Good morning.

My name is Mohan Ramamurthy, and I am Director of Unidata (http://www.unidata.ucar.edu), a National Science Foundation-funded program at the University Corporation for Atmospheric Research in Boulder, CO. Unidata's mission is to provide data, tools, and community leadership for enhanced Earth-system science education and research.

I'm here to talk about some important developments that will help scientists learn far more about such topics as global climate change, El Nino, and the development of powerful storms. Unidata has made great strides in establishing the underpinnings of a worldwide data sharing network. It has developed a system, known as the Internet Data Distribution system, or IDD, to enable scientists, students, and others across North America access and use meteorological data in real-time. Three years ago, the distribution system began to reach Central and South America. More recently, the system was extended to Antarctic, and we are hoping to continue to expand it to other continents in the coming years.

The democratizing and transformative effects of this type of access to data on atmospheric science research and education cannot be overstated. For example, the IDD system is providing important benefits to the Antarctic meteorological community. Because of communication and logistical difficulties, the provision of data to Antarctic researchers, educators and forecasters has been a significant challenge, and these challenges are being overcome by ***Antarctic IDD***, which at this time carries surface and upper air observations, satellite imagery, and forecast model output to an increasing number of participating nodes, including one at the U. S. McMurdo Station. The availability of observations from polar areas is especially crucial for documenting the nature and extent of climate change, for those are the very regions that are projected to experience the most significant warming in climate simulations and as such most vulnerable from an Earth system science perspective.

IDD can also be an invaluable tool for learning more about tropical cyclones, including hurricanes. Let us consider the significance of this data sharing with a highly illustrative case. Every tropical meteorology textbook states that hurricanes do not occur in the South Atlantic Ocean. So imagine the befuddlement of the meteorological community when forecasters followed the development of the first ever recorded hurricane off the coast of Brazil in March 2004. Hurricane Catarina, as it was dubbed, is significant for two reasons: a) it has made us reevaluate the conventional wisdom; and b) Hurricane Catarina could potentially be a climate change signal. Researchers believe that the South Atlantic region is one of the areas to watch for increased tropical cyclone activity in a warmer global climate. Looking to the future, IDD will provide a great resource to scientists across the two hemispheres who can investigate, among other things, geographic differences in atmospheric and oceanic processes and circulations.

Not too long ago, real-time data access was essentially only of the province of national weather services and a handful of elite research universities in the U.S. But as a result of

the IDD, a diverse community of over 160 colleges, universities, research labs, and government organizations are accessing and using real-time data. Users at these institutions are analyzing and visualizing a variety of atmospheric data on desktop computers and studying many types of atmospheric phenomena and process. In essence, data services provided by Unidata are allowing students and researchers to access the very databases and tools that are used by operational communities, and providing a pathway to integrate research and education.

While real-time data sharing is now taken for granted in North America, for myriad reasons, it is still relatively unknown in many parts of the world. However, the situation is changing rapidly, thanks to advances in cyberinfrastructure and the growing recognition that understanding global environmental processes and their regional linkages requires full, open, and timely access to earth system science data.

As you can see from the papers being presented at the session on Earth and Space Science Cyberinfrastructures at this Joint Assembly, the original data distribution system has been extended beyond the North American borders into a system of interconnected regional data networks spanning Latin America, the Caribbean, the Antarctica, and other continents. The adoption of the IDD concept has been so successful that Brazil now ranks only behind the United States in the number of participating sites in their own regionally customized and managed data sharing network called ***IDD-Brazil.***

In addition to research, profound impacts on education have already been noticed since the distribution system expanded beyond North America nearly three years ago. For example, data delivery to Central and South America has initiated veritable teaching innovations at many universities those regions, including the University of Costa Rica, Costa Rica, University of Buenos Aires in Argentina, and University of Sao Paolo, Brazil. Integration of real-world data has provided opportunities for active, student-centered and inquiry-based learning, infusing the excitement of discovery into geoscience courses at these institutions. I am sure my distinguished colleagues on this panel will have much more to say on this subject. Moreover, for the first time, previously unavailable observations and high resolution model output for Brazil are now being made available in near real-time to both Latin American and North American users.

A critical component of successful scientific inquiry includes learning how to collect, process, analyze, and integrate data from myriad sources, and geoscience education is uniquely suited to making science relevant by drawing connections between the dynamic Earth system and societal impacts. Continued collaborations resulting from such data sharing efforts will result in greater understanding of a range of geoscientific problems, which include advances in climate change and hydrologic sciences, and weather and El Nino predictions. Moreover, they will provide a richer analysis of the evolving state of the planet.

Thank you.