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DURHAM, N.H. -- Six "smart" balloons, each carrying a state-of-the-art, miniature ozone sensor designed and built by scientists at the University of New Hampshire, recently completed a series of flights measuring levels of the pollutant in the Houston area and over the Gulf of Mexico as part of 2006 Texas Air Quality Study II.

The balloons – termed "smart" because they allow operators to remotely control their vertical height to sample different layers of the atmosphere – measured the ozone concentration and a number of other meteorological variables while immersed in plumes of urban air.

Houston has one of the highest levels of ozone in the U.S., and scientists are trying to better understand how the pollutant is exported from "mega-polluted" areas, such as Houston and Mexico City, and what its impact is on the air quality of the Northern Hemisphere.

The first smart balloon, which stayed aloft for over three days and traveled more than 2,500 kilometers before landing in Florida, encountered ozone levels in excess of 200 parts per billion in polluted air over the Gulf of Mexico. Such high levels of ozone are considered unhealthy under guidelines established by the U.S. Environmental Protection Agency.

"The balloons provide a very unique platform," says Robert Talbot, director of the UNH Climate Change Research Center within the Institute for the Study of Earth, Oceans, and Space, where the miniature ozone sensor was developed.

Adds Talbot, "The real power of the balloons is the continuous observation on spatial scales that other platforms can't do." For example, a smart balloon, drifting at 10 meters per second in a polluted plume of air, can make much higher resolution measurements than an aircraft traveling ten times faster and flying in and out of the plume.

The balloons provided a new perspective on the flow and dispersion of pollution from the Houston area, and will help scientists learn how these plumes disperse over the Gulf of Mexico in particular so that computer models can be improved to better simulate and predict those processes.

Faculty and students from UNH and the University of Hawaii will work in collaboration with National Oceanic and Atmospheric Administration (NOAA) scientists in analyzing the data obtained during the smart balloon flights.

The NOAA Air Resources Laboratory Field Research Division, in collaboration with the

University of Hawaii, developed the smart balloon technology.

UNH led the overall balloon project for the summer Texas air quality campaign. Scientists and students from UNH also participated in the study by measuring levels of atmospheric nitric acid from NOAA's Research Vessel Ronald H. Brown and from an 18-story building on the University of Houston campus. UNH graduate students also measured the chemical composition and levels of aerosols in the Houston area.

The miniature ozone sensor was first deployed in the summer of 2004 during a massive air quality study called the International Consortium for Atmospheric Research on Transport and Transformation or ICARTT.

Talbot notes that continued work done by UNH engineers has upgraded the ozone sensor from a first-generation instrument to a "true research-grade precision instrument. The overall quality of the measurement is very high, accurate, and reliable, and the sensor can respond to changes in ozone very quickly," Talbot says.

The UNH smart balloon work was funded under the Targeted Wind Sensing program while the other measurements made by UNH scientists were done under the university's AIRMAP program. U.S. Senator Judd Gregg (R-NH) has been instrumental in securing funding for both scientific programs. For more information, visit www.tws.unh.edu and www.airmap.unh.edu.

Editors and reporters: A photo is available to download here (right-click and choose "Save As"): smartballoon.jpg (2MB)

Caption: Holding a smart balloon prior to one of six balloon launches in the 2006 Texas Air Quality Study (TexAQS) II are, left to right, John Porter and Jonathan Tytell of the University of Hawaii, and Randy Johnson of NOAA's Air Resources Laboratory Field Research Division. The UNH miniature ozone sensor is contained inside the balloon.