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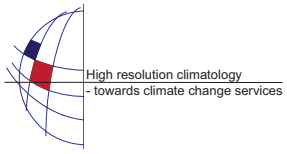

NCAR activities related to translating climate and weather information into infectious-disease and other public-health early warnings

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The atmosphere can influence the spread of human and agricultural infectious diseases through a number of different mechanisms, including the effect of the atmosphere on the health of the pathogen itself, the health and number of disease vectors, human behavior, wind transport, and flooding. Through knowledge of the statistical or physical relationships between disease incidence, for example outbreaks, and weather or climate conditions, it is possible to translate predictions of the atmosphere into predictions of disease spread or incidence. Medium range forecasts of weeks can allow redistribution of vaccines and medical personnel to locations that will be in greatest need. Inter-seasonal forecasts, e.g. based on the ENSO cycle, can provide long-lead-time information for disease early-warning systems, which can guide the manufacture of vaccines and inform aid agencies about future requirements. And knowledge of longer-term trends in climate conditions, associated, for example, with increases in green-house gases, can be used for development of infectious-disease mitigation and prevention policies. Because of the existence of complex physical, biological, and societal aspects to the links between atmospheric conditions and disease, prediction systems must be constructed based on knowledge of multiple disciplines.

To be described in the presentation are activities at the National Center for Atmospheric Research that involve the coupling of atmospheric models with infectious-disease models and decision-support systems. These include 1) the use of operational multi-week weather forecasts to estimate the spatial and temporal variability of the threat of bacterial meningitis in West Africa, 2) climate and spatial risk modeling of human plague in Uganda, 3) a study of how climate variability and human landscape modification interact to influence key aspects of both mosquito vector ecology and human behavior, and how they influence the increased incidence of dengue fever in Mexico, and 4) development of new knowledge about how extreme heat events across the United States and parts of Canada result from changing climate, land use and the interactions between them. In addition, NCAR has an arrangement with the US Centers for Disease Control wherein postdoctoral students are shared between the two organizations in order to provide experiences that will foster research at the interface between climate science and the study of infectious diseases.