2.8 SPATIAL AND TMEPORAL ORGANIZATION OF CONVECTIVE ACTIVITY IN THE HYMALAYAN REGION DURING THE ASIAN MONSOON

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The spatial and temporal evolution of mesoscale convective weather systems and short-lived convection in Northern India, along the Himalayan range and in the Tibetan Plateau were analyzed during the 1999, 2000 and 2001 monsoon seasons using METEOSAT-5 IR imagery (Tab.1 and Fig. 1). Rainfall and lightning data were also used in the interpretation of the results. An interesting finding of this study was the delineation of space-time patterns in the life-cycle of convective systems which suggest landform and orographic controls in establishing a convergence zone in the valley of the Ganges between the Great Indian Desert to the West and the Khasi Hills to the East, which we call the Northern India Convergence Zone (NICZ) (Fig.2). The NICZ exhibits strong nighttime activity with the development of disorganized short-lived convection (1-3 hours) along the front range of the Middle Himalaya at elevation between 2000 and 4000 m. These systems are current with nocturnal peaks of intense rainfall in the region between midnight and 3 AM. Consistent with solar forcing, convective cloud clusters predominate in the low level plains of the Uttar Pradesh and in the Tibetan Plateau during the afternoon and early evening. Furthermore, these data are consistent with the daily cycle of rainfall documented for a network of 20 hydrometeorological stations in the Central Nepal, which show strong nocturnal peaks of intense rainfall consistent with the close presence of Convective Weather Systems (CWSs) in the Gangetic Plains (Barros et al., 2000). Finally, the intra-annual and inter-annual variability of convective activity in the NICZ was assessed with respect to large-scale synoptic conditions, monsoon activity in the Bay of Bengal, and the modulating role of orography.

Barros, A.P., Joshi, M., Putkonen, J. and Burbank, D.W., 2000. A study of the 1999 monsoon rainfall in a mountainous region in central Nepal using TRMM products and rain gauge observations, Geophy. Res. Lett., 27(22), 3683_3686.

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Table1. Characteristics of CWSs for 1999 and 2000

	MCC	CCC	DSC
Life Time and Frequency	≈ 11 hours 30-35	≈ 8 hours 600-650	≈ 2 hours 6,500-7,000
Area of Cold Cloud Shields [<235K] (Km^2)	200,000-320,000 Km^2	100,000-200,000 Km^2	100,000-180,000 Km^2
Moving Direction	CWSs form over the Tibetan Plateau and in the Gangetic Plains and move in a manner consistent with the diurnal variability of winds in the region (Krishnamulti and Kishtawal, 2000).		
Spatial Variability	The EOF analysis indicates that the spatial variability is dominated by landform: the main source of variability is the East-West gradient caused by the contrast between the Thar desert and the Bay of Bengal, and the second dominant source of spatial variability is the North-South gradient caused by the contrast between the Tibetan plateau and the Gangetic Plains.		

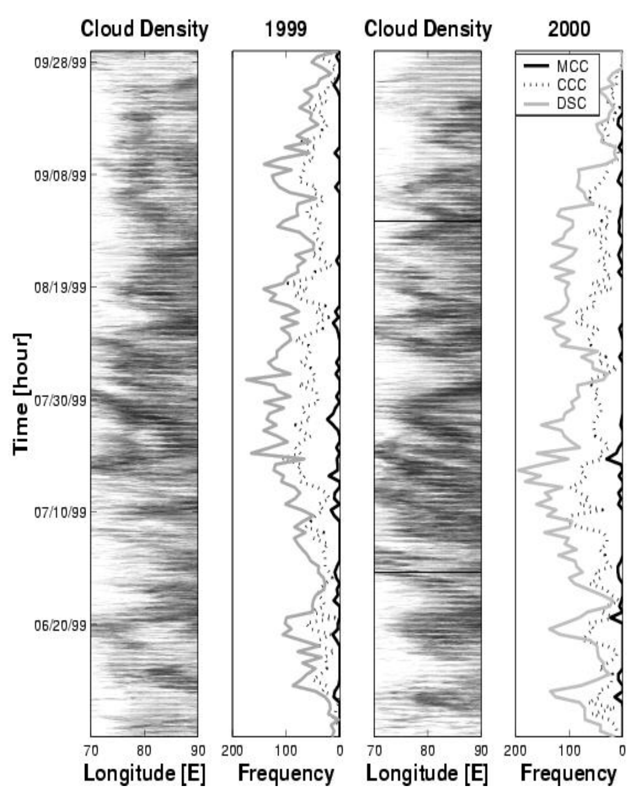

Fig. 1. The Hovmoeller diagram of cloud density N-S averaging and the frequency of CWSs for 1999 and 2000

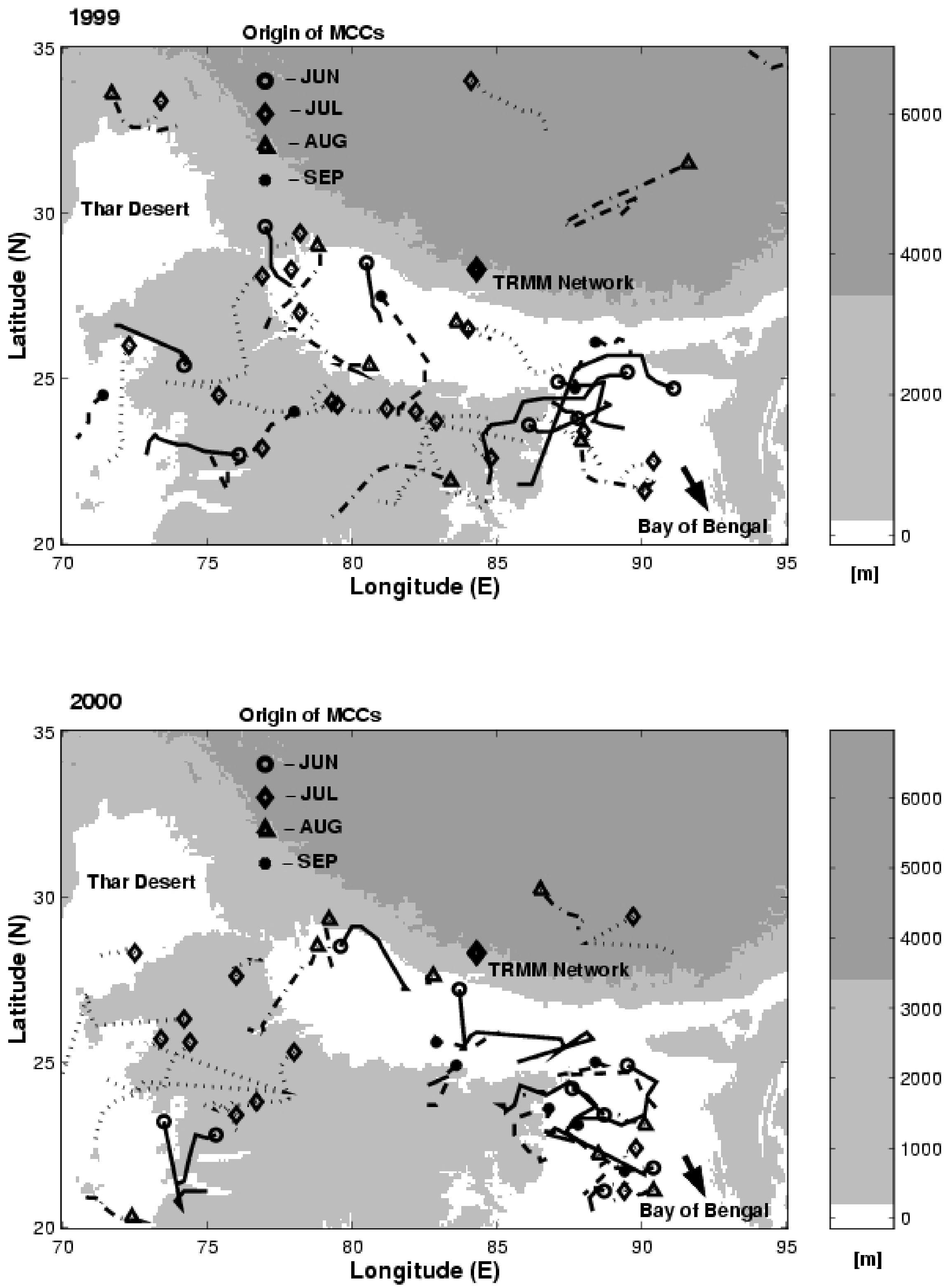

Fig. 2. Spatial variability of MCC propagation