

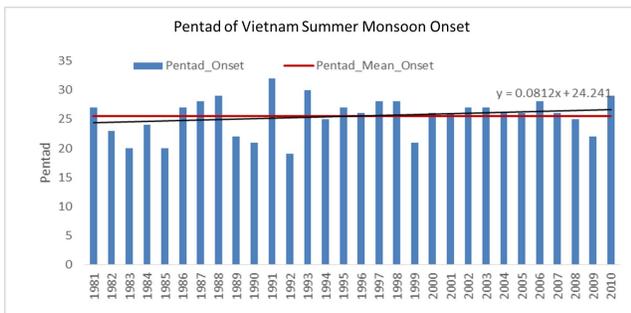
# Variability in the Onset of Summer Monsoon over Vietnam

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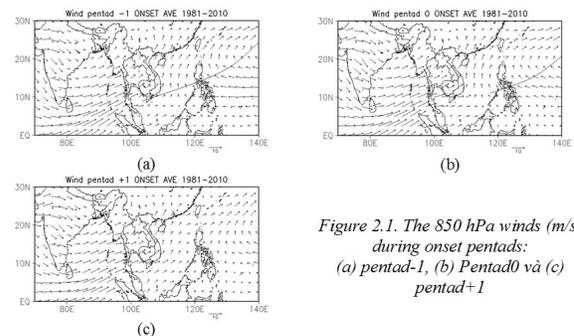
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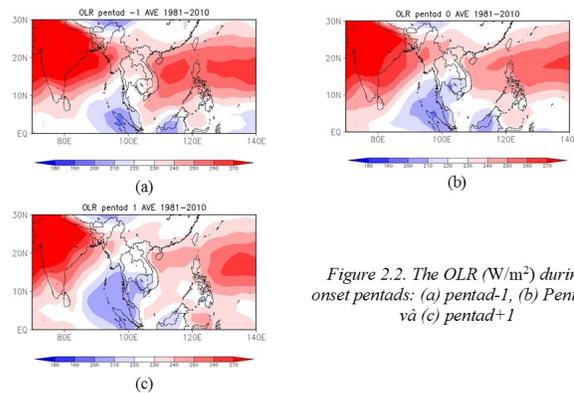
In this paper, the 850 hPa winds of CFSR (Climate Forecast System Reanalysis) and OLR (Outgoing Longwave Radiation) during the period from 1982-2010 were used for analyzing the onset dates of summer monsoon over Vietnam. The 850 hPa zonal winds of CFSR was used for definition of onset dates; based on the simple yet effective index, the Vietnam summer monsoon index (VSMI) (N.D. Mau et al, 2016), the 850-hPa zonal winds averaged over the southern parts of Vietnam (5°-17°N and 100° - 110°E). The onset pentad of Vietnam summer monsoon is defined as the first pentad of the two consecutive pentads when the 850 hPa zonal wind direction changes from easterly to westerly or from less than 0 m/s to greater than 0 m/s (N.D. Mau et al, 2016). The results showed the climatological onset date of summer monsoon in Vietnam is pentad of 25,5 (7 May), with the standard deviation is 2,4 pentads. During 1981-2010, the pentads of onset summer monsoon were increasing; and it was that the onset of summer monsoon was to be later. In addition, the onset of Vietnam summer monsoon was closed to activities of the El Niño–Southern Oscillation (ENSO) phases; later in the El Niño years; and earlier in the La Niña years (Fig. 1). In addition, there is a clear similarity between the change of direction of the 850 hPa winds and the development of deep convection during the onset of summer monsoon. The onset period of summer monsoons is marked by a suddenly changes in 850 hPa winds (from eastly winds to westly winds), which is reflected by the apparent difference in pentad-1 circulation with pentad-0 (Fig. 2).



**Figure 1.** Trends of the onset pentads of Vietnam summer monsoon during 1981-2010.



**Figure 2.1.** The 850 hPa winds (m/s) during onset pentads: (a) pentad-1, (b) Pentad0 và (c) pentad+1



**Figure 2.2.** The OLR (W/m<sup>2</sup>) during onset pentads: (a) pentad-1, (b) Pentad0 và (c) pentad+1

**Figure 2.** Changes in 850 hPa winds (Fig 2.1) and OLR (Fig. 2.2) during onset pentads of Vietnam summer monsoon.