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MERIDIONAL CIRCULATION IN SUMMER MONSOON OF SOUTHEAST ASIA

Earlier, relying on theoretical considerations and on some observational evidence, Asnani (1967) had postulated subsidence near the equator and the corresponding existence of an equatorial cell separating the two Hadley cells of the two hemispheres, in the General Circulation model of the atmosphere. Subsequently, Bunker (1971) made some detailed analysis of observations taken in Line Islands Experiment over Equatorial Central Pacific Ocean during April 1967 and concluded that "the observed circulation appears most nearly similar to Asnani's model with two Hadley cells and a single equatorial cell".

Working on the same line of theoretical argument and also keeping in view the observational evidence which has gradually been coming to light, we believe that along with the global average picture of General Circulation as given above, one can now make a fairly reliable picture of meridional circulation prevailing over southeast Asia in general and India in particular, during the peak months (July and August) of the summer monsoon. This idealised picture is shown in Fig. 1. We believe that in course of time, when the current difficulties in measuring vertical velocity in the tropical atmosphere are overcome, the picture may get only slightly altered in finer details.

According to this picture, the equatorial cell separating the two Hadley cells of the two hemispheres gets considerably elongated to the north in the region of southeast Asia during the summer monsoon season and also develops two sub-cells (I and II in the figure) within itself, one positioned over the equator and the other centred between 10° and 15°N.

This picture of regional meridional circulation during the summer monsoon is consistent with observations of (*i*) persistent cloudiness a few degrees south of the equator, (*ii*) relative clearance of the skies over the equator, (*iii*) cloud bands and possibly weak secondary trough north of the equator (Raman 1968), (*iv*) subsidence over south Indian Peninsula (Koteswaram 1958) and (*v*) persistent rains over central and north India. The picture is also consistent with observed southerly components in winds of lower troposphere and northerly components in winds aloft.

This picture is somewhat, though not entirely different from that given by Koteswaram (1958) whose model is shown in Fig. 2 here. The latter extended the subsiding limb upto the equator and

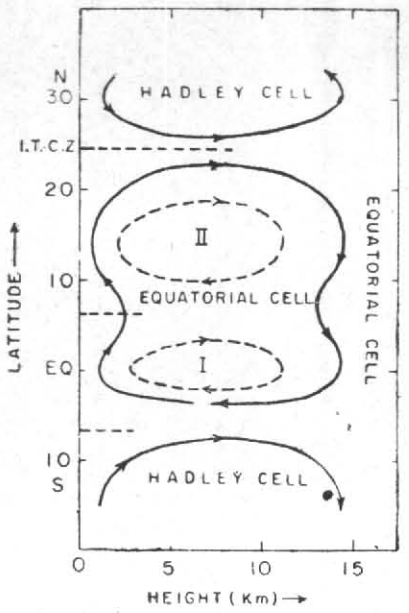

Fig. 1

Meridional circulation in summer monsoon over SE Asia

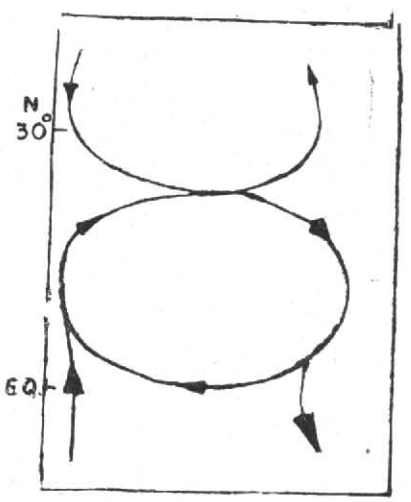

Fig. 2

Koteswararm's (1958) model of Asian summer monsoon

did not clearly indicate what happens south of the equator in his model. If the Hadley cell of the southern hemisphere with its limb of upward motion near the equator is positioned in Fig. 2 immediately south of the equator, then there would be substantial differences between Figs. 1 and 2 near the equator. The important common feature between Figs. 1 and 2, however, is the region of subsidence

sufficiently to the south of the monsoon trough but sufficiently to the north of the equator. This subsidence, perhaps first postulated by Koteswaram (1958) has been amply substantiated by subsequent computations of vertical motion (Keshavamurty personal communication).

G. C. ASNANI

Indian Institute of Tropical Meteorology,
Poona
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