

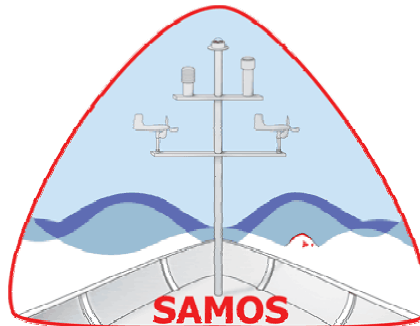
The SAMOS Initiative

Shawn R. Smith and Jeremy Rolph

smith@coaps.fsu.edu

rolph@coaps.fsu.edu

Center for Ocean-Atmospheric Prediction Studies
The Florida State University, Tallahassee, Florida USA



SAMOS
Shipboard Automated Meteorological and Oceanographic System

<http://samos.coaps.fsu.edu>

SAMOS Initiative

- **Current focus:** Improving access to high-quality meteorological and near-surface oceanographic observations collected in-situ on research vessels (R/Vs)
- **Science Goals:**
 - Creating quality estimates of the heat, moisture, momentum, and radiation fluxes at the air-sea interface
 - Improving our understanding of the biases and uncertainties in global air-sea fluxes
 - Benchmarking new satellite and model products
 - Providing high quality observations to support modeling activities, process studies, and global climate programs

What is a SAMOS?

- Automated data logging system
 - Sampling interval of 1 minute or less
 - Continuous recording
 - Typically mounted on bow or on mast over wheel house
- Typical observations:
 - Navigation: position, heading, course and speed over ground
 - Meteorology: true wind vector, air temperature, moisture, pressure
 - Oceanography: sea temperature, salinity, conductivity, florescence
- Additional capability:
 - Pitch, roll, heave, ship-relative winds, precipitation, multiple radiation components, visibility, ceiling height, swell and waves
 - Some direct flux measurements



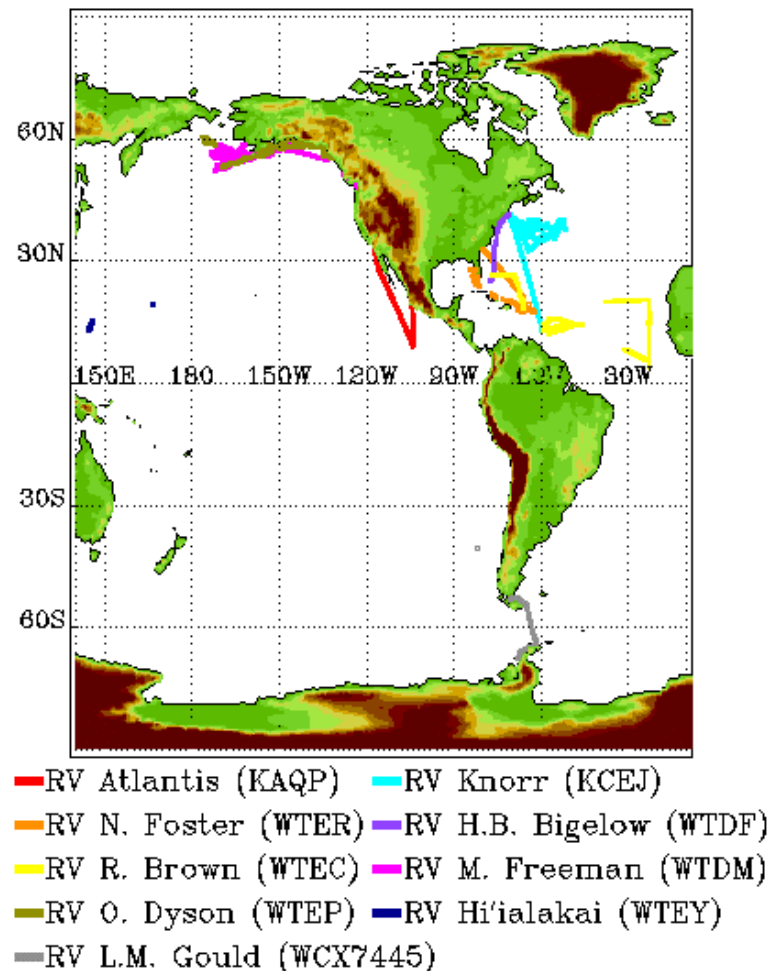
Courtesy: B. Walden, WHOI

Current Status

- Currently 12 R/Vs providing data when at sea
 - FY 2007: ~2 million one-minute records

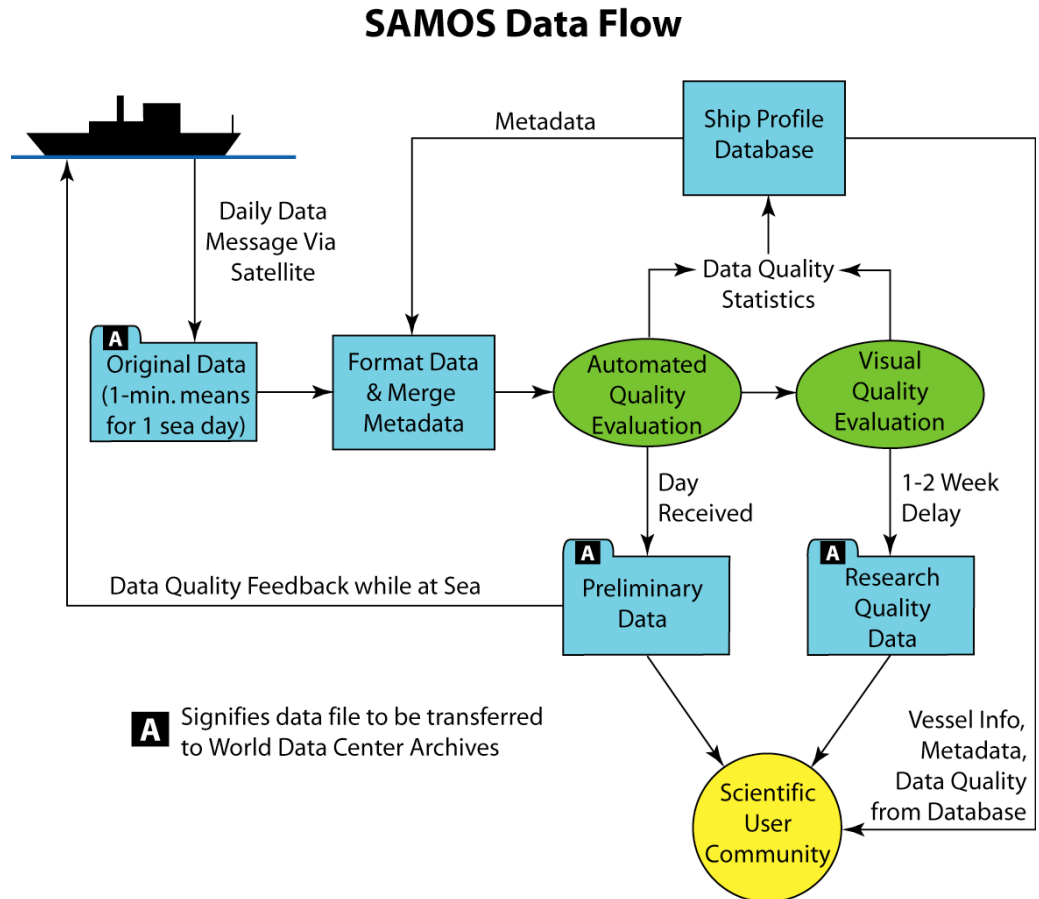
Table 1: Ships transmitting observations to SAMOS DAC during FY 2006 and FY 2007.

Vessel	Operator	Number of ship days with data	
		1/10/2005 Š 30/9/2006	1/10/2006 Š 30/9/2007
<i>Atlantis</i>	WHOI	192	291
<i>Gordon Gunter</i>	NOAA		4
<i>Healy</i>	USCG		62
<i>Henry Bigelow</i>	NOAA		70
<i>Hi'Ōlalakā</i>	NOAA		107
<i>KaŌlrimoana</i>	NOAA		61
<i>Knorr</i>	WHOI	276	252
<i>Lawrence Gould</i>	NSF/Raytheon		32
<i>Miller Freeman</i>	NOAA		190
<i>Nancy Foster</i>	NOAA		122
<i>Oscar Dyson</i>	NOAA		170
<i>Ronald Brown</i>	NOAA		149
		468	1510



Flow of SAMOS Observations

- Ship to Shore
 - Data transmitted as once daily email attachment via 24/7 broadband satellite communication.
 - Data for previous day sent near as possible to 0000 UTC.
 - All vessels using tagged pair (param:value) CSV SAMOS format
- Detailed metadata is collected for all vessels.



SAMOS Metadata (1)

- Current practice is to collect metadata using Word forms sent via email
- This has been a limited success
- Seeking better automation through either:
 - ASCII text document sent via email at start of each cruise
 - Web interface that would allow operators to directly input metadata into SAMOS ship database

user ship related analyst tools search tools samos system administrator samos_dev

Ship Metadata Form << SAMOS_development >>

Vessel Information				
Vessel Name	Call Sign	IMO Number	Recruiting Country	Vessel Type
ATLANTIS	KAQP	009105798	None	Research vessel
Operating Country	Home Port	Date of Recruitment	Data Reporting Interval (sec.)	Participation in Other Data Exchanges
USA	Woods Hole, MA	05/19/2005	60	

Contact Information	
Home Institution	Aboard Vessel
Name: Woods Hole Oceanographic Institution	Technician Name(s): SSSG
Address: 266 Woods Hole Road Woods Hole, MA 02543 USA	Technician Email(s): sssg@atlantis.whoi.edu
Contact Person	

Vessel Layout	
Dimensions (meters)	Digital Imagery and Schematics
Length: 83.2	Select an image to upload: <input type="text"/> <input type="button" value="Browse..."/>
Breadth: 16.0	
Freeboard: 1.2	
Draught: 5.3	
Cargo Height: N/A	

Data File Specification <input type="button" value="Add"/>			
Date Valid: 06/01/2005 to Today			
File Format	Format Version	File Compression	Email Data Sent From
\$SAMOS	001	zip (ZIP)	

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SAMOS Metadata (2)

- ASCII format would mimic SAMOS data format.
 - \$SMETA,CS:KCEJ,VAR:AT,H
T:20.4,UNIT:DegC,...
 - Good for automation
 - XML would also work

- Web approach may be preferable for ease of implementation.
- If you are interested in a live demo, please see either Jeremy Rolph or Shawn Smith during the meeting

user	ship related	analyst tools	search tools	samos system	administer	samos_dev
<input type="checkbox"/> platform speed over ground	<input type="checkbox"/> platform speed over water 2	<input type="checkbox"/> precipitation accumulation	<input type="checkbox"/> precipitation accumulation 2	<input type="checkbox"/> precipitation accumulation 2		
<input type="checkbox"/> present weather	<input type="checkbox"/> rain rate	<input type="checkbox"/> rain rate 2	<input type="checkbox"/> rain rate 2	<input type="checkbox"/> rain rate 2		
<input type="checkbox"/> relative humidity	<input type="checkbox"/> relative humidity 2	<input type="checkbox"/> short wave atmospheric radiation	<input type="checkbox"/> shortwave atmospheric radiation 2	<input type="checkbox"/> sea temperature		
<input type="checkbox"/> sea temperature 2	<input type="checkbox"/> specific humidity	<input type="checkbox"/> specific humidity 2	<input type="checkbox"/> total cloud amount	<input type="checkbox"/> time		
<input type="checkbox"/> time of day	<input type="checkbox"/> ultra violet atmospheric radiation 2	<input type="checkbox"/> visibility	<input type="checkbox"/> ultra violet atmospheric radiation	<input type="checkbox"/> wet bulb temperature		
<input type="checkbox"/> wet bulb temperature 2						

Key:
 ship does not have variable
 ship has variable
 variable has modifications needing approval
 variable is new and needs approval

ATLANTIS's Variables

Expand to view or modify the ship's variables.

[Show All] [Hide All]

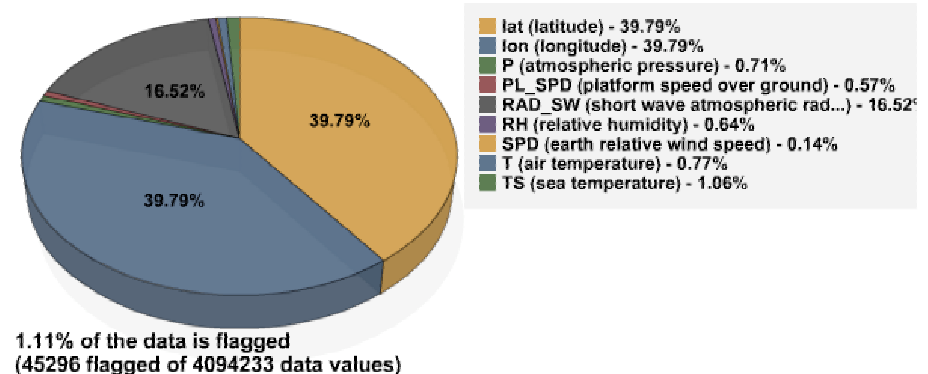
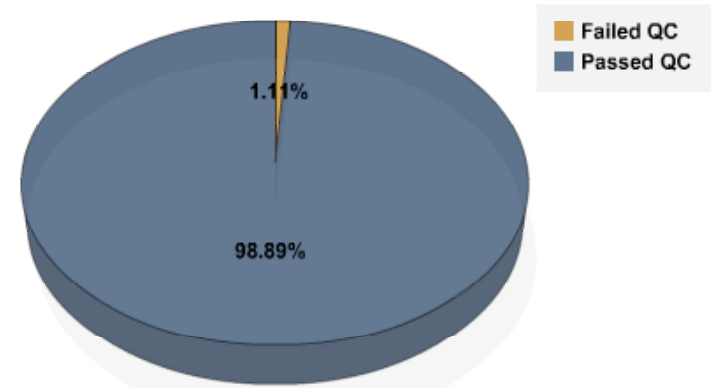
☐ only show variables for the date Today [Today]

air temperature			
earth relative wind direction			
latitude			
Designator	LA	Date Valid	06/01/2005 to Today [Today]
Descriptive Name	original_units	Instrument	last_calibration
latitude	degrees (+N)	Best of Pcode GPS, Northstar	
observation_type	average_method	average_center	average_length
measured	unknown	unknown	
sampling_rate	data_precision		
	0.0001		
[Submit New Changes]			
[Add] / [Modify] variable with:			
Designator	LA	Date Valid	06/01/2005 to Today [Today]
longitude			

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SAMOS Data Processing (1)

- Automated processing
 - Combines metadata with daily data received from vessel
 - Conducts preliminary quality evaluation
- Analyst visually monitors data from each vessel (not 24/7)
 - Vessel operators notified when problems are discovered
- Research quality products developed with additional visual quality evaluation



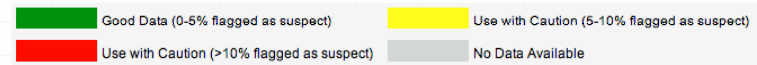
SAMOS Data Processing (2)

- Data distribution
 - <http://sam0s.coaps.fsu.edu/>
 - Direct access to metadata for all participating vessels
 - Graphical tools will allow users to search for available data and quality information.
- Archival
 - Agreement in place with NODC (U.S.) and NCAR for long term archival of all observations.
 - First annual report to be released in Jan 2008

Data Availability

The purpose of this page is to allow the user to get a rough idea of the quality of data for a particular day and ship. In some cases multiple files may exist for a single day and ship. In these cases quality is calculated for the overall day, meaning an overall quality for the pieces as a whole are calculated. To see the quality of each piece individually click on the colored box aligning the ship and day desired.

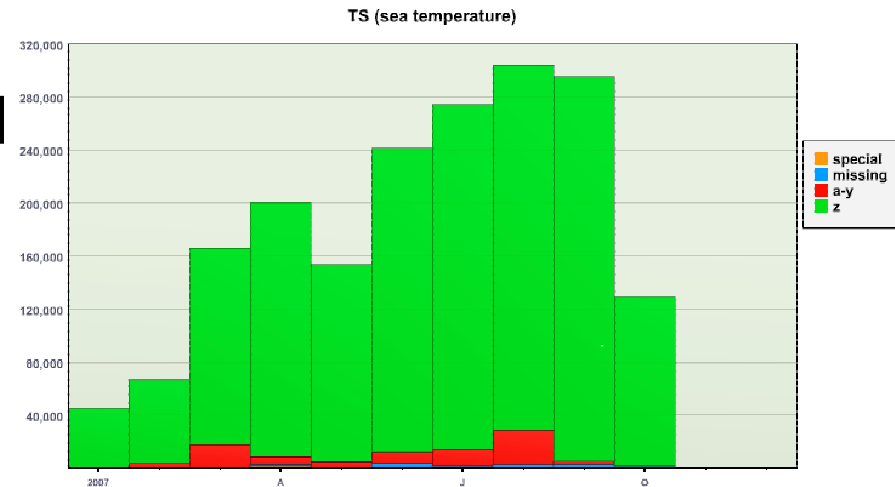
[Click here to download data](#)



	ATLANTIS	HEALY	HENRY B. BIGELOW	H'I'ALAKAI	KNORR	MILLER FREEMAN	RON BROWN
09/25/07	Green	Yellow	Grey	Yellow	Green	Red	Grey
09/24/07	Green	Green	Grey	Red	Green	Yellow	Grey
09/23/07	Green	Green	Grey	Red	Green	Yellow	Grey
09/22/07	Green	Green	Grey	Yellow	Green	Yellow	Green
09/21/07	Green	Green	Grey	Green	Green	Yellow	Green
09/20/07	Green	Green	Grey	Green	Green	Yellow	Yellow
09/19/07	Green	Green	Grey	Green	Green	Green	Green
09/18/07	Green	Green	Grey	Grey	Green	Yellow	Green
09/17/07	Green	Yellow	Grey	Grey	Green	Yellow	Green
09/16/07	Green	Red	Grey	Grey	Grey	Green	Green
09/15/07	Green	Yellow	Grey	Grey	Green	Green	Green
09/14/07	Green	Red	Grey	Grey	Green	Green	Green
09/13/07	Green	Red	Yellow	Grey	Green	Green	Yellow
09/12/07	Green	Red	Yellow	Grey	Green	Green	Green
09/11/07	Red	Red	Yellow	Grey	Green	Green	Green
09/10/07	Red	Red	Yellow	Grey	Green	Yellow	Grey
09/09/07	Yellow	Green	Red	Green	Green	Yellow	Grey
09/08/07	Green	Green	Yellow	Green	Green	Yellow	Grey
09/07/07	Yellow	Green	Yellow	Yellow	Green	Green	Grey
09/06/07	Yellow	Green	Yellow	Green	Green	Green	Grey
09/05/07	Green	Green	Red	Green	Green	Green	Grey

Benefits for Vessel Operators

- Routine data quality evaluation by experienced marine meteorologists
 - At sea notification of data problems
 - Near real-time distribution of science observations
- Metadata tracking (and inclusion into all data files)
- Decision support for vessels wishing to improve their sensor suites and/or instrument exposure
- Coming soon:
 - On board evaluation of your SAMOS via comparison to NOAA portable flux standard

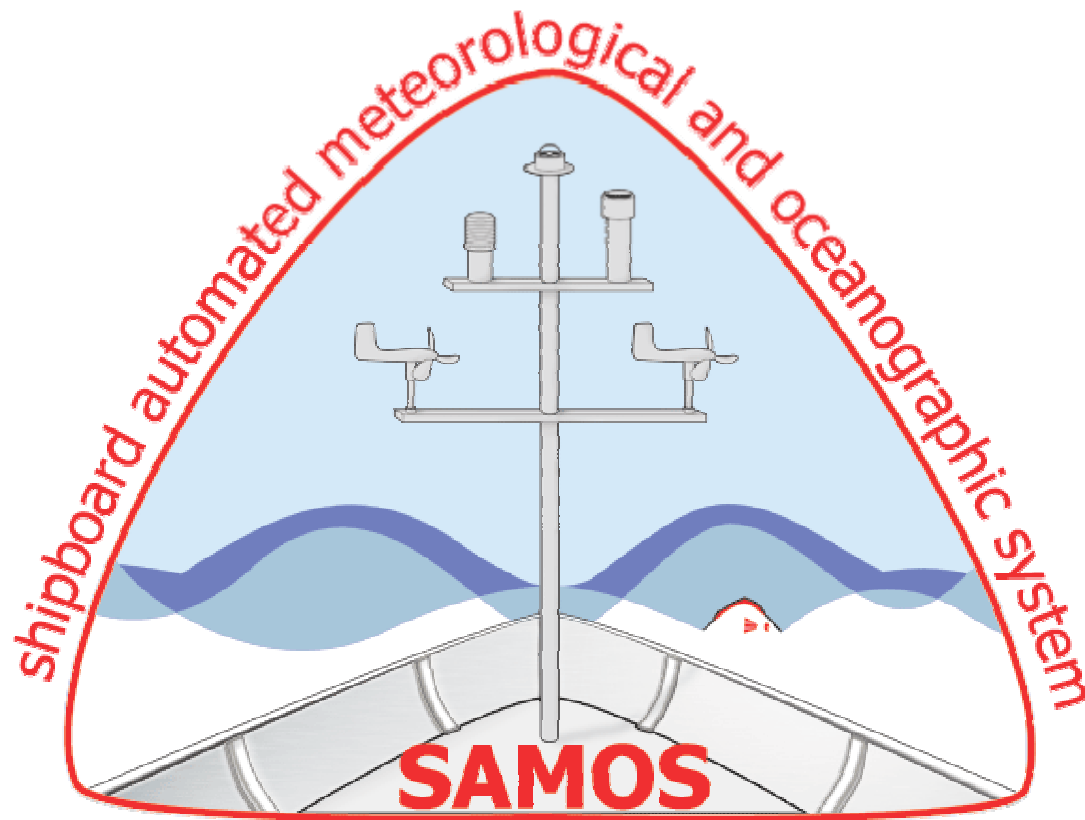


Recruitment

- SAMOS welcomes additional vessel operators
 - Anticipate adding 8 NOAA ships in 2008
 - Would like to recruit new UNOLS vessels in 2008
- Recruitment information:
 - <http://samos.coaps.fsu.edu/html/participate.php>
- Operators need to:
 - Implement daily data transfer (SAMOS format preferred)
 - Custom scripts may be needed to work with your vessel
 - Those with access to SCS 4.0+ can use built-in SAMOS applet (talk to Tom Stepka; tom.stepka@noaa.gov)
 - Provide detailed metadata
 - Currently use word forms, but web interface will be ready soon

Final Thoughts

- 4th SAMOS Workshop (Joint with Global Ocean Surface Underway Data project)
 - Summer 2008 (date TBA)
 - Hosted by U.S. Coast Guard in Seattle, WA
 - All from RVTEC welcome
- FSU thanks the NOAA Climate Observation Division and the U.S. National Science Foundation for supporting the SAMOS Initiative.



SAMOS

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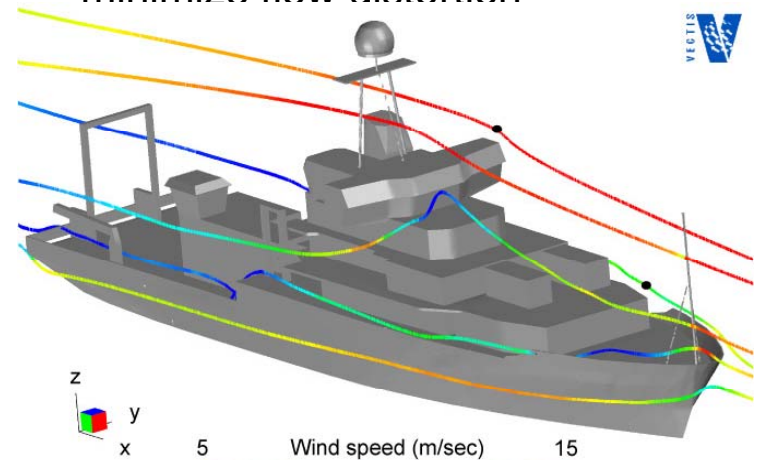
<http://samos.coaps.fsu.edu>

Improving Data Accuracy

- NOAA ESRL (C. Fairall lead) is developing a portable seagoing air-sea flux standard (PSAFS)
 - PSAFS measures direct fluxes, mean meteorology, radiation and precipitation
 - PSAFS will be deployed on R/Vs to evaluate vessel's SAMOS measurements
- SAMOS data center and NOAA ESRL submitted proposal to support air flow modeling of R/Vs
 - Identify the origin height of air reaching the sensor
 - Determine the percent change in measured wind speed and direction
 - Locate best site for instruments to minimize flow distortion



Courtesy: C. Fairall

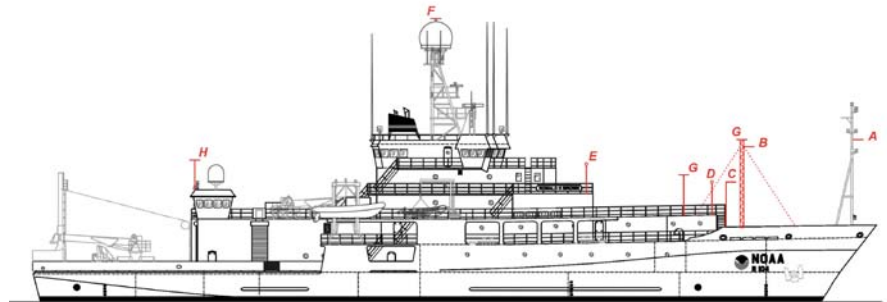


Courtesy: B. Moat, NOC-Southampton

Educational Initiatives

- “Guide to making climate quality meteorological and flux measurements at sea”.
 - F. Bradley (CSIRO), C. Fairall (NOAA) lead authors
 - **Purpose:** To provide practical guidance to persons responsible for installing and maintaining meteorological instrumentation on ships
- First distributed at International Marine Technicians Meeting (Oct. 2006, WHOI)

http://samos.coaps.fsu.edu/html/docs/NOAA-TM_OAR_PSD-311.pdf



- Content includes
 - Recommended sensor locations
 - Problems related to data collection on a ship
 - Air-sea flux definitions and basic variables measured
 - Types of bulk-flux met. sensors
 - Securing data and documentation

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