

Upgrades and Additions to the ARM Climate Research Facility

Balloon-Borne Sounding Systems

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Autosonde Sounding System

The AUTOSONDE, a Vaisala DigiCORA® Unmanned Sounding System, will be installed in CY 2010 at the ARM Climate Research Facility North Slope of Alaska site in Barrow, Alaska.

The Autosonde provides full automation of upper-air observations. The system has the capacity for 24 launches before radiosonde and balloon restocking is necessary. Restocking normally takes three hours, therefore reducing operation costs significantly. Approximately 50 Vaisala Autosonde systems are deployed around the world and have a proven performance and reliability record in extreme climates, something very beneficial in regard to the Barrow site.



The Autosonde Sounding System will:

- ✓ Allow for up to 24 consecutive unmanned, fully-automated launches
- ✓ Minimize operating costs and increase operator safety
- ✓ Allow for remote configuration and control of launch schedule
- ✓ Provide reliable and rugged performance in harsh Arctic conditions
- ✓ Use RS92 radiosondes, consistent with current ARM Climate Research Facility systems
- ✓ Allow for automated or manual launch configurations

The Autosonde system is housed in an insulated shelter, along with the meteorological equipment, control computer, and the sounding subsystem. The launcher vessel, where the balloons are filled and released, is a separate unit mounted at one end of the shelter. A sub-processor controls the launcher and gas measurement for each balloon.

Radiosondes and balloons are loaded onto the trays of the rotating table mechanism, referred to as the "daisywheel", at the back of the shelter. For each launch, the daisywheel rotates, allowing for access to the next pre-loaded radiosonde by the launcher.

The sounding subsystem, located inside the shelter, receives and processes the data sent by the radiosonde. This process is identical to those used by current DigiCORA systems installed at ARM Climate Research Facility sites.

A dedicated Automatic Weather Station will be installed near the Autosonde enclosure to produce surface weather data for the sounding subsystem processes and for input into the "go/no-go" decision making process in case of high winds.



AUTOSONDE Specifications

SHELTER

Dimensions: 4.9m x 2.4m x 2.5m
Height with launcher vessel: 3.7m
Weight: 3 metric tons

LAUNCHER VESSEL

Dimensions: 1.2m H, 2m Dia.
Balloon size: 200-800 g
Balloon filling gas: Helium or Hydrogen

GRUAN - GCOS Reference Upper Air Network

In 2009 the ARM fixed sites were approved by the Department of Energy to join the Global Climate Observing System (GCOS) Reference Upper Air Network (GRUAN). The ARM fixed sites are comprised of the Southern Great Plains Central Facility (SGPCF), the North Slope of Alaska Barrow location (NSAC1), and the Tropical Western Pacific Darwin, Manus and Nauru locations (TWPC1, C2 and C3).

Part of the requirement for being a GRUAN site is the monthly launching of Chilled Frost Point Hygrometer sondes (CFH's). CFH launches are much more demanding than the typical Vaisala sondes launched daily at all ARM sites. Launching a CFH requires using a cryogenic gas (Trifluoromethane) cooled to -80C and transferring it into the CFH itself prior to launch. The balloon that carries the heavier CFH is 10ft in diameter once inflated so is much more sensitive to surface wind speeds. A typical launch of a CFH requires two people to accomplish effectively.



Implementing these launches at remote sites like the TWP and NSA require careful planning and attention to operational procedures and safety controls. Beginning in mid-year FY2010 personnel at the SGPCF will begin launching the CFH's once or twice per month. The SGPCF launches will be used to develop, test and refine launch and safety procedures, validate hardware (ground station, low-temp freezer, Balloon Filling Enclosure, etc) and define the data dissemination requirements.

ARRA-Purchased System

With the receipt of ARRA funding, a new DigiCORA-III Sounding System was purchased for installation at the ARM Climate Research Facility Southern Great Plains site. The new system employs the newest generation Vaisala SPS311 subsystem, identical to what is currently used at both Tropical Western Pacific sites.

The purchase of this new system allows for a spare DigiCORA-III system to be available for use in the event of a catastrophic equipment failure at any site.



Hardware & Software Upgrade

All ARM Climate Research Facility DigiCORA-I and DigiCORA-II backup systems now have hardware chipset upgrades. These upgrades provide the latest algorithms for radiation correction that are necessary due to a physical change to the RS-92 radiosonde booms.



All ARM Climate Research Facility DigiCORA-III systems were upgraded to the newest DigiCORA Sounding Software Version 3.61.1. This release insures that the most up-to-date algorithms and modifications which will provide us with the most accurate sounding data achievable.