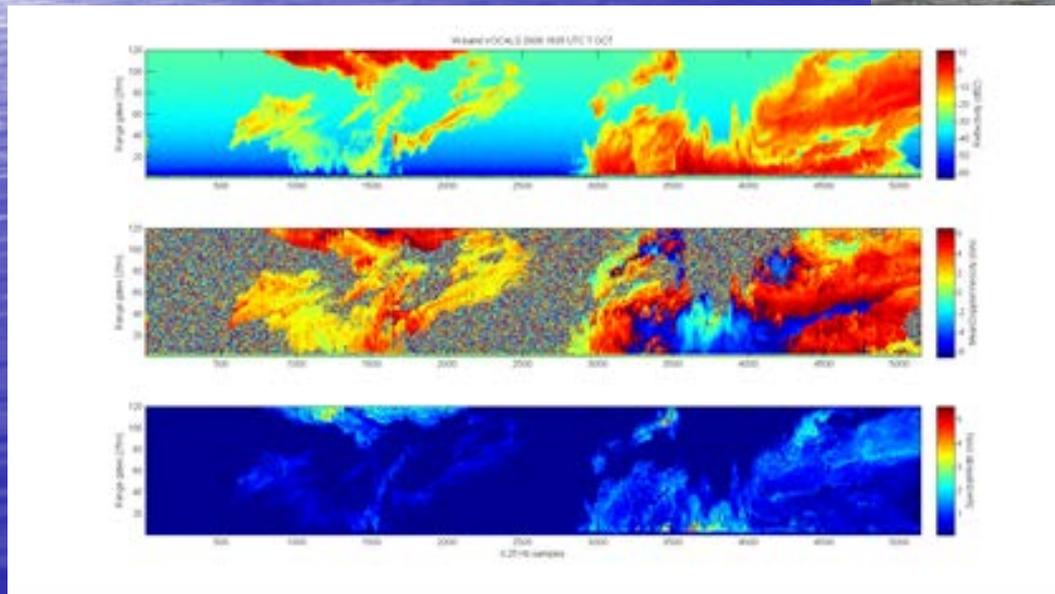
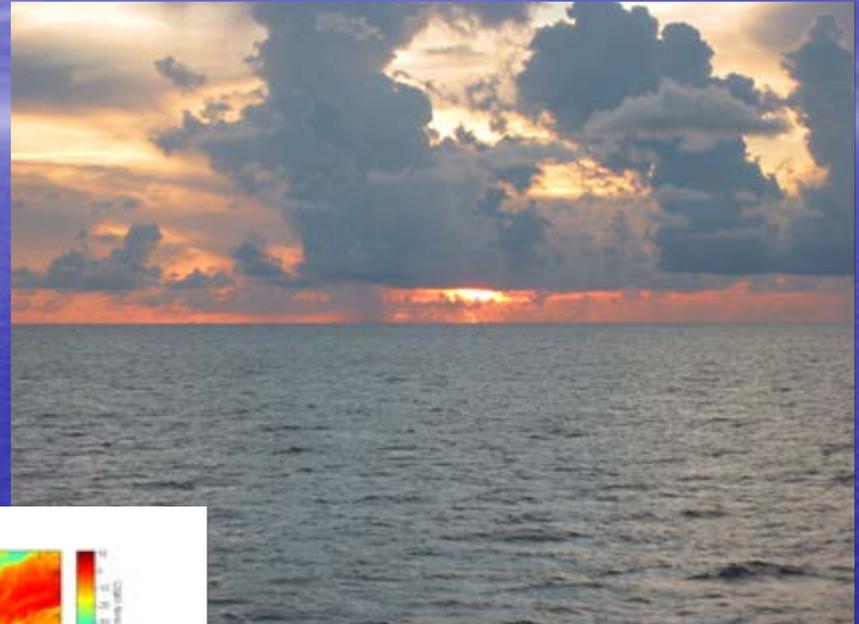


A Motion-Stabilized W-Band Radar for Shipboard



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Stabilized Platform and W Band Radar

- Stabilized Platform and Specs
- W-band Radar and Specs
- Objective
- Up to day summary

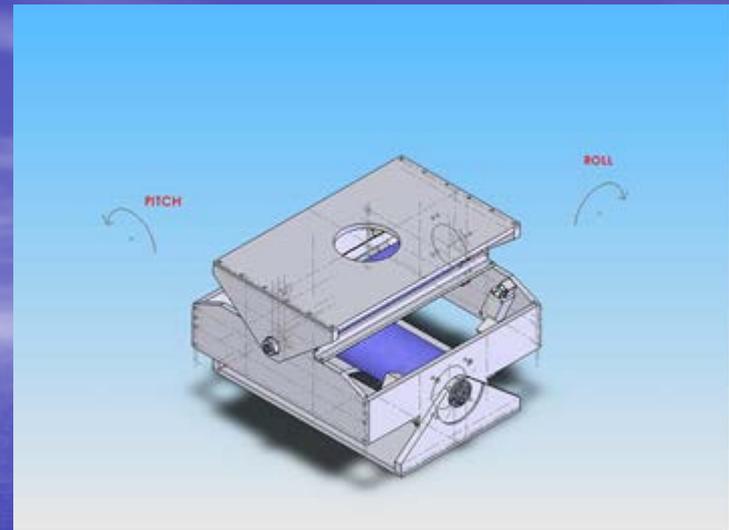
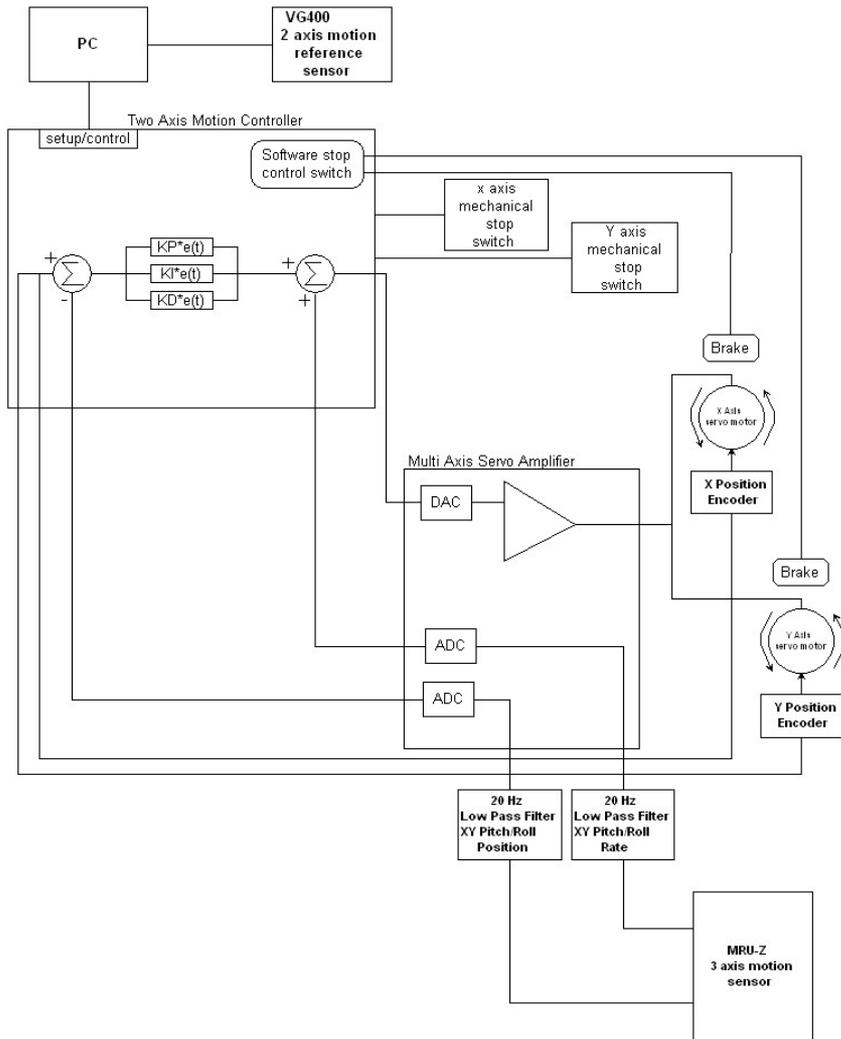
Stabilized Platform

- The idea started in the early month of 2005.
- The first prototype was shown at the Inmartech 2006 conference (Woods Hole, MA).
- ESRL Portable Flux Standard being developed for the NOAA Office of Climate Observations.
- The first field test of the system was on the NOAA Ship Ronald H. Brown during the Status 2007 cruise (October 10 – November 6).

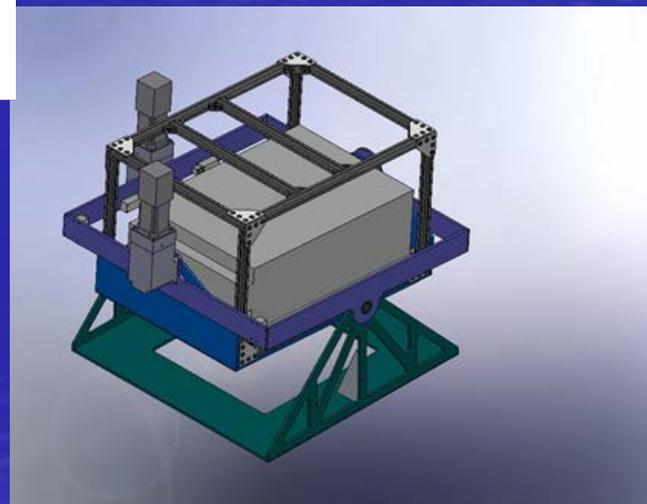
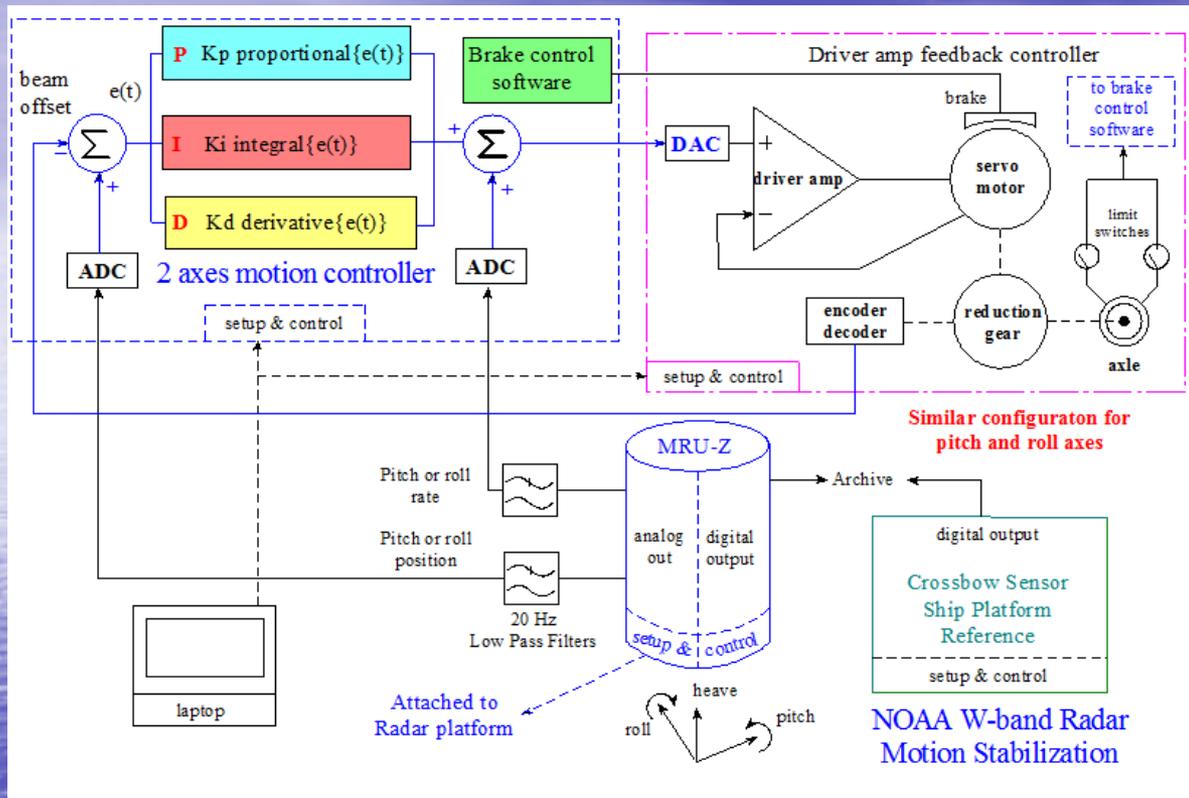


Stabilized Platform

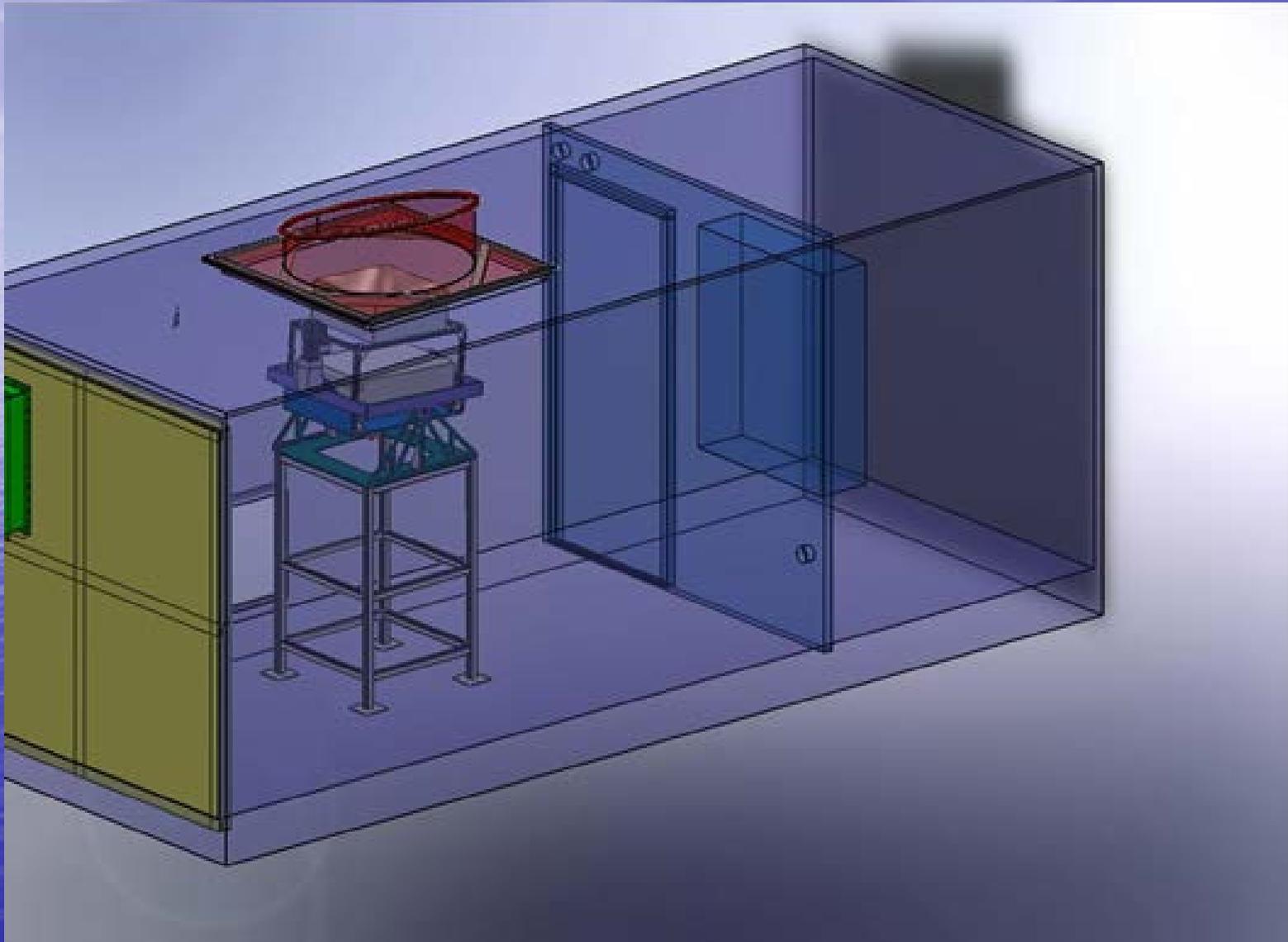
Block Diagram for W-Band Radar Stand Alone Stabilized Motion Controller



Stabilized Platform



Stabilized Platform



Stabilized Platform

- **Specifications:**

Two axis motion controller from Galil
model #DMC 2020

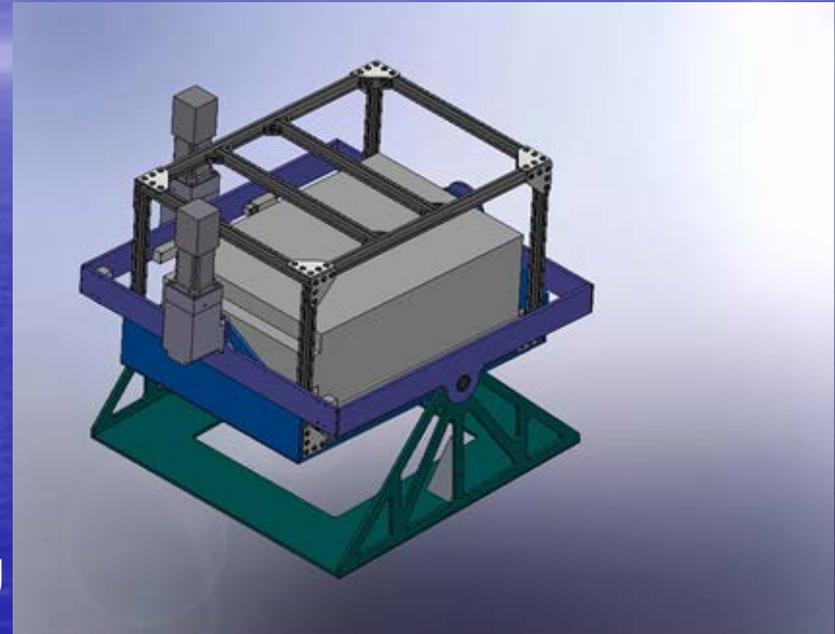
Power Amplifier/ Interface from Galil
model #AMP-19520

Solid State Vertical Gyro from Crossbow
model VG400MA-100

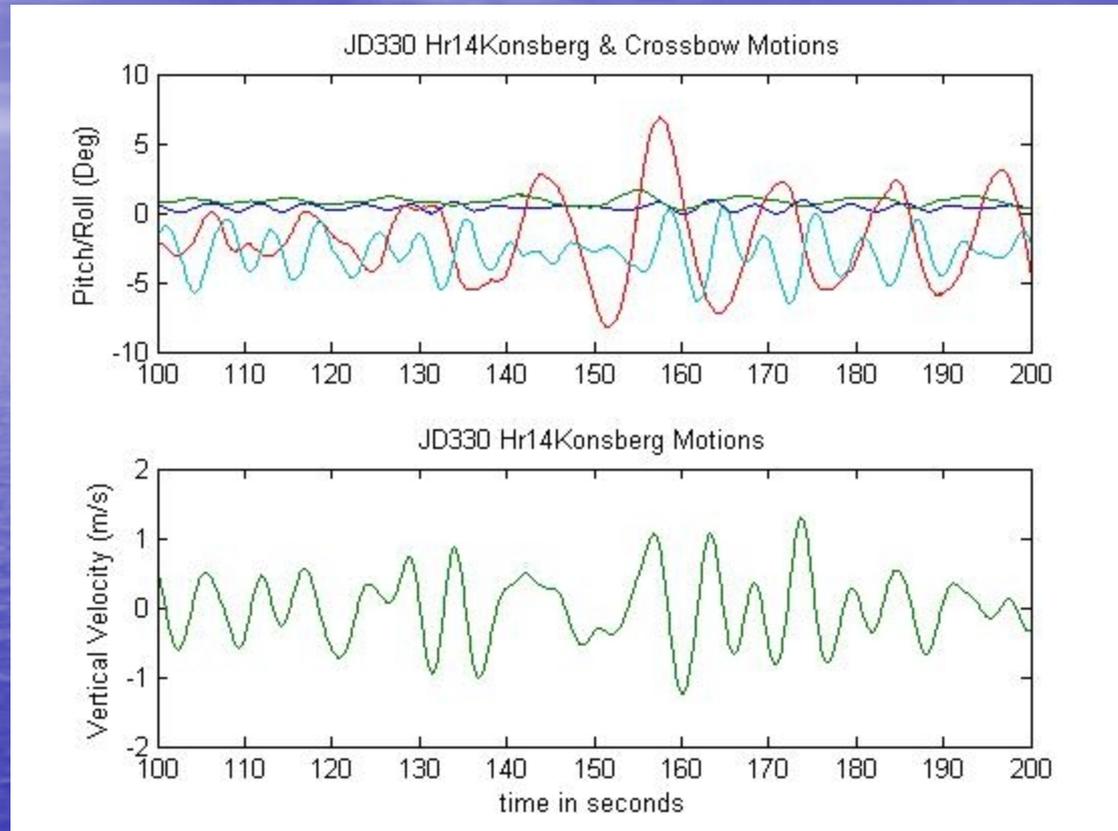
Solid State Vertical Gyro from Kongsberg
model MRU-Z

Two Servo motors from Parker
with two 100/1 Gearhead reducer from Bayside Motion Group

Two Analog 20Hz low pass filters

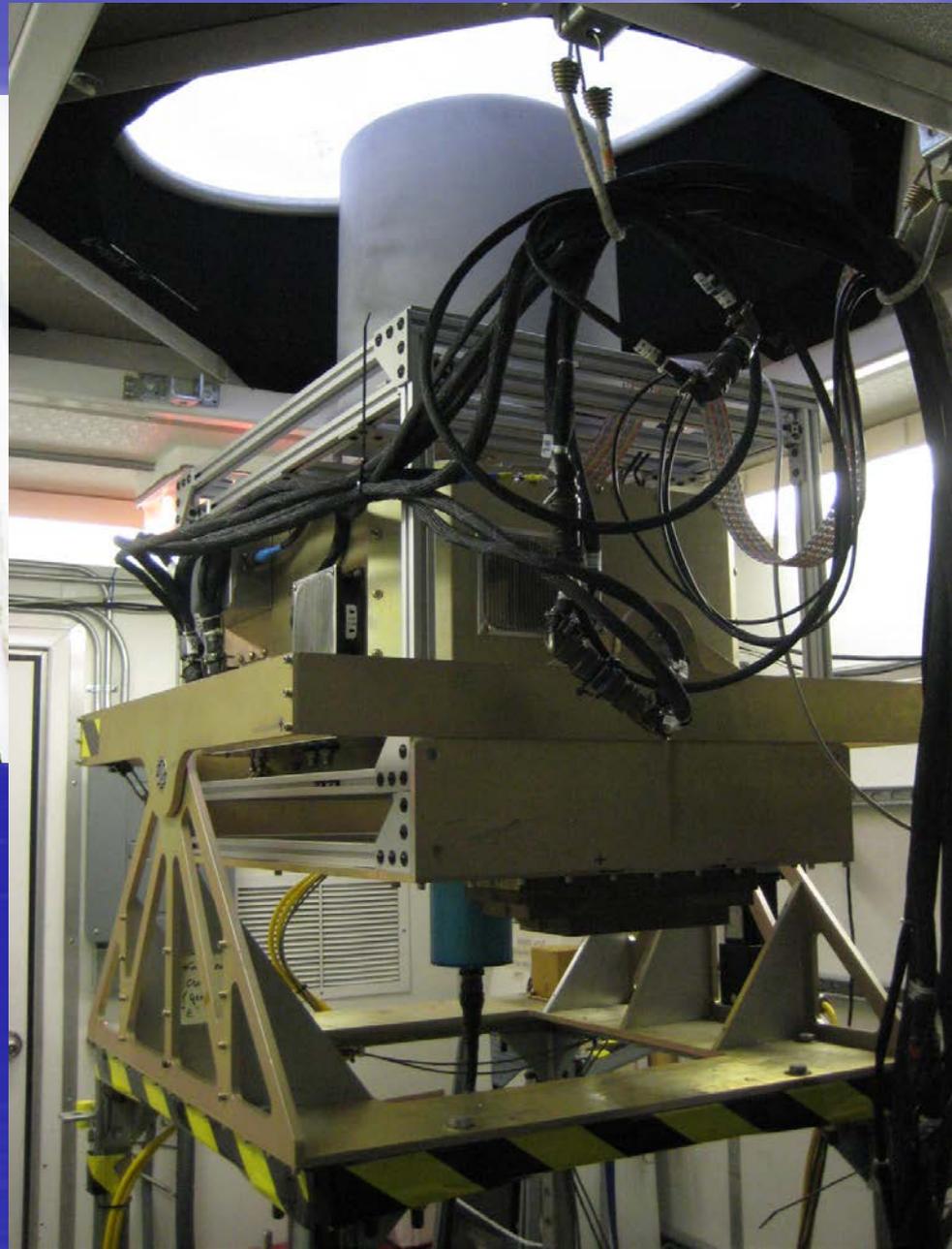
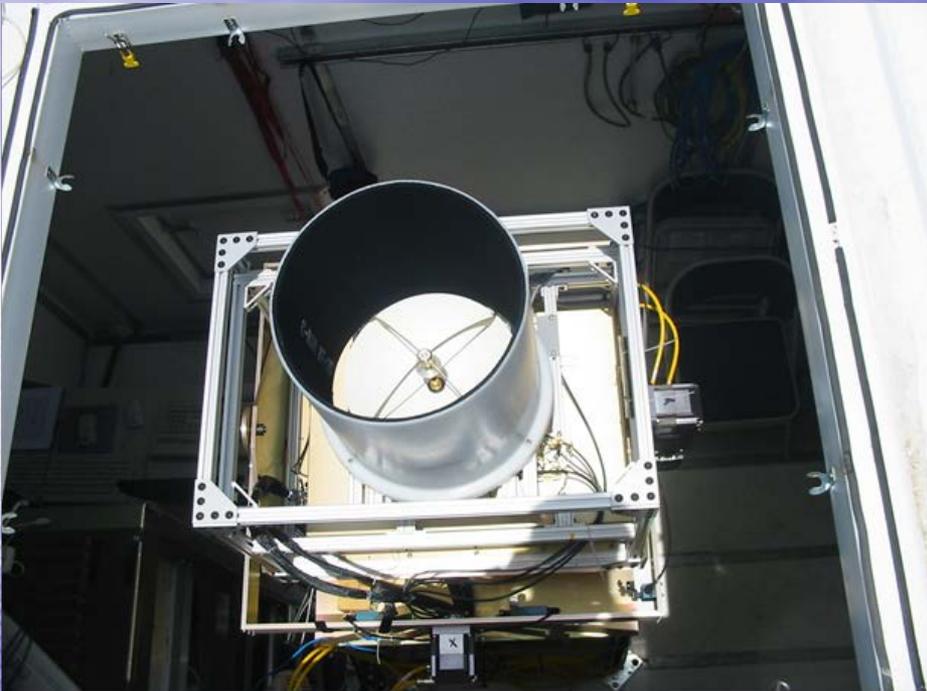


Stabilized Platform

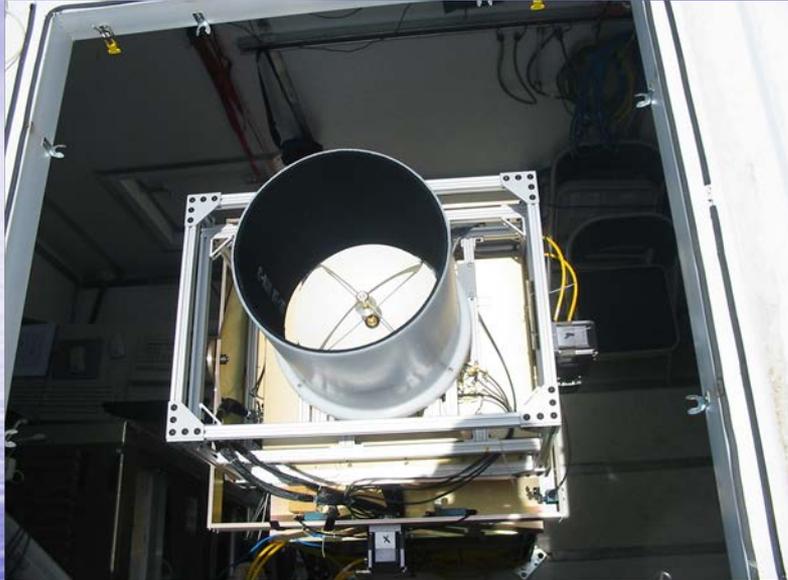


Crossbow pitch (cyan), roll (red) response on JD 330 HR 14 of 2008.
It also shows compensated pitch and roll measured on the Kongsberg.

W Band Radar



W Band Radar



$$\text{dB} = 10 \log(x_2/x_1)$$

dBm is the ratio of power in reference to an absolute power

$$\text{dBZ} = 10 \log(Z)$$

Z is the reflectivity factor
(sixth moment of the size distribution of scatterers)

W Band Radar

Frequency 94.56 GHz

Bandwidth 15MHz

Peak Power 1700 watts

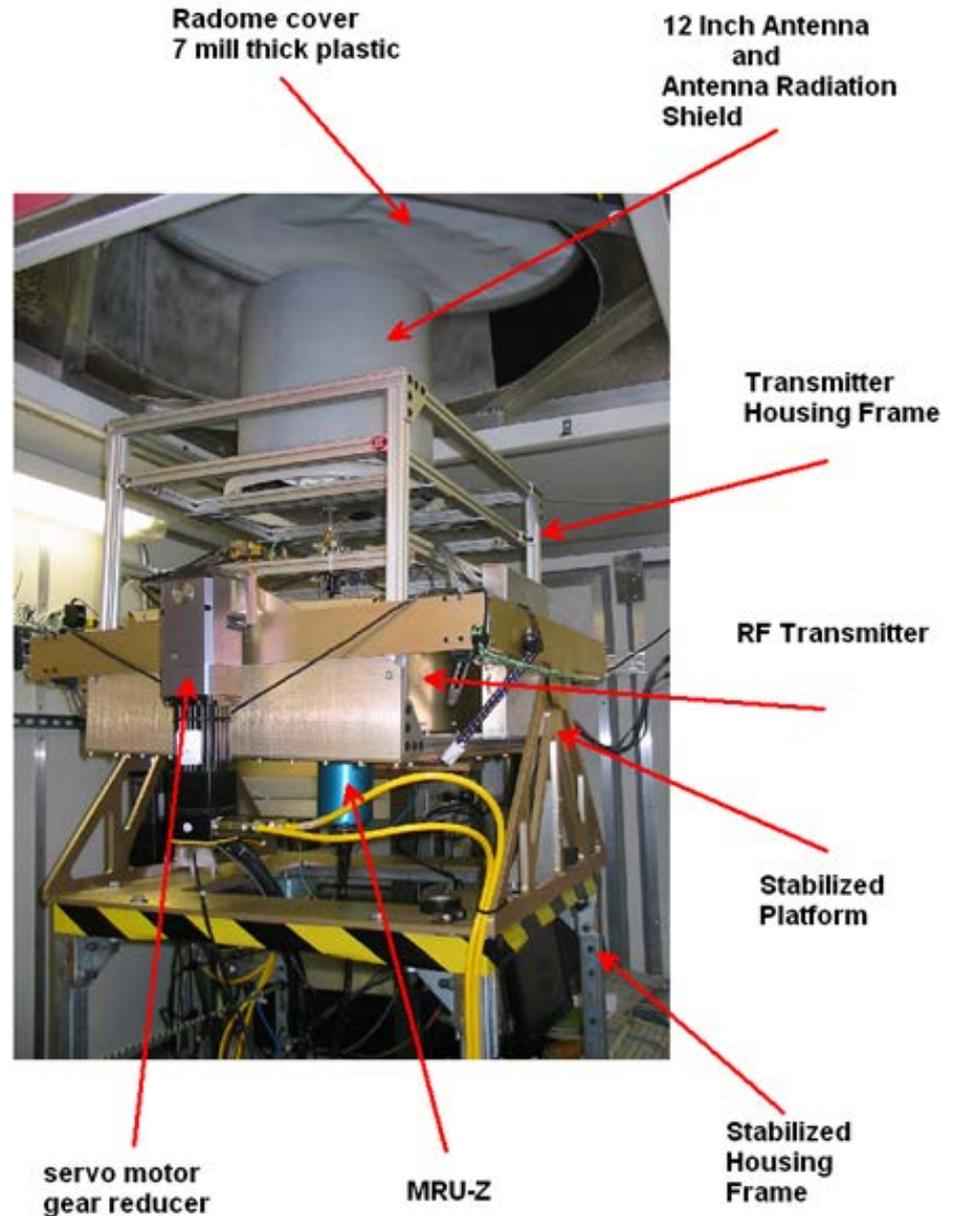
Sensitivity -33dBZ at 3km

Antenna Cassegrain type

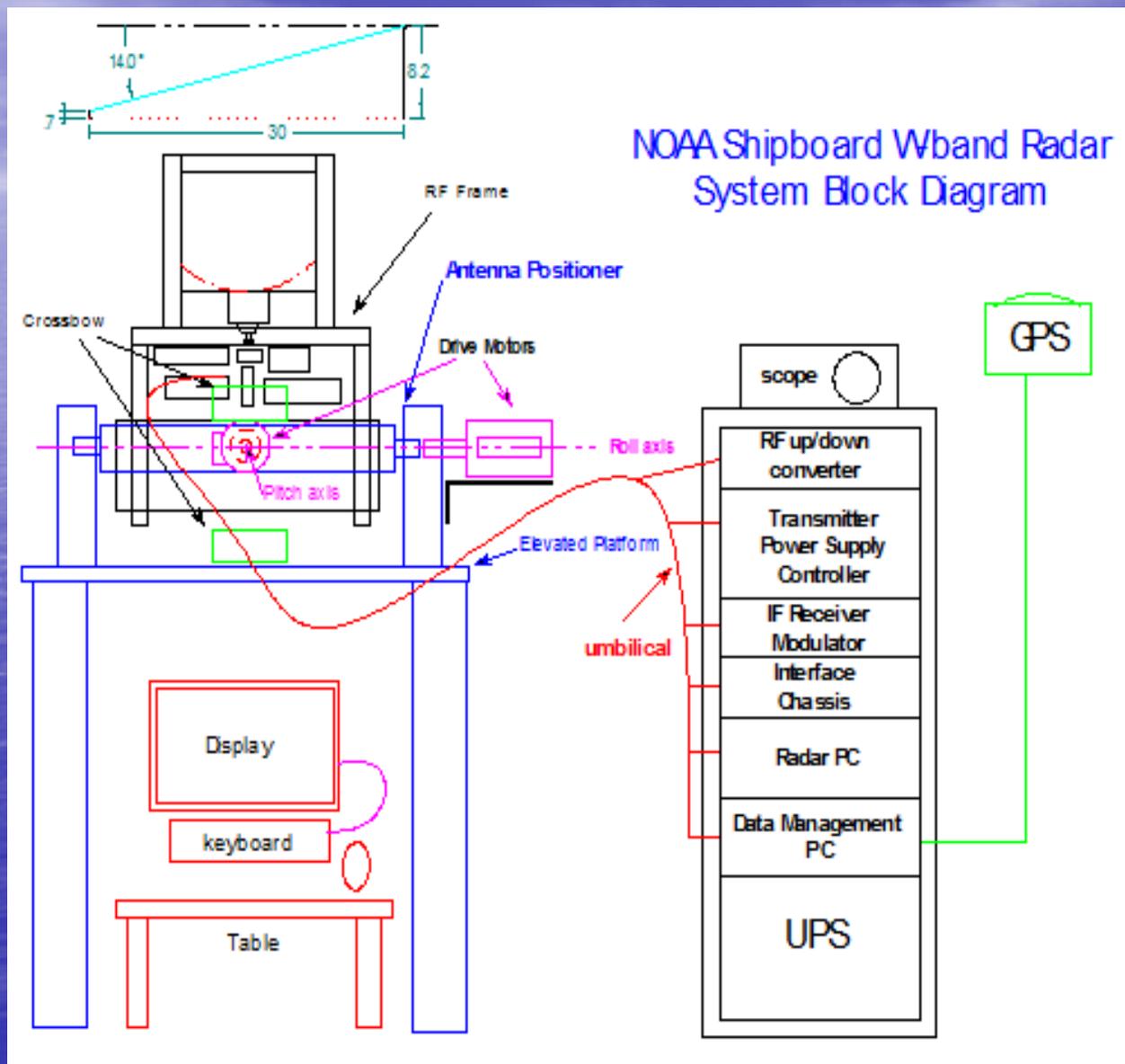
Antenna gain 47.3dB

Antenna beamwidth 0.7°

Antenna 0.304m diameter



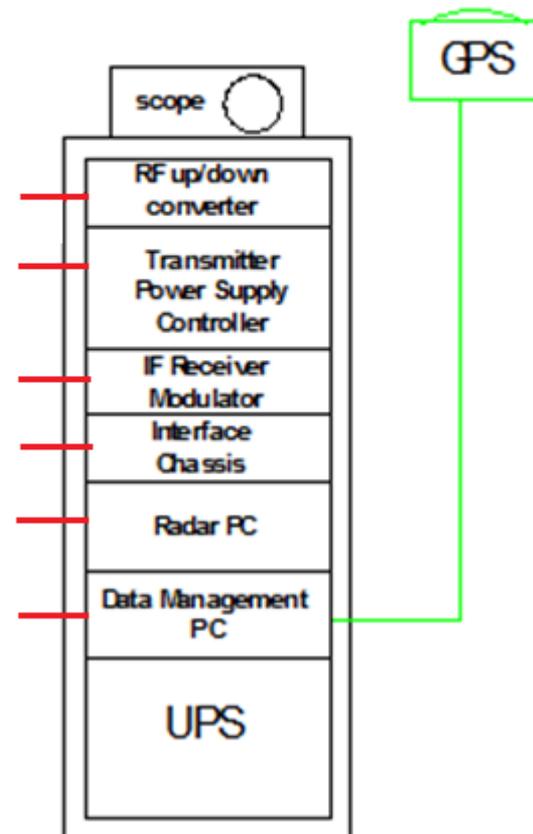
W Band Radar



W Band Radar

- Spacek Labs,
Coherent Up/Down converter 2.160 GHz IF stage
Up converts 60 MHz IF Tx pulse to 2160 MHz
Provides 100 MHz reference oscillator
Down converts 2160 MHz to 60 MHz Rx IF
Provides power for RF stage modules
Level set knob to adjust pulse level
- Applied Systems Engineering,
Transmitter power supply/controller
HPiB control interface with local and remote operations
Low voltage power supplies
Front panel control and display
Transmitter warm up and cool down modes
System fault monitoring and restart
- Receiver/Modulator Chassis
Generates 60 MHz IF Tx pulse
Blanking circuit for 60 MHz received IF

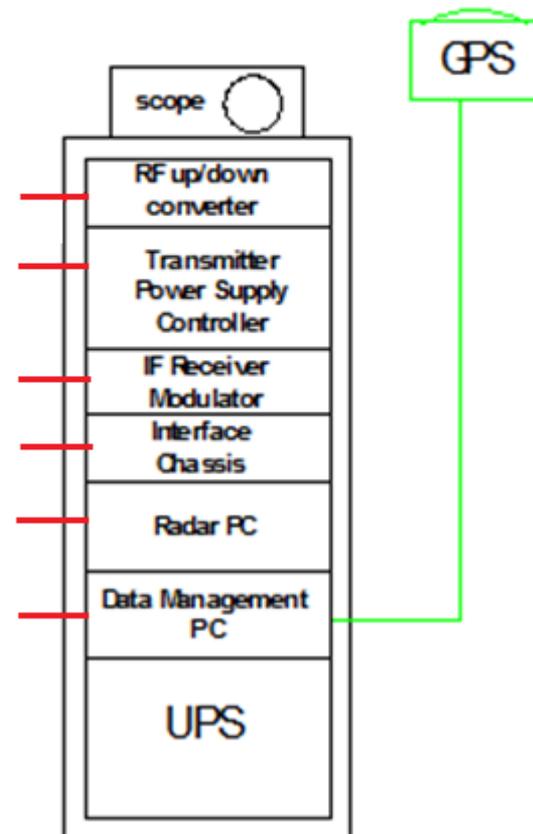
NOAA Shipboard Wband Radar
System Block Diagram



W Band Radar

- Interface Chassis
 - Low voltage power supplies, monitors voltage
 - Buffers radar timing signals
 - Buffers local oscillator from radar timing card
- Radar PC
 - Generates radar timing with radar controller card
 - Samples time series with Piraq III digital receiver card
 - Runs Lapxm radar operating system – stores NetCDF files for moments and spectra (external)
 - Runs GPS time sync software
- Data Management PC
 - Runs radar monitor LabView software
 - Controls the transmitter and radar system UPS
 - Records sensor data from Crossbow and Kongsberg sensors
 - Runs GPS time sync software.
 - Pulls moment NetCDF files from radar PC and adds health message.

NOAA Shipboard Wband Radar System Block Diagram

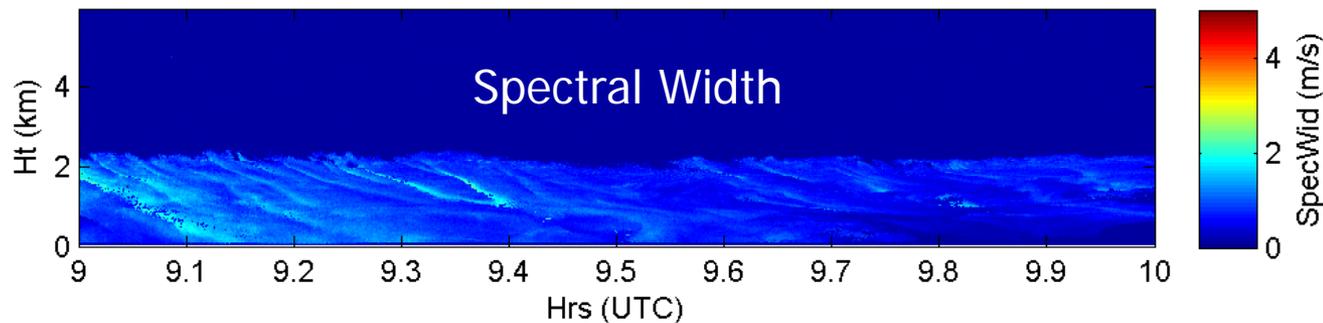
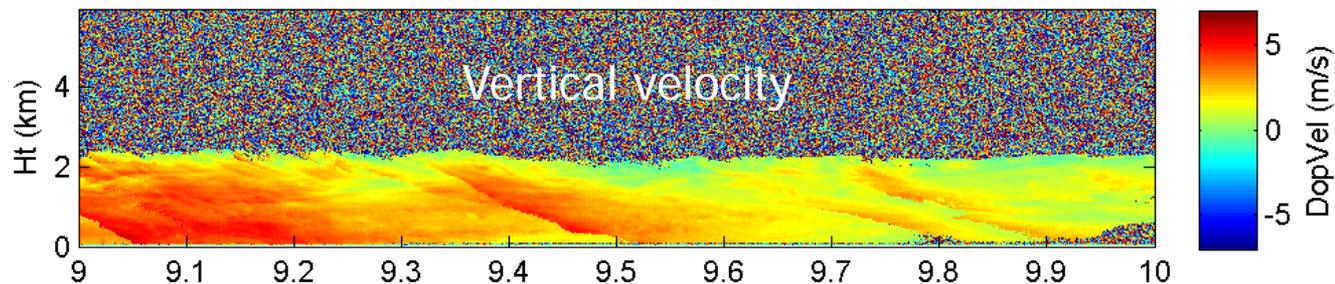
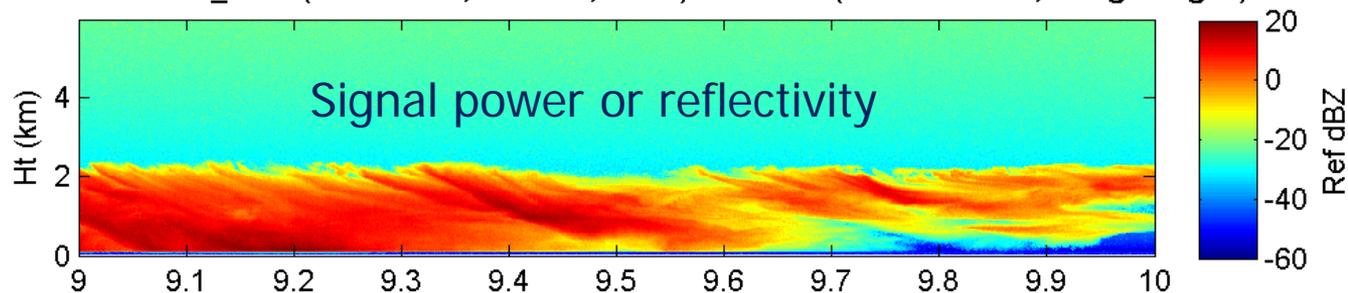


W Band Radar



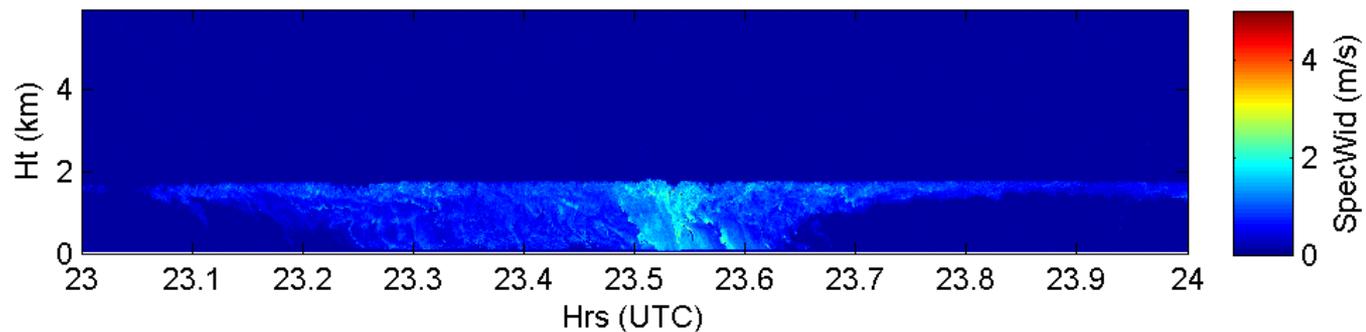
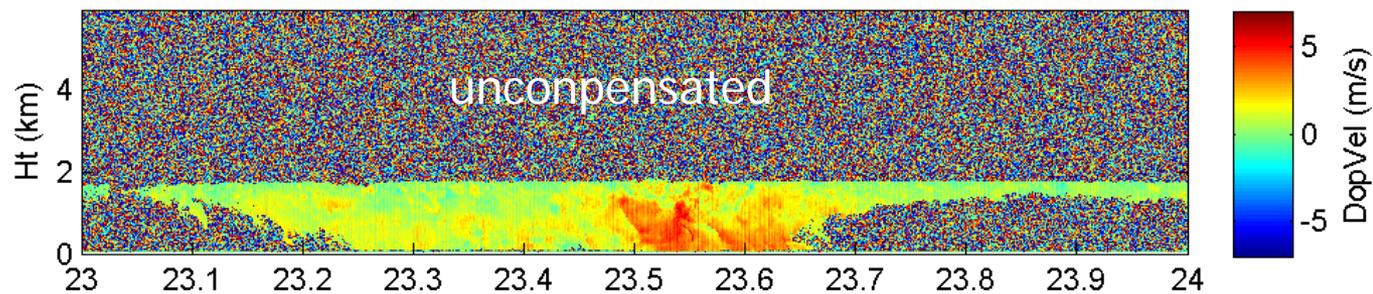
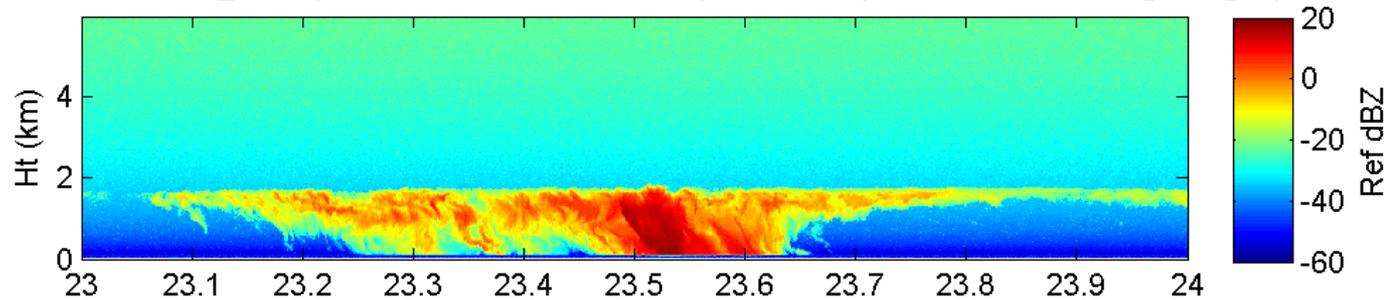
W Band Radar

AtlanticTransect_2014 (2014-03-15, DOY074, Hr-09). W-Band (motionread=1, Kongsberg=1)



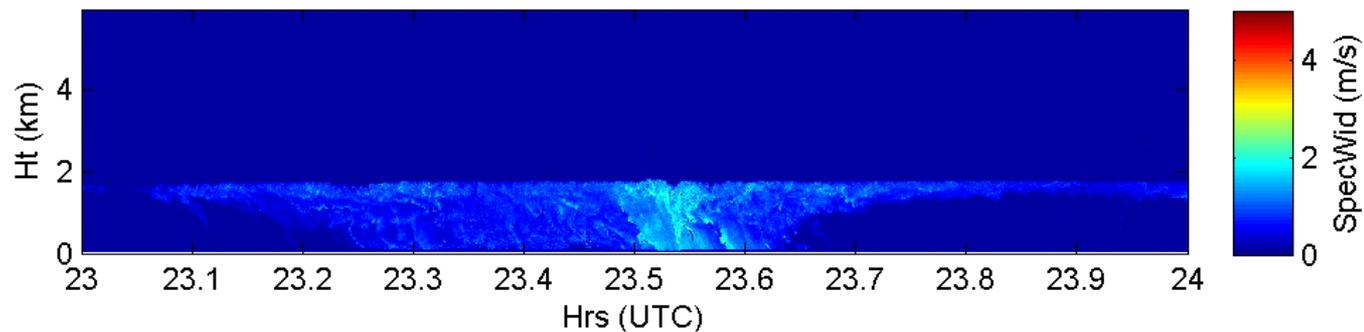
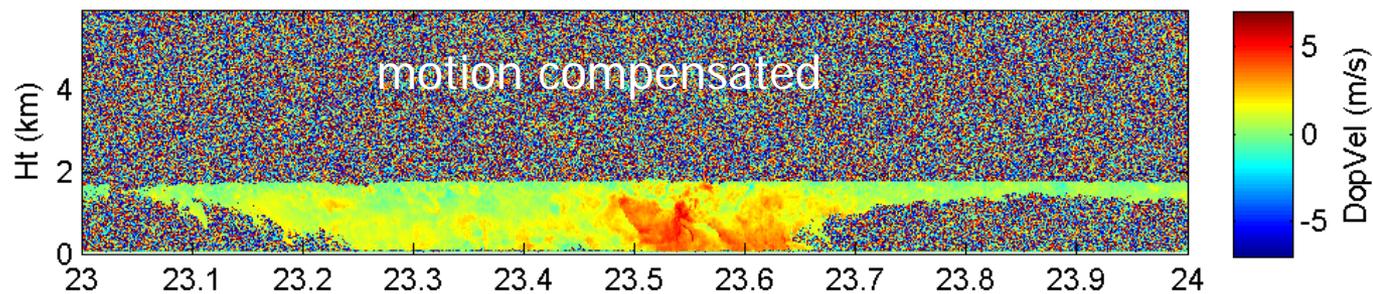
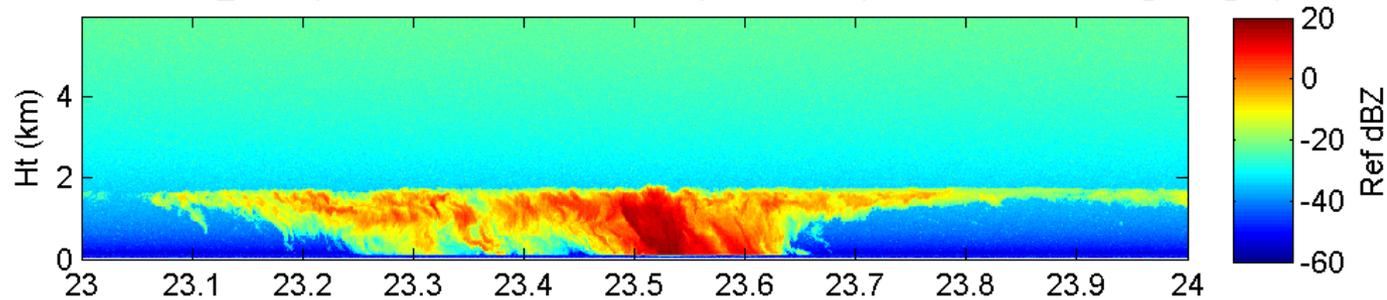
W Band Radar

AtlanticTransect_2014 (2014-03-10, DOY069, Hr-23). W-Band (motionread=0, Kongsberg=0)



W Band Radar

AtlanticTransect_2014 (2014-03-10, DOY069, Hr-23). W-Band (motionread=1, Kongsberg=1)



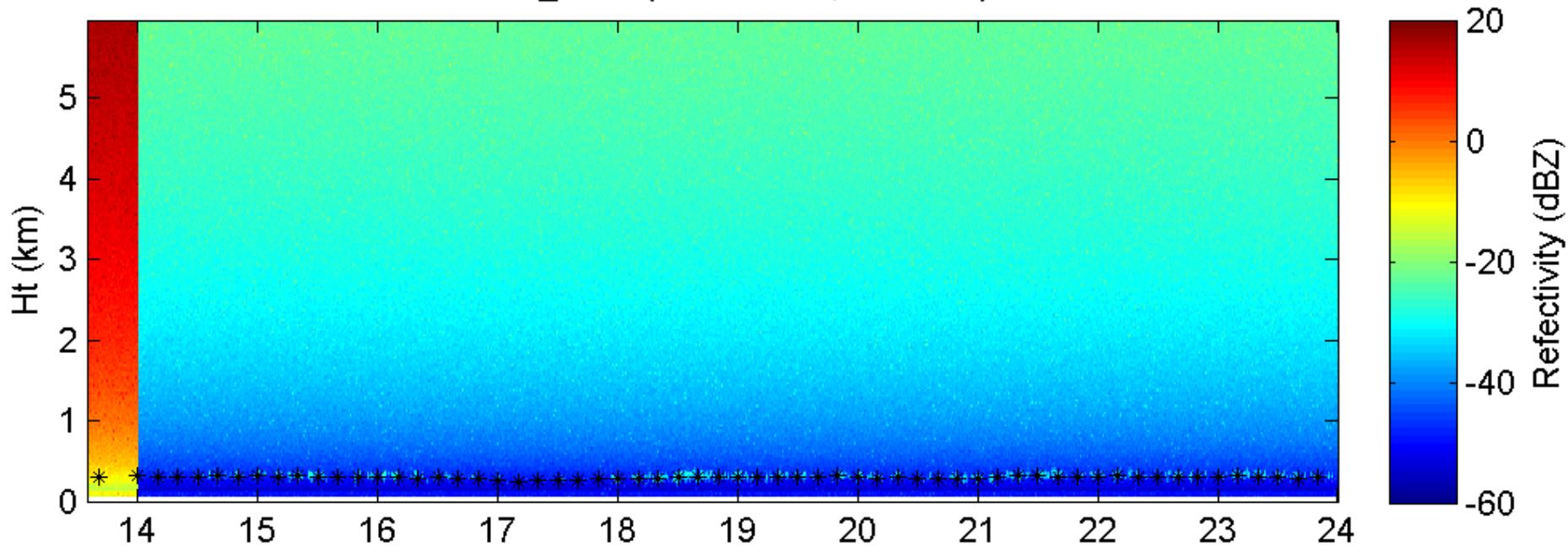
W Band Radar

Objective

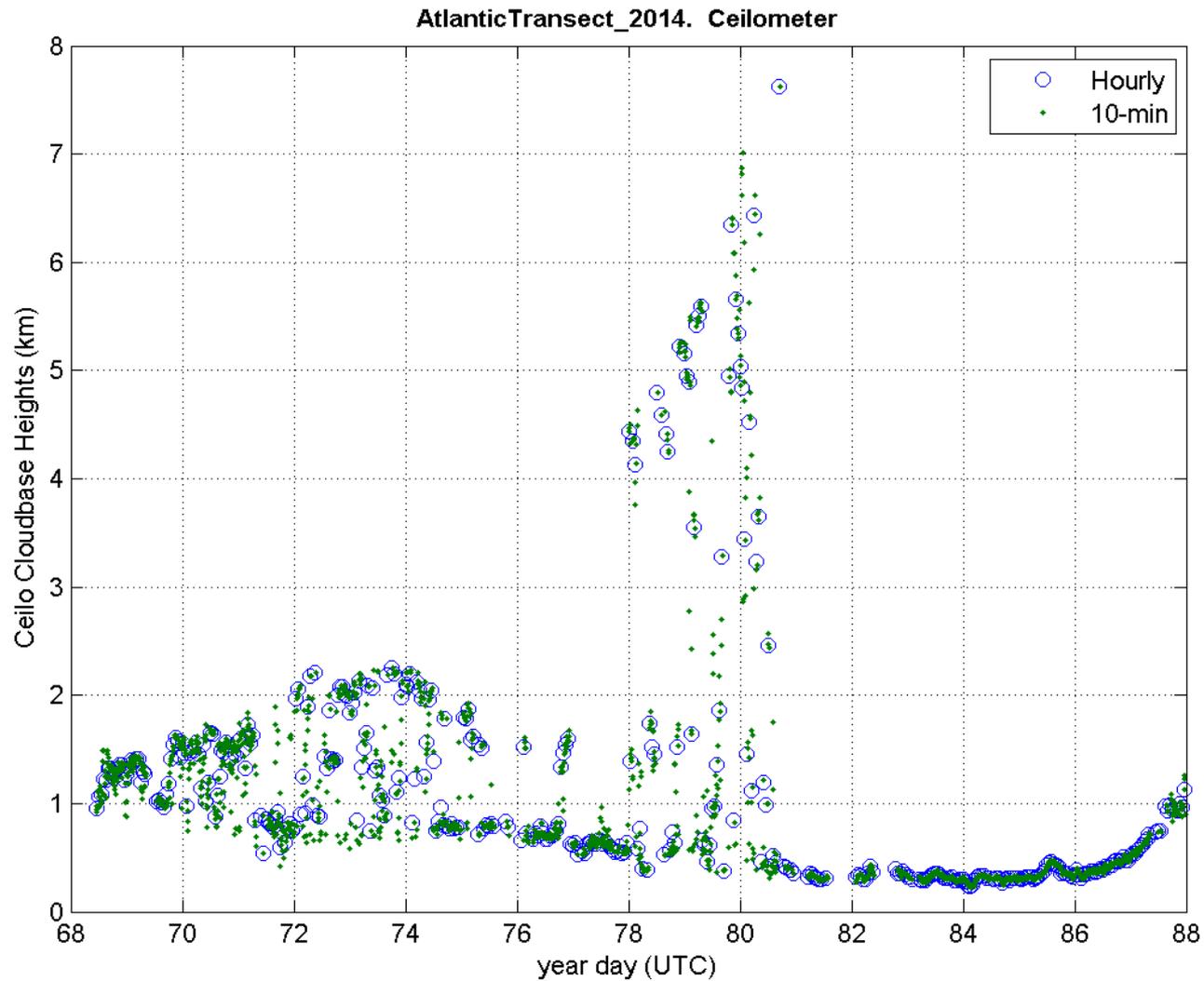
Data comparison with Satellite fly over ship course on March 12-15-18-21-25

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AtlanticTransect_2014 (2014-03-25, DOY084). W-Band

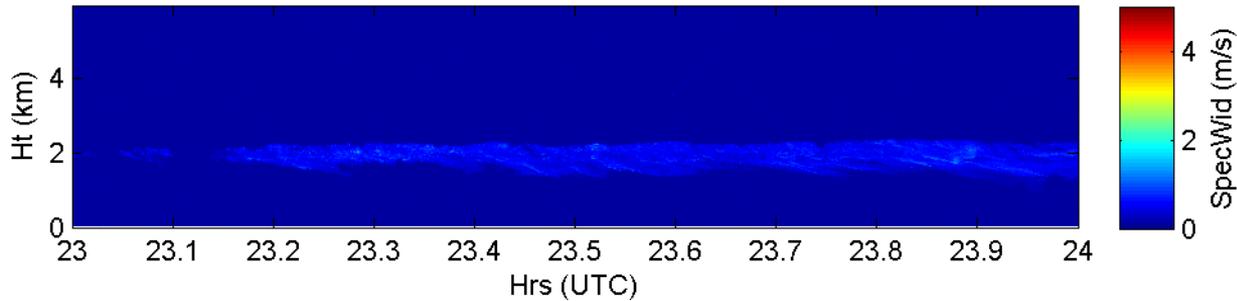
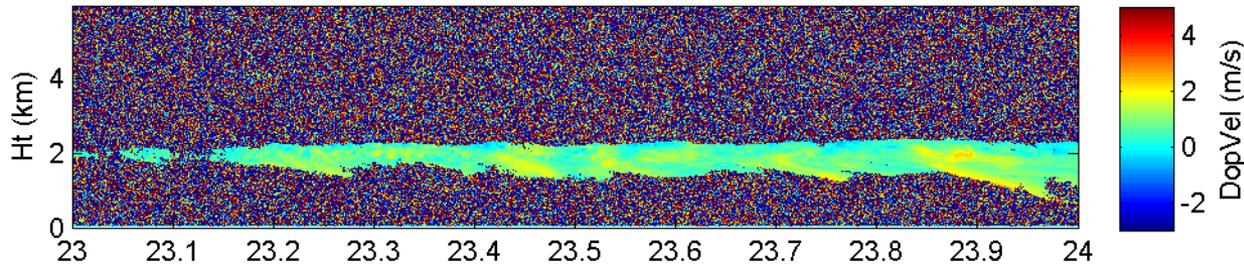
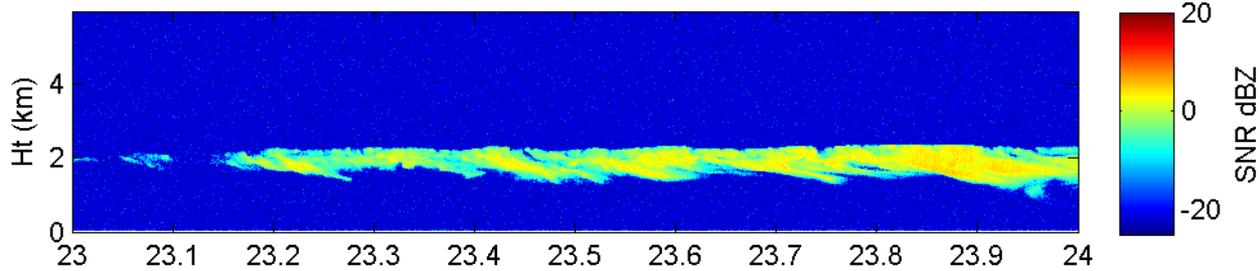


Ceilometer on the R/V Polarstern



W Band Radar on the R/V Polarstern

AtlanticTransect_2014 (2014-03-13, DOY072, Hr-23). W-Band (motionread=1, Kongsberg=1)



Airborne radar profiling of sea spray

- Objective: Improve parameterization of sea spray effects on surface fluxes
- Approach: Measure profiles of sea spray with surface forcing



THANKS FOR YOUR ATTENTION

