

The atmospheric characteristics of extremely wet July 2009 around Japan

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ABSTRACT

In July 2009, broad areas of Japan except southern part experienced extremely wet and cloudy weather (figure 1). The end of rainy season, usually in mid-July, was delayed by two weeks or could not be specified in most of Japan. This weather was brought by strong transportation of water vapor along a stronger subtropical high over just south of Japan and a pronounced trough over northeastern China. The subtropical high was stronger than its normal but did not extend over Japan even in late July when it usually extends northward and bring hot and sunny summer in Japan. In front of the trough, high frequency disturbances were more active than their normal which brought heavy rain in northern Japan. These circulation fields were brought by very strong and meandering subtropical jet stream in accordance with very active propagation of Rossby wave packets (figure 2). We investigated the reasons (1) why the sub-tropical jet stream was very strong during July, (2) why the phase of the trough were locked in northeastern China and (3) why northward extension of the subtropical high was weak over Japan even in late July. As a result of the investigation of the relationship between SST, tropospheric temperature and sub-tropical jet stream, (1) strengthened subtropical jet stream was mainly brought by tropospheric warming in the tropics through the record-breaking SST warming. As a result of the investigation of the relationship between convective activities and the sub-tropical high, (3) in accordance with the active phase of MJO propagation, in late July, convective activities were suppressed around the Philippines and weakened subtropical high which was well known as Pacific Japan (PJ) pattern. As for (2), although the cause of phase lock was not clear, it is speculated that enhanced convection over the Arabian Sea and suppressed convection around India might contribute to maintaining the phase.

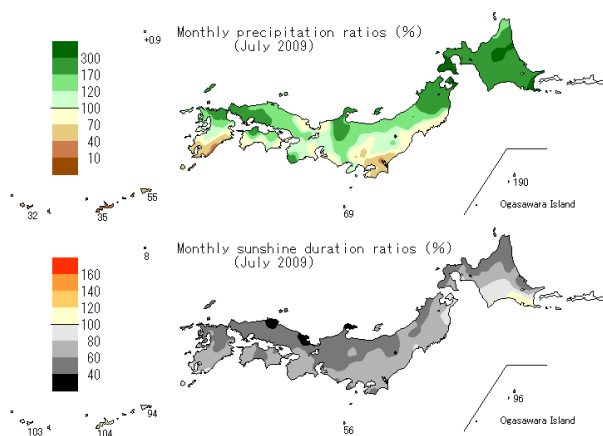


Fig. 1 Monthly precipitation and sunshine duration ratios (July 2009)

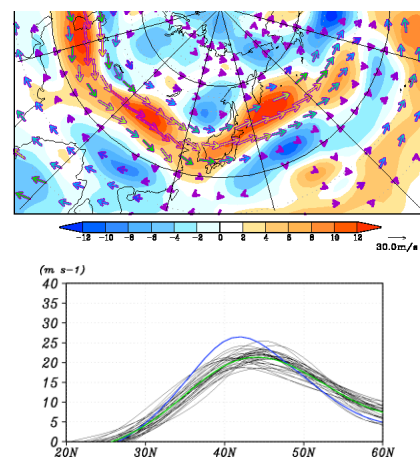


Fig. 2 200hPa monthly wind vector and zonal wind anomalies (upper), zonal wind (lower) (July 2009) In the lower figure, black, blue and green lines show each year of 1979 -2008, 2009 and normal, respectively.