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High-resolution modeling of the predictability of convective systems, and influences by absorbing aerosols over northern India and the Himalayas foothills during boreal summer

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The Himalayas foothills region (HFR) is an important component of the South Asian monsoon. To the south, the HFR borders the fertile, populous, and heavily polluted Indo-Gangetic Plain (IGP). To the north, it rises to great height (~ 4-5 km) to the Tibetan Plateau over a distance of less than 100 km. The HFR itself consists of complex mountainous terrain, with strong orographic forcing for precipitation. During the late spring and early summer, dust aerosol from the Thar and Middle East deserts , as well as moisture from the Arabian Sea were transported to the western part of the western part of the IGP and foothills spurs pre-monsoon severe thunderstorm over the region. During the monsoon season (mid June -August) convection from the Bay of Bengal, spread along the foothills northwestward to northern Pakistan. Recent climate model studies and preliminary observations have indicted not only the importance of dynamical forcing of precipitation in the HFR, but also possible strong impacts by the dense aerosols, from both local sources, and remote transport, that blanket the IGP from late spring up to the onset of the monsoon in June, and during monsoon breaks in July. In this work, we use the NASA Unified Weather Research and Forecasting (Nu-WRF) model to study the predictability (1-7 days) South Asian monsoon rainfall system. Results of 7-day forecast experiments using an embedded domain of 27 km and 9 km resolution were conducted for the period June 11- July 15, 2008, with and without aerosol forcing are carried out to assess the intrinsic predictability of rainfall over the HFR, and possible impacts by aerosol direct effect, and possible connection of large-scale South Asian monsoon system.