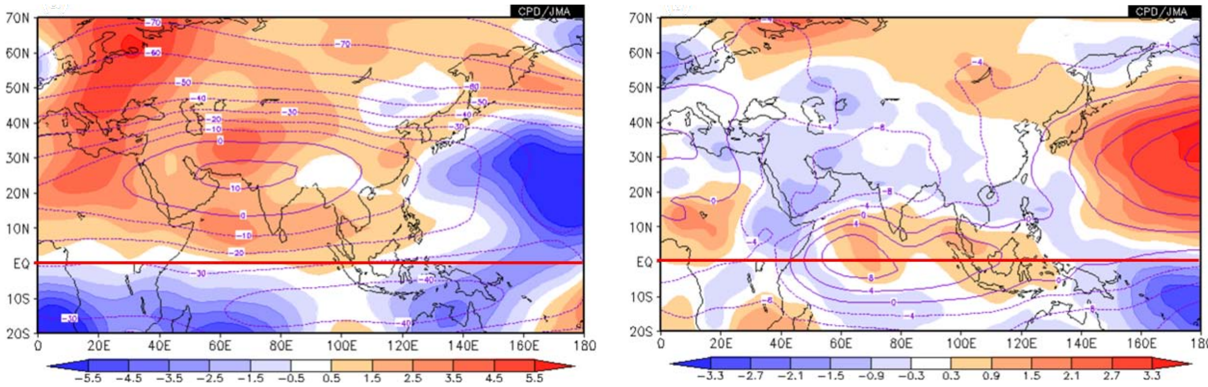

Figure 2 Four-month mean stream function and its anomaly for June – September 2010

(a) The contours indicate the 200-hPa stream function at intervals of 10 × 10^6 m^2/s, and the color shading indicates 200-hPa stream function anomalies from the normal. (b) The contours indicate the 850-hPa stream function at intervals of 4 × 10^6 m^2/s, and the color shading indicates 850-hPa stream function anomalies from the normal. The base period for the normal is 1981 – 2010. In the Northern (Southern) Hemisphere, warm (cold) shading denotes anticyclonic (cyclonic) circulation anomalies.

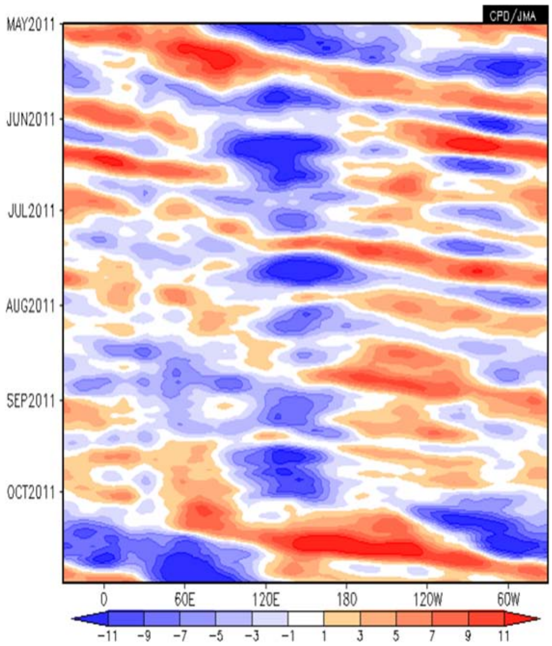

Figure 3 Time-longitude cross section of five-day running mean 200-hPa velocity potential anomaly from May to October 2011 (5ºS – 5ºN mean)

The shading denotes 200-hPa velocity potential anomalies (x 10^6 m^2/s) from the normal (i.e., the 1981 – 2010 average). The cold (warm) shading indicates large-scale divergence (convergence) anomalies.

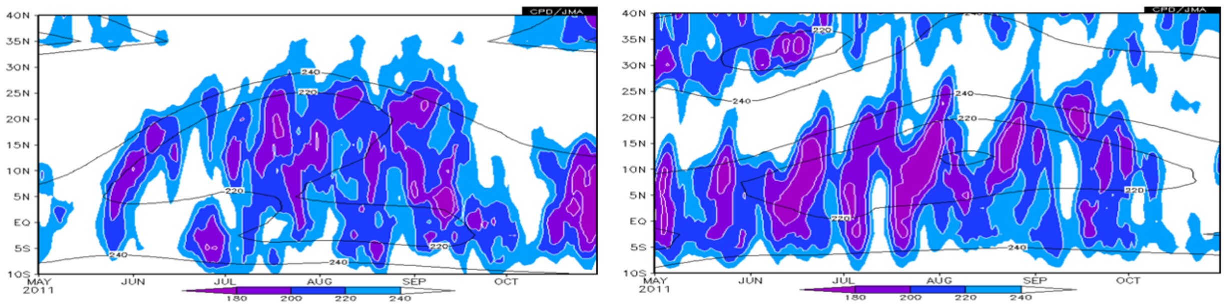

Figure 4 Latitude-time cross section of five-day running mean OLR from May to October 2011 ((a) India (65º – 85ºE mean), (b) area east of the Philippines (125º – 145ºE mean))

The thick black lines indicate the climatological mean OLR (W/m^2) for the period from 1981 to 2010, and the shading denotes the OLR for 2011.

2. Precipitation and temperature

Four-month total precipitation amounts based on CLIMAT reports during the monsoon season (June – September) were above 200% of the normal around southern Pakistan, and below 60% of the normal around Java Island (Figure 5). They were mostly consistent with the distribution of OLR anomalies (Figure 1).

Four-month mean temperatures for the same period were higher than normal from Pakistan to northern China, around southern China and around Japan, and lower than normal around northern India, in most parts of the Indochina Peninsula and in eastern China (Figure 6).

It was reported that heavy rains caused at least 175 fatalities in southern China in June, and more than 70 fatalities in Korea from 26 July to 29 July. Floods that began in August are also reported to have caused more than 460 fatalities in Sindh, Pakistan.

Precipitation over the Indochina Peninsula continued to be above normal from June to September, causing floods over a wide area in the Chao Phraya River and Mekong River basins. This flooding caused serious damage over the Indochina Peninsula, especially in Thailand.

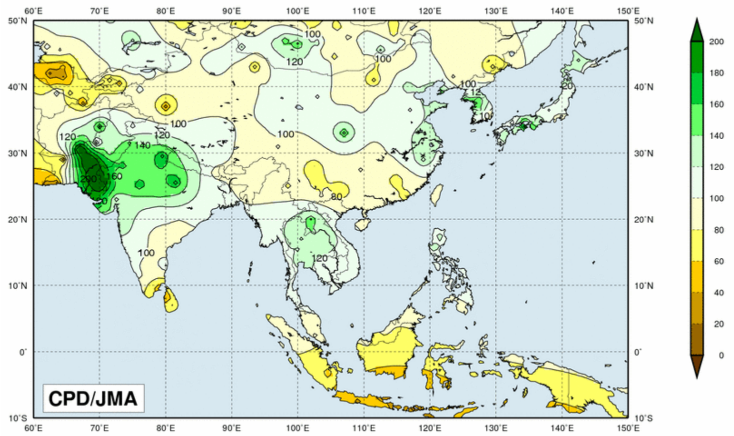

Figure 5 Four-month precipitation ratios (%) from June to September 2011

The base period for the normal is 1981 – 2010.

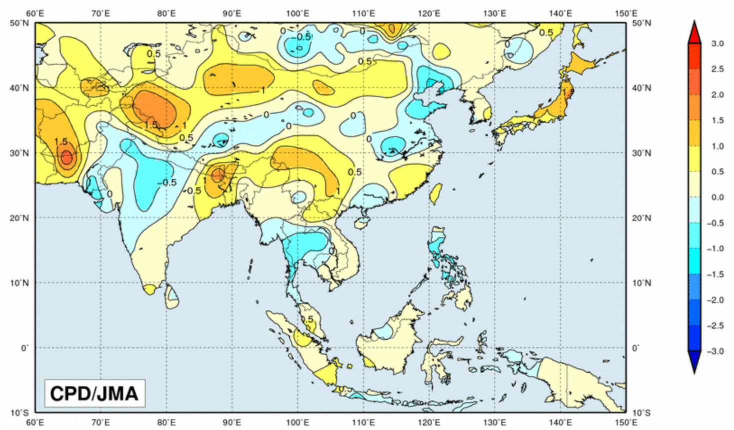

Figure 6 Four-month mean temperature anomalies (°C) from June to September 2011

The base period for the normal is 1981 – 2010.

3. Tropical cyclones

During the monsoon season, 17 tropical cyclones (TCs) of tropical storm (TS) intensity or higher formed over the western North Pacific (Table 1). The number of formations was almost the same as the 1981 – 2010 average of 16.0. A total of 7 of the 17 TCs passed around the South China Sea and approached or hit southern China or Vietnam. Three of them hit the main islands of Japan.

Severe tropical storm Nock-ten caused more than 70 fatalities and Typhoon Nesat caused more than 80 fatalities in the Philippines. Severe Tropical Storm Talas caused 78 fatalities and Typhoon Roke caused 17 fatalities in Japan (as of 2 November 2011).

Note: Disaster information is based on reports by governmental organizations (China, Korea, the Philippines and Japan) and UN organizations (IRIN).

Table 1 Tropical cyclones forming over the western North Pacific from June to September 2011

Number ID	Name	Date (UTC)	Category[1)]	Maximum wind[2)] (knots)
T1103	Sarika	6/9 – 6/11	TS	40
T1104	Haima	6/21 – 6/24	TS	40
T1105	Meari	6/22 – 6/27	STS	60
T1106	Ma-on	7/12 – 7/24	TY	95
T1107	Tokage	7/15 – 7/15	TS	35
T1108	Nock-ten	7/26 – 7/30	STS	50
T1109	Muifa	7/28 – 8/8	TY	95
T1110	Merbok	8/3 – 8/9	STS	50
T1111	Nanmadol	8/23 – 8/30	TY	100
T1112	Talas	8/25 – 9/5	STS	50
T1113	Noru	9/3 – 9/6	TS	40
T1114	Kulap	9/7 – 9/8	TS	35
T1115	Roke	9/13 – 9/22	TY	85
T1116	Sonca	9/15 – 9/20	TY	70
T1117	Nesat	9/24 – 9/30	TY	80
T1118	Haitang	9/25 – 9/26	TS	35
T1119	Nalgae	9/27 – 10/4	TY	95

Note: Based on information from the RSMC Tokyo-Typhoon Center.
1) Intensity classification for tropical cyclones
TS: tropical storm, STS: severe tropical storm, TY: typhoon
2) Estimated maximum 10-minute mean wind