

Title : Center for Collaborative Adaptive Sensing of the Atmosphere (CASA)
Type : Award
NSF Org : EEC
Latest
Amendment
Date : July 12, 2006
File : a0313747

Award Number: 0313747

Award Instr.: Cooperative Agreement

Prgm Manager: Stephan P. Nelson

EEC DIV OF ENGINEERING EDUCATION AND CENTERS
ENG DIRECTORATE FOR ENGINEERING

Start Date : September 1, 2003

Expires : August 31, 2008 (Estimated)

Expected

Total Amt. : \$17000000.00 (Estimated)

Investigator: David J. McLaughlin mclaughlin@ecs.umass.edu (Principal
Investigator current)

James F. Kurose (Co-Principal Investigator current)

Sandra Cruz-Pol (Co-Principal Investigator current)

V. Chandrasekar (Co-Principal Investigator current)

Kelvin K. Droegemeier (Co-Principal Investigator current)

Sponsor : U of Massachusetts Amherst

Research Administration Building

AMHERST, MA 010039242 413/545-0698

NSF Program : 1480 ENGINEERING RESEARCH CENTERS

Fld Applctn:

Program Ref : 0000,4444,7234,7238,OTHR,

Abstract :

Our ability to monitor, anticipate, and respond to changing
circumstances and events is increasingly important, particularly with
regard to
our physical surroundings. Nowhere is this capability more vital to
society, or
the challenges associated with its practical implementation greater, than
in
the context of the atmosphere, where hazardous local weather, such as
thunderstorms, tornadoes, microbursts, snow storms, and floods as well as
lofted radiological, chemical and biological agents can, in a matter of
minutes or hours, destroy or contaminate life and property over vast areas.
Yet, the portion of the atmosphere that contains the bulk of both natural
and
man-made hazards the lower troposphere and particularly the atmospheric
boundary layer is grossly undersampled by today's sensing technologies. Our
ERC
proposes a revolutionary new paradigm in which transforming systems of
distributed, collaborative, and adaptive sensing (DCAS) networks are
deployed
to overcome fundamental limitations of current approaches. Here,
distributed
refers to the use of large numbers of appropriately spaced sensors capable
of

high spatial and temporal resolution throughout the entire troposphere. These systems will operate collaboratively within a dynamic information technology infrastructure, adapting to changing conditions in a manner that meets competing end user needs. These systems will achieve breakthrough improvements in sensitivity and resolution leading to significant reductions in tornado false alarms, vastly improved precipitation estimates for flood prediction, fine scale wind field imaging and thermodynamic state estimation for use in airborne hazard dispersion prediction and other applications. Successful implementation of DCAS systems will require fundamental breakthroughs consistent with the NSF Technical Merit Review Criteria. Among these breakthroughs will be integration and sharing of knowledge across disciplines; design and fabrication of low cost, multi beam, solid state radars; creation of a systems based architecture to organize sensing, computing, and communications resources; development of twoway end user interfaces that dynamically target system resources; deployment of integrative test beds to validate assumptions and understand emergent system behavior; implementation of cross linked hierarchical data storage and processing; and improved understanding of small scale atmospheric processes. To achieve these breakthroughs, we have assembled leading engineering and computer science experts from the University of Massachusetts, Amherst. They will work in partnership with scientists and engineers from the University of Oklahoma, Colorado State University and the University of Puerto Rico, Mayaguez, and corporate partners including Raytheon, IBM, Vaisala, and federal and state government agencies to create the Center for Collaborative Adaptive Sensing of the Atmosphere (CASA). We will create scalable prototype test beds to demonstrate the potential for DCAS to revolutionize our understanding, detection, and prediction of hazardous atmospheric phenomena with end users involved from the outset. CASA meets the NSF Broader Impacts Review Criteria through: comprehensive education and outreach programs that introduce systems based engineering to K-12 students via the mandated engineering/technology curriculum in Massachusetts, and serves as the mechanism for expanding participation by under represented groups in engineering and scientific endeavors at all levels. Further, it will engage first responders and other end users through the provision of both technology and training. CASA will address the observation, prediction and response of weather, an issue that affects between 10 percent and 30 percent of the U.S. gross national product. Our management structure has the flexibility to take advantage of our broad partnership. For example, CASA will collaborate with industry partners, who, in turn, will create new product lines and services

based on our new paradigm for sensing, analyzing, predicting and responding
to
atmospheric hazards in the troposphere.