



Possible impacts of the pre-monsoon dry line and sea breeze front on nocturnal rainfall over northeast Bangladesh

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The northeast region of Bangladesh receives a large amount of rainfall before the large-scale monsoon circulation begins. For example, in April (a “pre-monsoon” month) 2010, 804 mm of rain fell in the regional capital Sylhet. It was the second wettest month of the entire year. From our conversations with the local people, we know that this pre-monsoon rainfall is extremely important to their livelihoods. We therefore need to understand its triggering mechanisms. Several theories have been published, all of which are likely to be at play. However, in this work we look more closely at how the sea breeze front and prominent pre-monsoonal dry line in this region may play a role. If these mechanisms play a role in the convection, then it is likely that they trigger convection further afield, and then the resulting systems then propagate towards northeast Bangladesh. We believe this because rainfall associated with dry line/sea-breeze front convection often occurs during the late afternoon, but the rainfall over northeast Bangladesh shows a clear late-night/early-morning maxima. At present, the temporal and spatial resolution of the regional observations is inappropriate for examining these possible mechanisms. We therefore use a numerical model (WRF) to investigate the possible links between the convection and the sea breeze front and dry line. We use April 2010 as a case study since it was such a wet pre-monsoon month.

The simulation shows that a sea breeze circulation often develops during the day in the coastal zone of Bangladesh and northeast India. After sunset the sea breeze front propagates inland pushing back the hot, dry air over India. On several days during the simulation, convection is triggered along the sea breeze front, which then propagates towards northeast Bangladesh and intensifies across the topography surrounding the Sylhet region. From our simulations, it appears that nocturnal convection over northeast Bangladesh is triggered by several mechanisms, but that the dry line and sea breeze front could also be an active contributor.