Summary of the 2014 Asian Summer Monsoon

28 November 2014

Tokyo Climate Center, Japan Meteorological Agency

1. Precipitation and temperature

Four-month total precipitation amounts based on CLIMAT reports during the monsoon season (June – September) were more than 120% of the normal in Hokkaido region of Japan, from western Japan to southern China and from western China to northern Pakistan. Conversely, the corresponding figures were less than 60% of the normal around the Korean Peninsula, in central and northwestern Mongolia, in southern parts of Central Asia and in southern Pakistan (Figure 1). The amounts were mostly consistent with the distribution of four-month mean OLR anomalies (Figure 3).

Extremely heavy precipitation was seen from western Japan to southern China and in southwestern India in August. In contrast, extremely light precipitation was seen in Mongolia in July (figures not shown).

Four-month mean temperatures for the same period were more than 1°C above normal in Japan's Hokkaido region, southeastern Mongolia, southeastern China, central India and western Pakistan, and were more than 1°C below normal around eastern China and northern Mongolia (Figure 2).

Heavy rain reportedly caused fatal floods and landslides in western India in July, in Nepal and adjacent northern India in August, and around the border of India and Pakistan in September. Monsoon season fatalities were reported as exceeding 1,000 in India, 250 in Nepal and 360 in Pakistan.

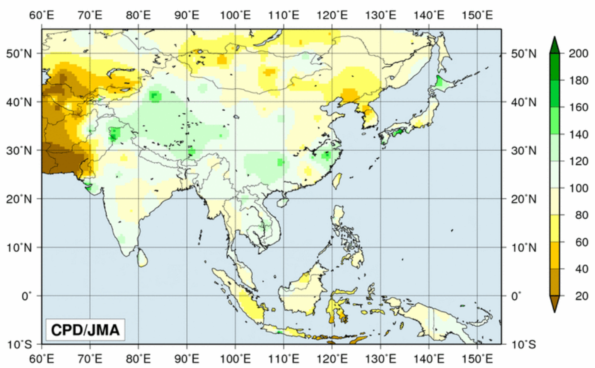


Figure 1 Four-month precipitation ratios (%) from June to September 2014
The base period for normal is 1981 – 2010. There were not data in Afghanistan.

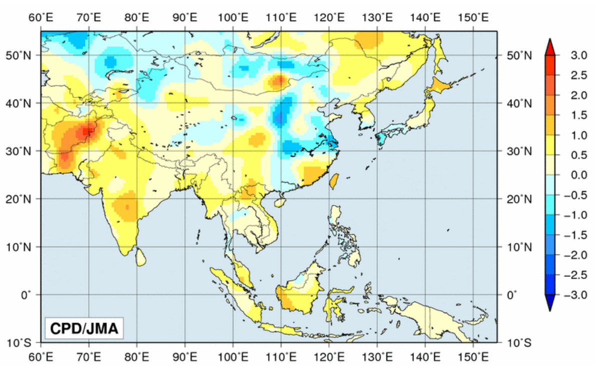


Figure 2 Four-month mean temperature anomalies (°C) from June to September 2014
The base period for normal is 1981 – 2010. There were not data in Afghanistan.

2. Tropical cyclones

During the monsoon season, 13 tropical cyclones (TCs) of tropical storm (TS) intensity or higher formed over the western North Pacific (Table 1). This was lower than the 1981 – 2010 average of 16.0. A total of 5 among these 13 passed around the South China Sea and approached or hit Viet Nam or China, 3 passed over the Philippines and 2 hit the main islands of Japan.

Fatalities caused by Typhoon Rammasun exceeded 100 in the Philippines, 20 in Viet Nam and 50 in China.

Note: Disaster information is based on reports by governmental organizations (China, India, Nepal, Pakistan and the Philippines) and the European Commission.

Table 1 Tropical cyclones forming over the western North Pacific from June to September 2014

Number ID	Name	Date (UTC)	Category[1)]	Maximum wind[2)] (knots)
T1406	Mitag	6/9 – 6/12	TS	40
T1407	Hagibis	6/13 – 6/23	TS	40
T1408	Neoguri	7/2 – 7/13	TY	100
T1409	Rammasun	7/9 – 7/20	TY	90
T1410	Matmo	7/16 – 7/26	TY	70
T1411	Halong	7/27 – 8/15	TY	105
T1412	Nakri	7/28 – 8/4	STS	55
T1413	Genevieve	8/7 – 8/14	TY	110
T1414	Fengshen	9/6 – 9/10	STS	60
T1415	Kalmaegi	9/12 – 9/17	TY	75
T1416	Fung-Wong	9/17 – 9/24	TS	45
T1417	Kammuri	9/23 – 9/30	STS	50
T1418	Phanfone	9/29 – 10/6	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

3. Monsoon activity and atmospheric circulation

Convective activity (inferred from OLR) averaged for June – September 2014 was enhanced over the southern part of the South China Sea and around the southwestern part of Japan, and was suppressed over western to central parts of the equatorial Indian Ocean, India, the Bay of Bengal and around Taiwan (Figure 3). According to the OLR indices (Table 2), the overall activity of the Asian summer monsoon (represented by the SAMOI (A) index) was below normal except in July. Convective activity in the vicinity of the Philippines was characterized by distinct intra-seasonal variability with an enhanced phase in July in contrast to a suppressed phase in August, as implied by the negative-to-positive shift in SAMOI (W).

In the upper troposphere, the Tibetan High was generally weaker than normal (Figure 4 (a)), which was consistent with the subtropical jet stream flowing southward of its normal position. In the lower troposphere the monsoon trough was prominent east of the Philippines. Zonal wind shear between the upper and lower atmosphere over the North Indian Ocean and southern Asia (Figure 5) was enhanced in mid-July and reduced in mid-August. The northwestward extension of the Pacific High was weaker than normal, which was a contributing factor to cool and wet summer conditions around western Japan (Figure 4 (b)).

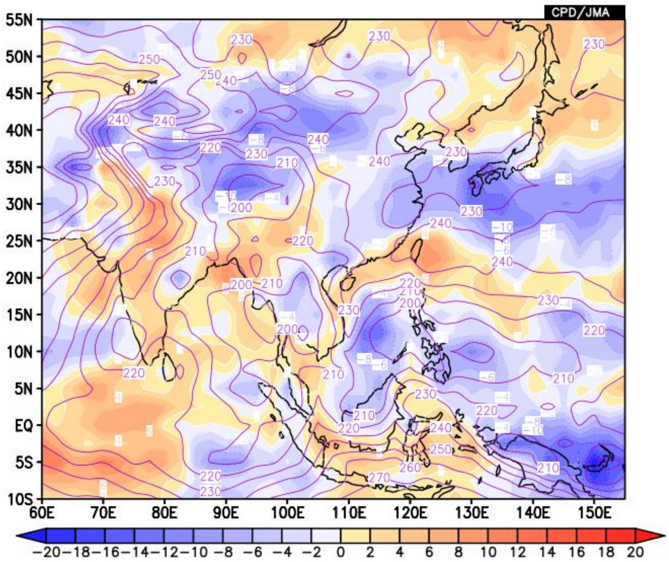
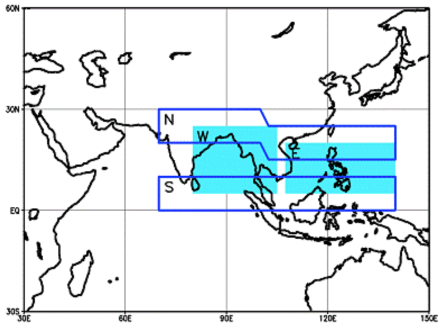


Figure 3 Four-month mean outgoing longwave radiation (OLR) and its anomaly for June–September 2014
The contours indicate OLR at intervals of 10 W/m^2, and the color shading denotes OLR anomalies from the normal (i.e., the 1981–2010 average). Negative (cold color) and positive (warm color) OLR anomalies show enhanced and suppressed convection compared to the normal, respectively. Original data are provided by NOAA.

Table 2 Summer Asian Monsoon OLR Index (SAMOI) values observed from May to October 2014
Asian summer monsoon OLR indices (SAMOI) are derived from OLR anomalies from May to October. SAMOI (A), (N) and (W) indicate the overall activity of the Asian summer monsoon, its northward shift and its westward shift, respectively. SAMOI definitions are as follows: SAMOI (A) = (-1) × (W + E); SAMOI (N) = S – N; SAMOI (W) = E – W. W, E, N and S indicate area-averaged OLR anomalies for the respective regions shown in the figure on the right normalized by their standard deviations.

	Summer Asian Monsoon OLR Index (SAMOI)		
	SAMOI (A): Activity	SAMOI (N): Northward-shift	SAMOI (W): Westward-shift
May 2014	-0.5	-0.4	1.9
Jun. 2014	-0.4	-0.4	-0.6
Jul. 2014	1.5	0.3	-1.3
Aug. 2014	-0.6	-0.5	1.0
Sep. 2014	-0.1	-0.6	-0.9
Oct. 2014	-0.4	-0.2	-0.4



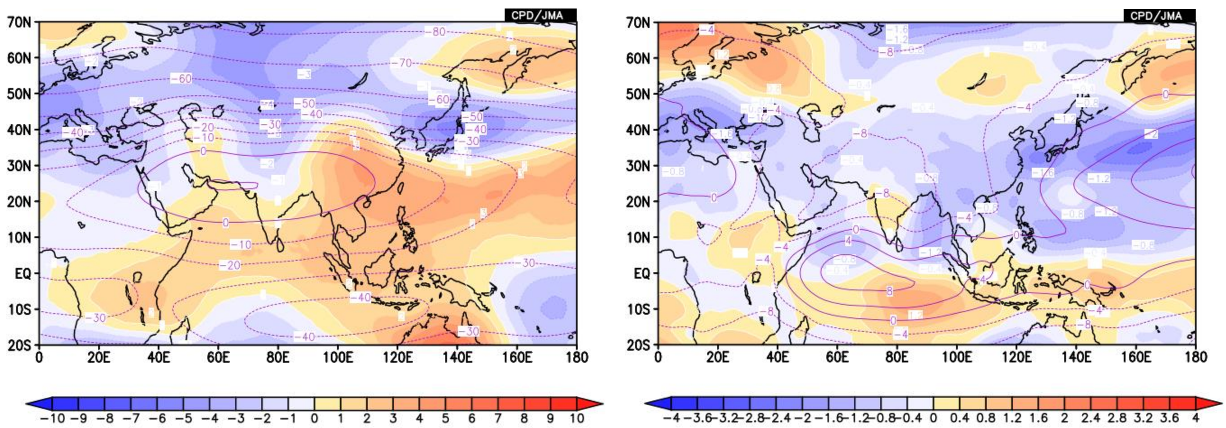
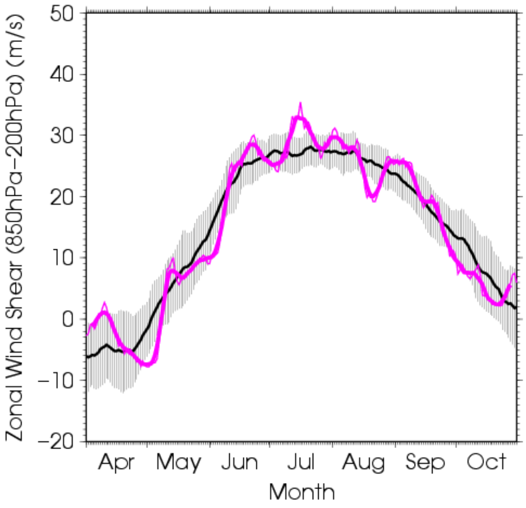


Figure 4 Four-month mean stream function and its anomaly for June – September 2014
(a) The contours indicate the 200-hPa stream function at intervals of 10×10^6 m^2/s, and the color shading indicates 200-hPa stream function anomalies from the normal. (b) The contours indicate the 850-hPa stream function 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. Warm (cold) shading denotes anticyclonic (cyclonic) circulation anomalies in the Northern Hemisphere, and vice-versa in the Southern Hemisphere.



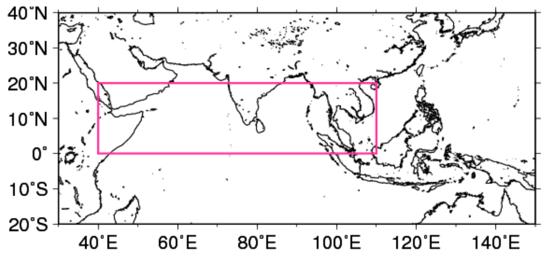


Figure 5 Time-series representation of the zonal wind shear index between 200-hPa and 850-hPa averaged over the North Indian Ocean and southern Asia (the region enclosed by the pink rectangle in the right figure: equator – 20°N, 40°E – 110°E)

The zonal wind shear index is calculated after Webster and Yang (1992). The thick and thin pink lines indicate seven-day running mean and daily mean values, respectively. The black line denotes the normal (i.e., the 1981 – 2010 average), and the gray shading shows the range of the standard deviation calculated for the time period of the normal.

References

Webster, P. J., and S. Yang, 1992: Monsoon and ENSO: Selectively interactive systems. *Quart. J. Roy. Meteor. Soc.*, **118**, 877 - 926.