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Linked Environment for Atmospheric Discovery (LEAD): Transforming the Sensing and Numerical Prediction of High Impact Local Weather Through Dynamic Adaptation

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Those who have experienced the devastation of a tornado, the raging waters of a flash flood, or the paralyzing impacts of lake-effect snows understand that mesoscale weather develops rapidly, often with considerable uncertainty with regard to location. Such weather is also locally intense and frequently influenced by processes on both larger and smaller scales. Ironically, few of the technologies used to observe the atmosphere, predict its evolution, and compute, transmit, or store information about it operate in a manner that accommodates the dynamic behavior of mesoscale weather. Radars do not adaptively scan specific regions of thunderstorms; numerical models are run largely on fixed time schedules in fixed configurations; and cyberinfrastructure does not allow meteorological tools to run on-demand, change configurations in response to the weather, or provide the fault tolerance needed for rapid reconfiguration. As a result, today's weather technology is highly constrained and far from optimal when applied to any particular situation.

This presentation describes a major paradigm shift now underway in the field of meteorology – away from today's environment in which remote sensing systems, atmospheric prediction models, and hazardous weather detection systems operate in fixed configurations, and on fixed schedules largely independent of weather – to one in which they can change their configuration dynamically in response to the evolving weather. A major driver of this change is a project known as Linked Environments for Atmospheric Discovery (LEAD) – a 5-year NSF Large Information Technology Re-

search (ITR) grant that is developing cyberinfrastructure to allow scientists, students, tools and sensors to interact with weather. This presentation will describe the research and technology development being performed to establish this capability, along with how those capabilities are being deployed in the atmospheric science community.