

**REVIEW**

**A Review on the Western North Pacific Monsoon:  
Synoptic-to-Interannual Variabilities**

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**ABSTRACT**

In this paper we review the observed structure and evolution characteristics of the western North Pacific monsoon on various time scales, including its annual cycle, synoptic wave activity, intraseasonal oscillations, and interannual variabilities. On the synoptic (2-10-day) timescale, summertime synoptic waves and equatorial symmetric and anti-symmetric modes are often observed, and they may be responsible for triggering tropical cyclone genesis. On the intraseasonal scale, there are significant spectrum peaks at bi-weekly (10-20-day) and lower-frequency (20-70-day) bands. On the interannual time scale, the monsoon is greatly modulated by and possibly feeds back to the El Niño-Southern Oscillation (ENSO). The paper reviews our current understanding of physical mechanisms that give rise to the synoptic-scale, intraseasonal and interannual variabilities, and multi-scale interactions among these motions. The comparison between the Indian monsoon and the western North Pacific monsoons in terms of their differences in precipitation and circulation patterns, dominant time scales, and global teleconnection is also illustrated. Finally we discuss some remaining issues related to the western North Pacific monsoon variabilities.

(Key words: Monsoon-ocean interactions,  
Synoptic-scale wave trains and tropical cyclones,  
Bi-weekly and lower-frequency intraseasonal oscillations,  
Monsoon interannual variability, Teleconnection)

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