Meteorological and Wave Measurements for Improving Meteorological and Air Quality Modeling

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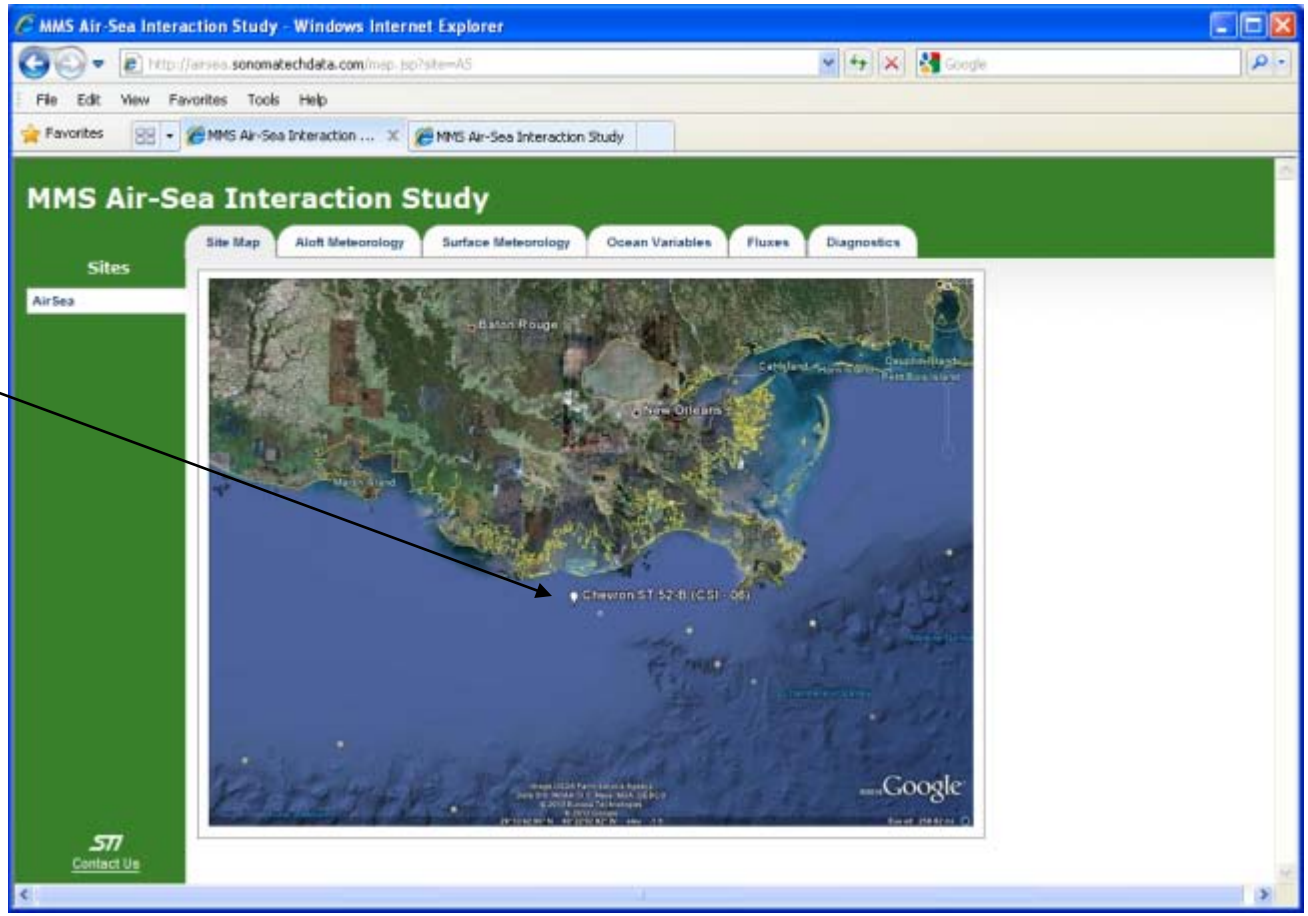
Overview

- 12-month program led by STI with collaboration from NOAA, CU, and LSU
- Key Goals are to collect data for use in
  - Improving predictions of boundary layer parameters
  - Improving regional-scale meteorological model predictions
  - Providing a framework for advanced offshore measurements

STI's team loading equipment onto the oil platform

Site Location

~12 miles offshore and 78 miles south-southwest of New Orleans



Instruments

Instrument	Main Parameters	Height Coverage
Mini-sodar	Wind profiles	15 – 200 (m apl)
Ceilometer	Mixing heights and clouds	~0 – 4,000 (m apl)
Microwave radiometer	Temperature and humidity profiles	~0 – 10,000 (m apl)
Two ultrasonic anemometers and fast-response humidity and CO_2 sensors	Latent, sensible, and momentum flux, and turbulence (plus temperature and winds)	~7 (m msl)
Surface meteorology	Wind speed and direction, temperature, humidity and pressure	~10 (m apl) for wind speed/direction ~2 (m apl) for remaining parameters
Wave sensor via LSU	Wave height, spectra, and period	0 (m msl)
Underwater temperature float	Water temperature	~.02 (m below sea level)
Pyranometer	Downwelling radiation	~3 (m apl)
Infrared temperature sensor	Sea skin temperature	0.0 sea level

Status

- All meteorological instruments were installed and became operational on October 4, 2010
- Data are being sent to STI and posted to website daily
- Operations are currently planned to continue until October 3, 2011
- Additional year and/or site possible

Installed Equipment (1 of 3)

Radiometer, satellite communications, and ceilometer

microwave radiometer

ceilometer

short- and long-wave radiation sensors

Radiometer, ceilometer, mini-Sodar, PIR/PSP, and meteorological tower

meteorological tower

mini-Sodar

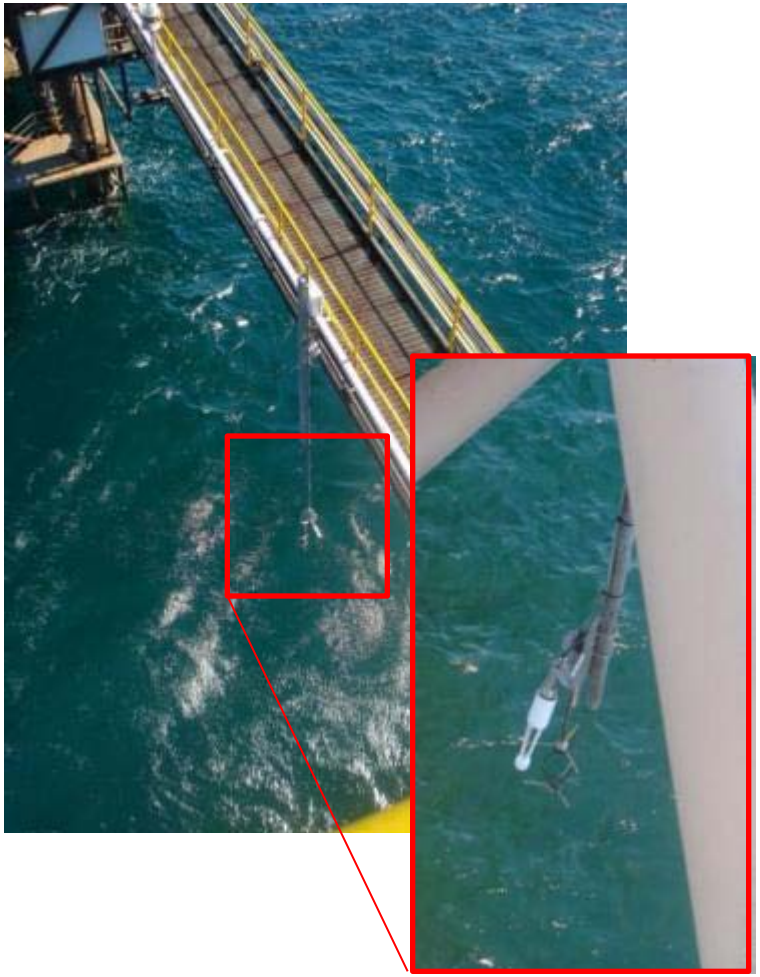
Installed Equipment (2 of 3)

IR skin temperature sensor

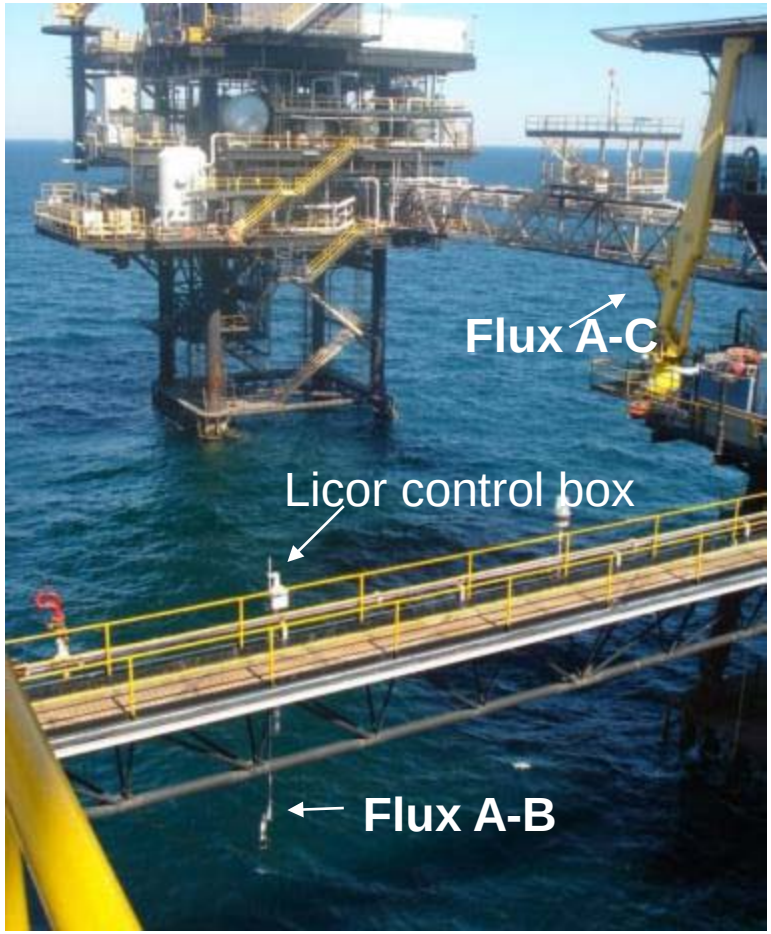
Short-wave and
long-wave radiation sensors

Installed Equipment (3 of 3)

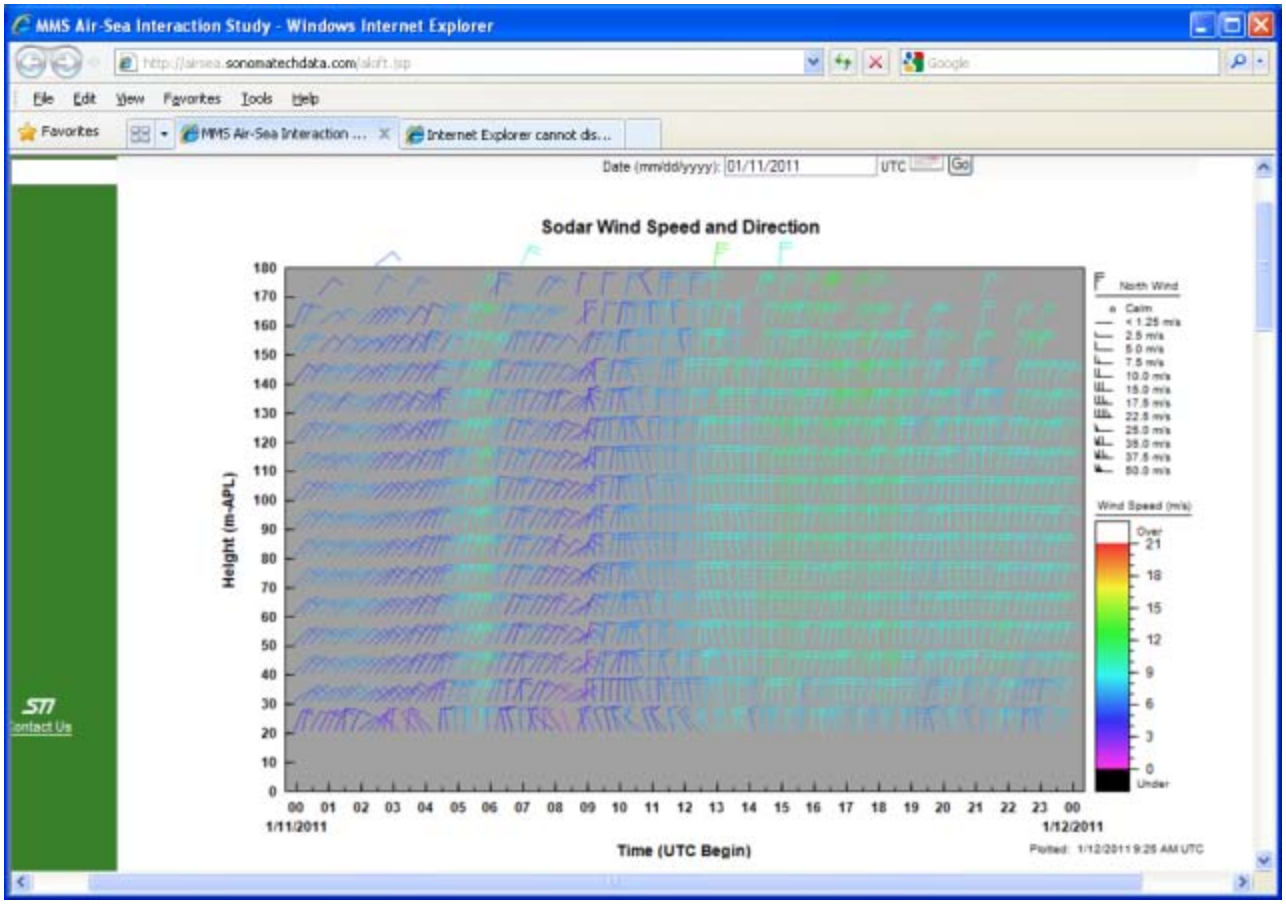
Flux package A-B bridge



Flux package sensors

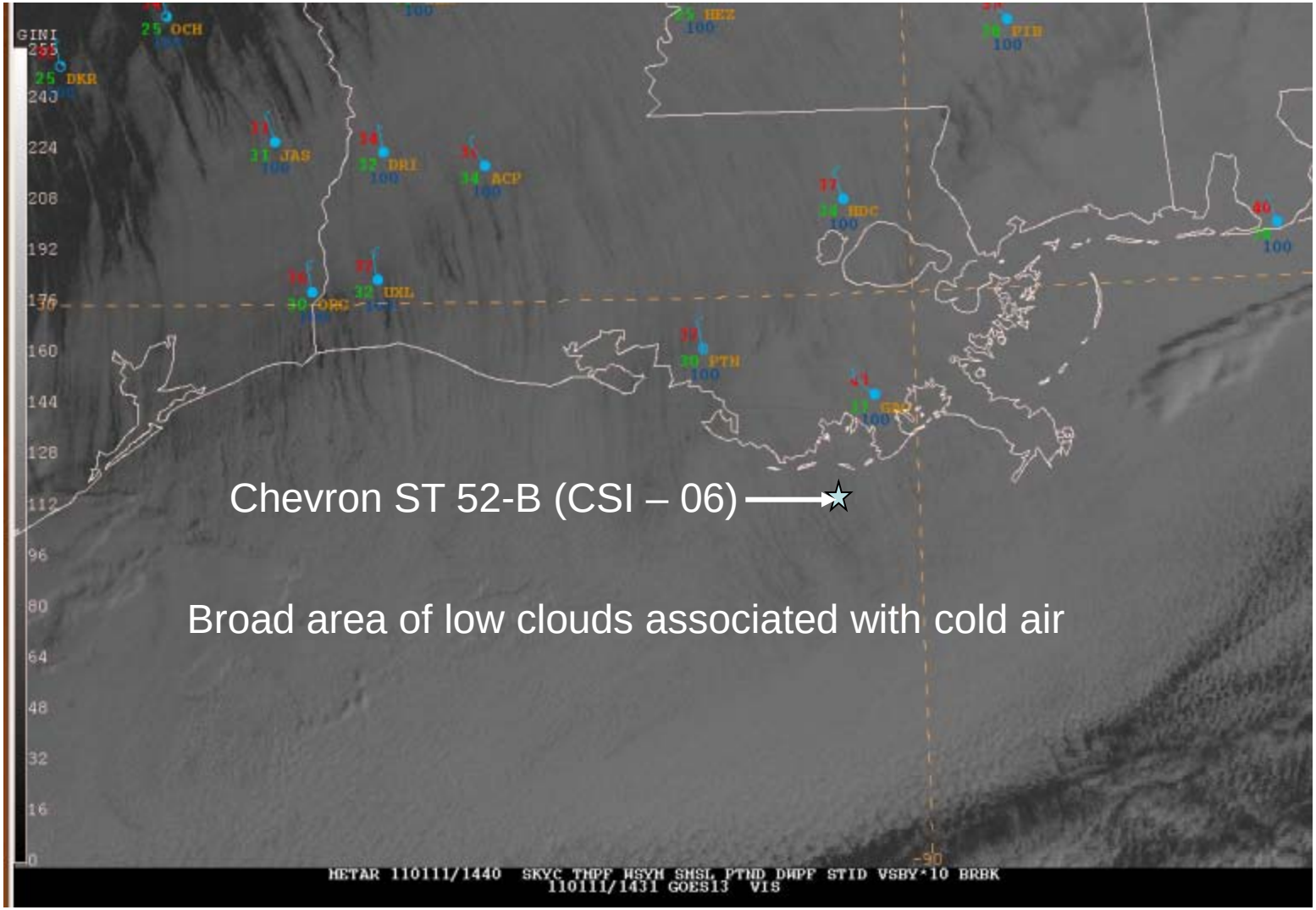


Sodar Data on 1/11/2011



Strong northerly winds transport cold air from the north

Visible Satellite Imagery Data on 1/11/2011

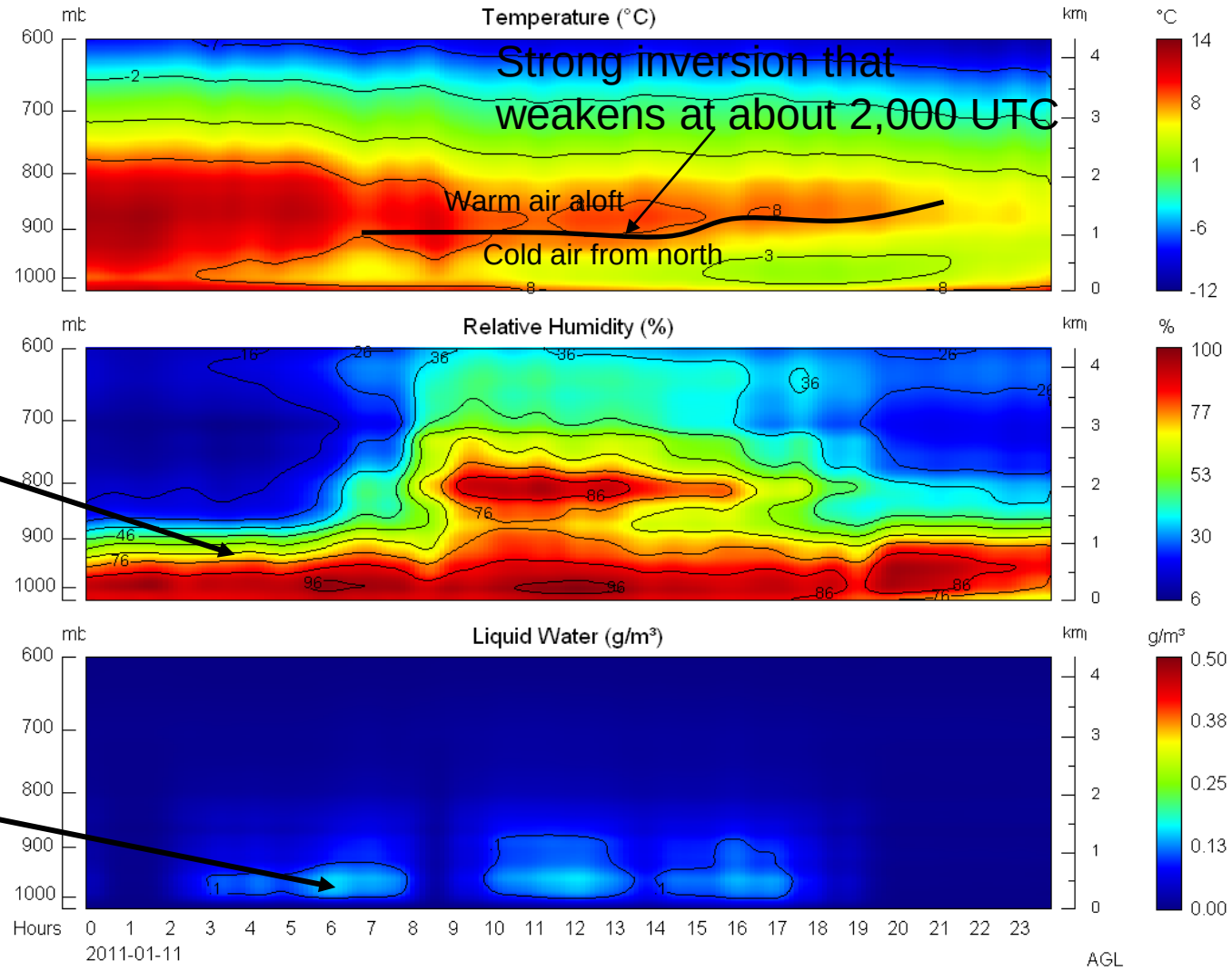


1431 UTC January 11, 2011

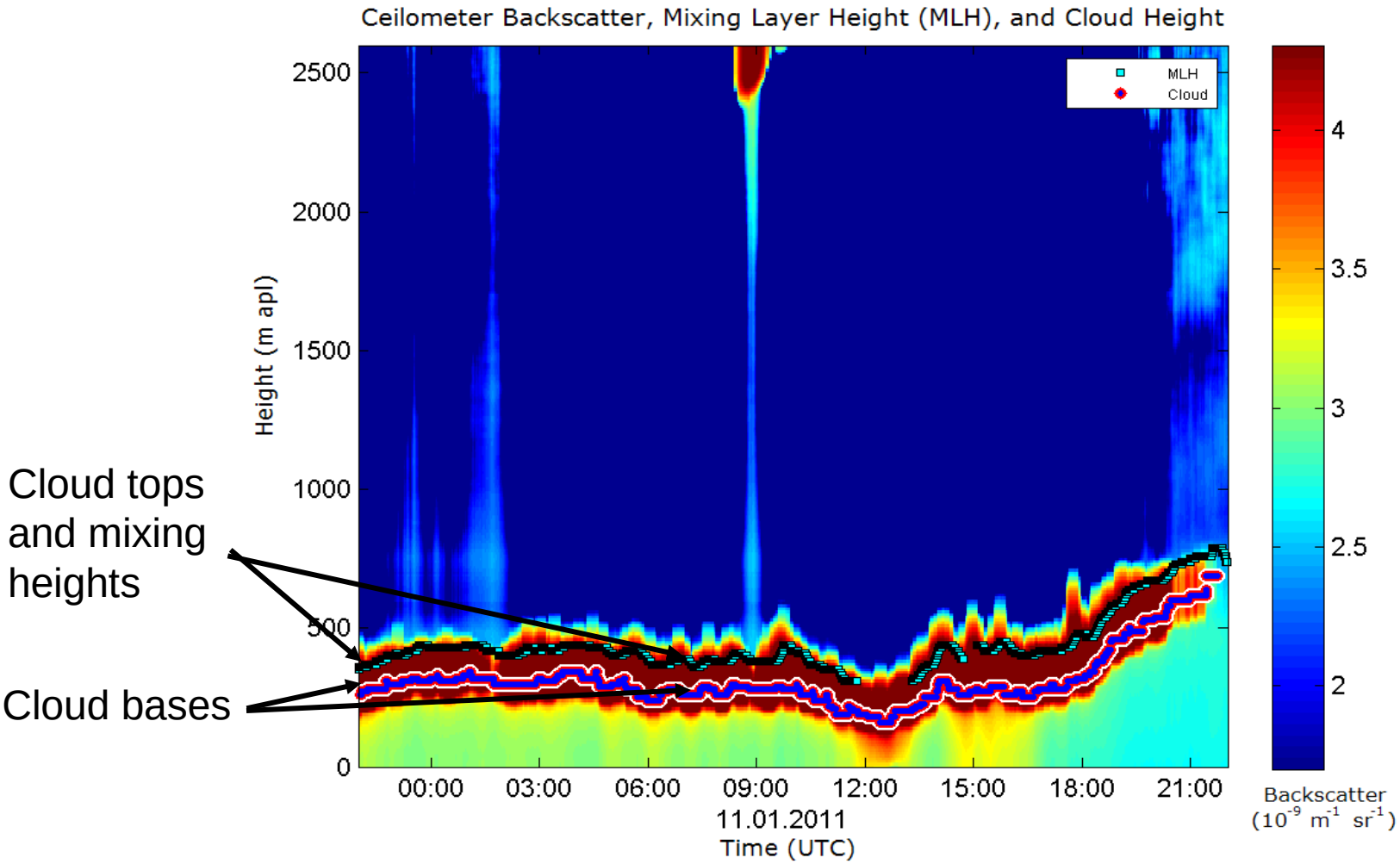
Radiometer Data on 1/11/2011

Strong RH gradient near the top of the cloud layer

Increased levels of liquid water in the cloud layer

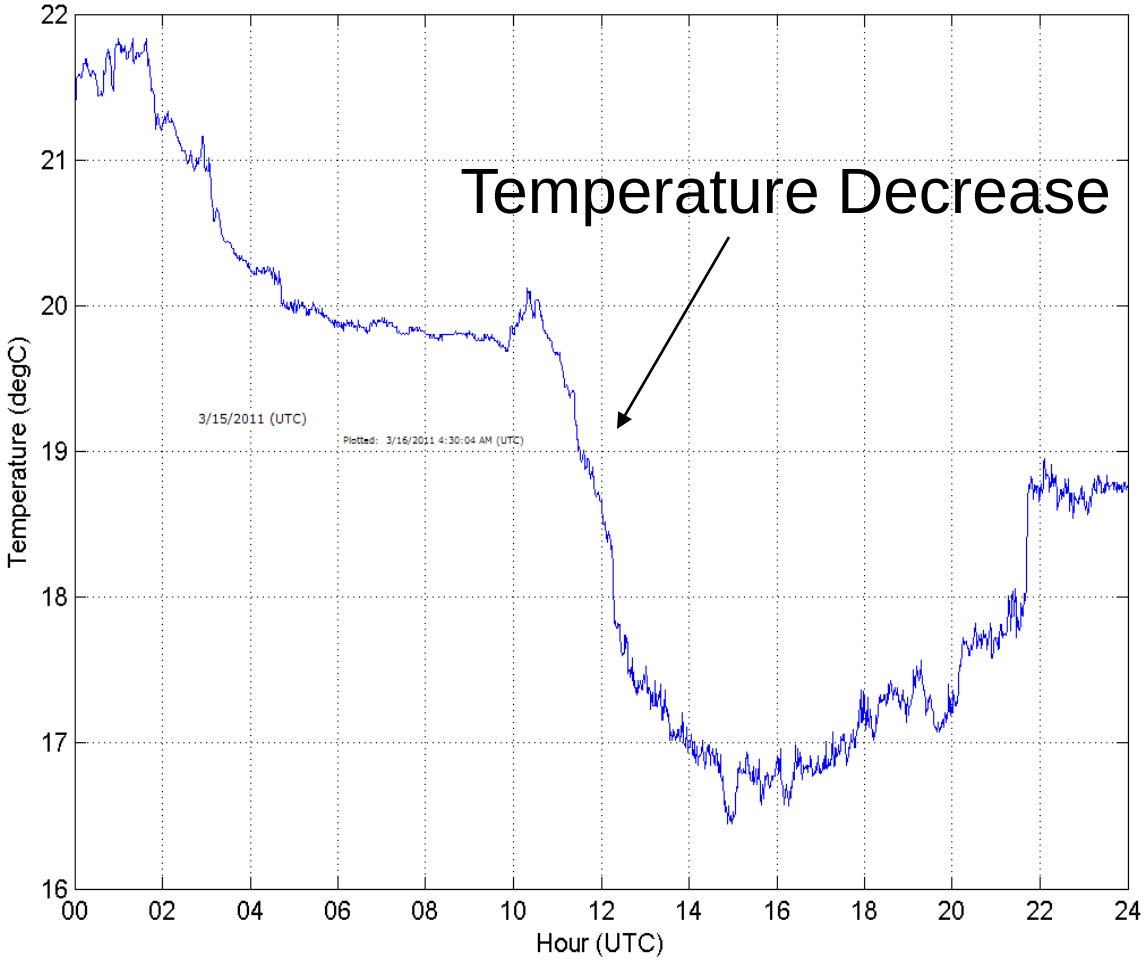


Ceilometer Data on 1/11/2011

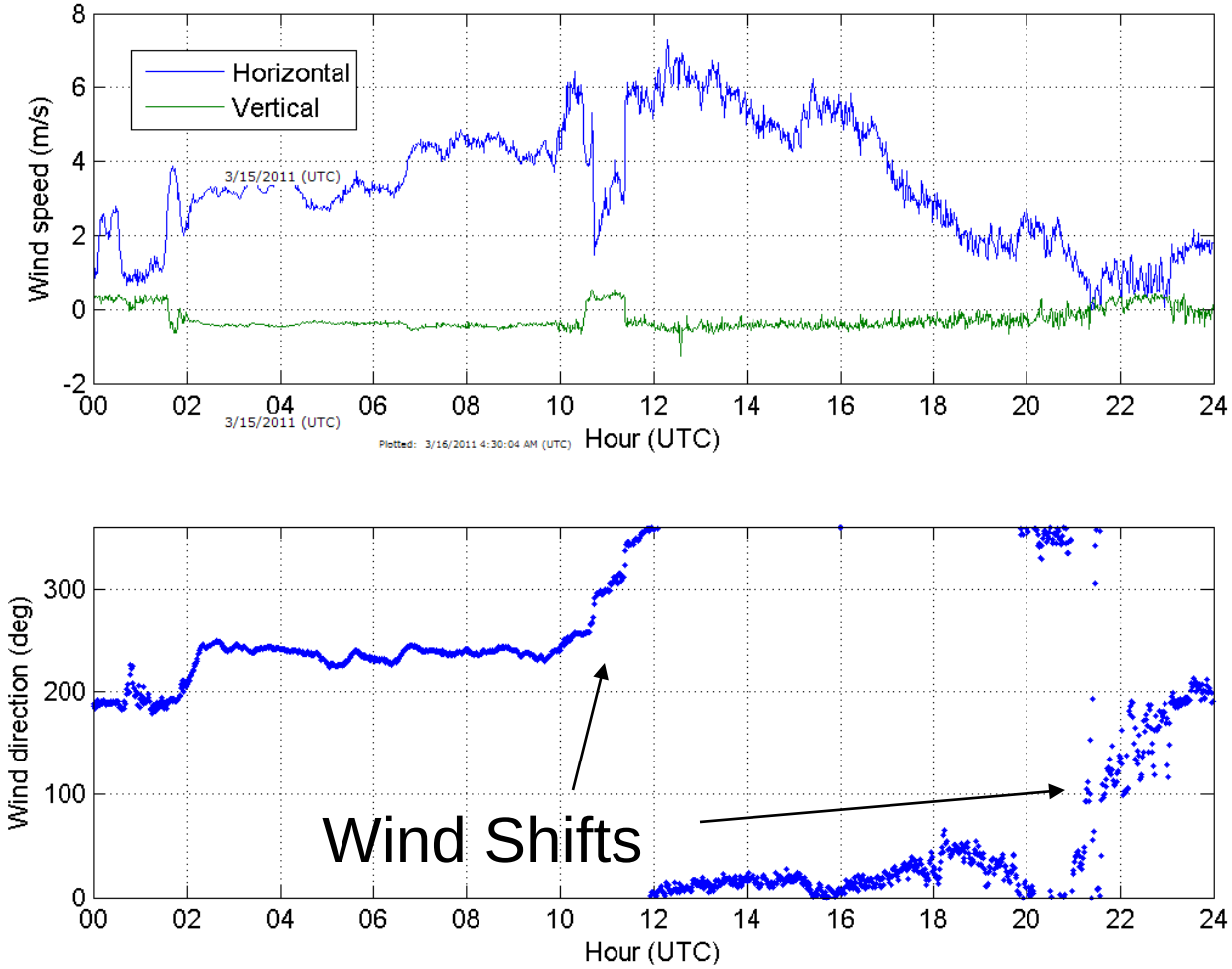


Mixing and cloud base heights increase in the afternoon as the temperature inversion weakens

Sonic Anemometer A-C Bridge Data on 3/15/2011



Sonic Anemometer A-C Bridge Data on 3/15/2011



ST-52B Platform

Platform name: Chevron Platform, ST-52B, South of Terrebonne Bay, Louisiana
WAVCIS name: CSI-06
NDBC name: Station SPLL1
Coordinates: -90º29', 28º52'
Platform deck (roof) height: 37 m msl
Catwalks heights: ~20 m msl
Water depth: 20.5 m
Active wells: No, this platform is for crew quarters

Note, there is now a large shelter on the deck, plus our equipment

Provide a Framework for Advanced Offshore Measurements (1 of 2)

Use of highly complex instruments in offshore areas

- Flux
  - Unattended
  - Long-term
  - Two instruments
  - Upside down
- Sodar
  - New clutter removal techniques
    - Electronic
    - Physical
  - Noise reduction for crew
- Radiometer
  - Beta software for off-zenith measurements (key for boundary layer data)

Provide a Framework for Advanced Offshore Measurements (2 of 2)

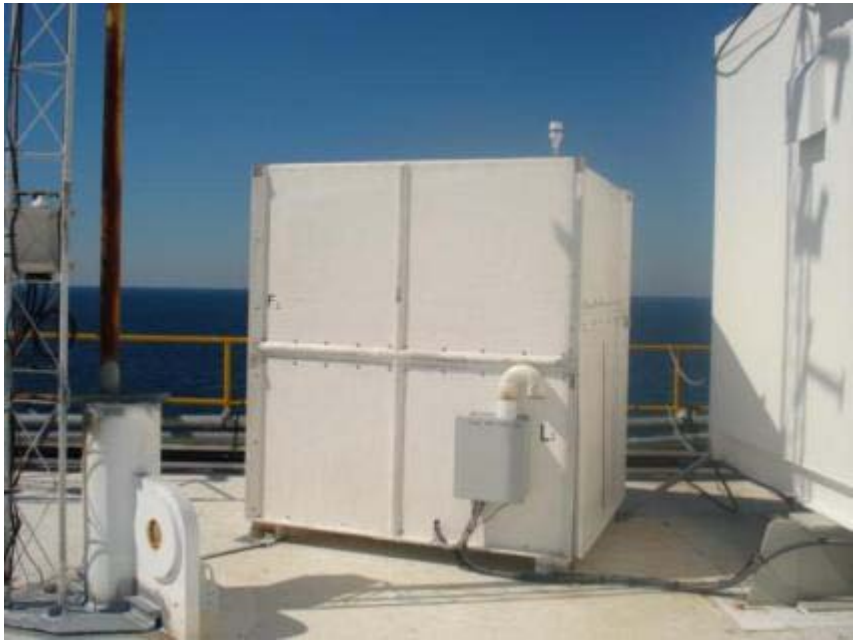
- Ceilometer
  - Mixing height algorithms are being tested
- Radiometer for skin temperature measurements
  - Redesign of instrument for improved sky correction
- New system for near-surface temperature measurements
- Computer
  - One computer
  - Water-cooled shelter
- Communications and data storage
  - Large amount of data
- Infrastructure
  - Special mounts for all instruments

Installation – Unloading Equipment

Installation – Mini-Sodar

Noise abatement blanket

Fully enclosed mini-Sodar



Installation – Ceilometer

Installing the ceilometer

Mounted and installed

Installation – Data Acquisition System

Inside the DAS

Batteries for the DAS

Test Bed – Fabrication of Brackets (1 of 2)

Custom mounts for the flux sensors

Custom mounts for the radiation sensors

Test Bed – Fabrication of Brackets (2 of 2)

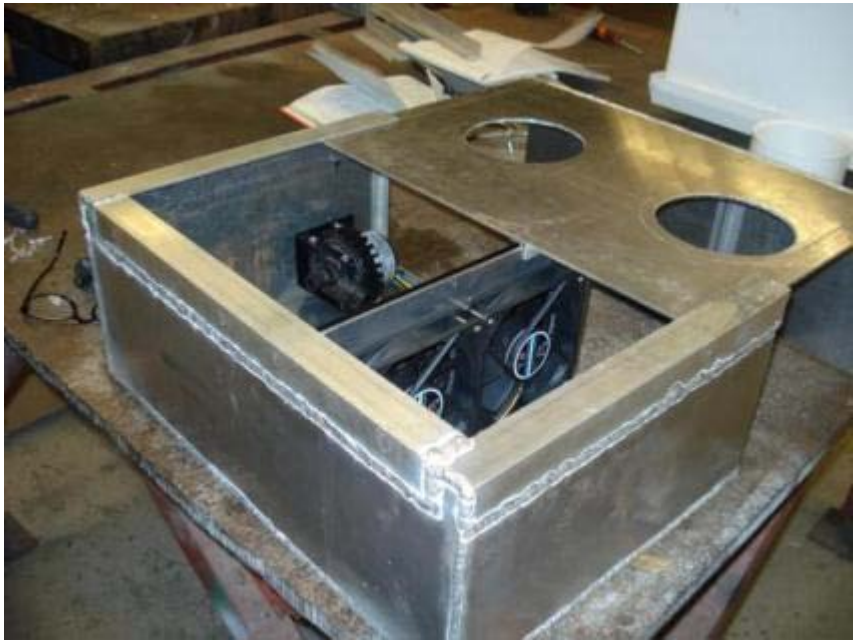
Custom mounts for the infrared sensor and tipping bucket

Custom mounts for the ceilometer and microwave radiometer

Near-Surface Sea Temperature

Test Bed – Central Processing Unit (CPU)

Enclosure for
CPU Cooling System



Inside the
Data Acquisition System

Test Bed – Instruments

Flux charger box

Flux sensors and modem on truck for testing

Summary

- 12-month program led by STI with collaboration from NOAA, CU, and LSU
- Key goals are to collect data for use in
  - Improving predictions of boundary layer parameters
  - Improving regional-scale meteorological model predictions
  - Providing a framework for advanced offshore measurements
- Suite of advanced measurements
- Many technical and logistical issues overcome
- Operations going well overall