The SAMOS Data Assembly Center

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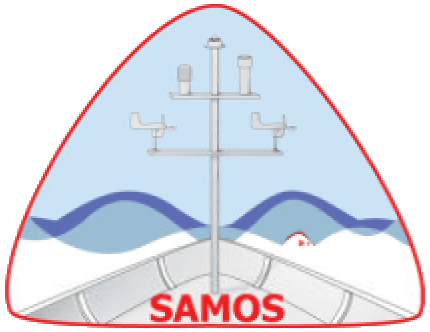


SAMOS Initiative

- **Mission**: To improve the quality of meteorological and near-surface oceanographic observations collected in-situ on research vessels (R/Vs) and select volunteer observing ships (VOS)
- **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 bow or mast mounted on R/V or VOS

Courtesy: B. Walden, WHOI

- Typical observations:
  - Navigation: position, heading, course and speed over ground
  - Meteorology: true wind vector, air temperature, moisture, pressure
  - Oceanography: sea temperature, salinity, conductivity
- Additional capability:
  - Pitch, roll, heave, ship-relative winds, precipitation, multiple radiation components, visibility, ceiling height, swell and waves
  - Some direct flux measurements

Data Sought by SAMOS Initiative

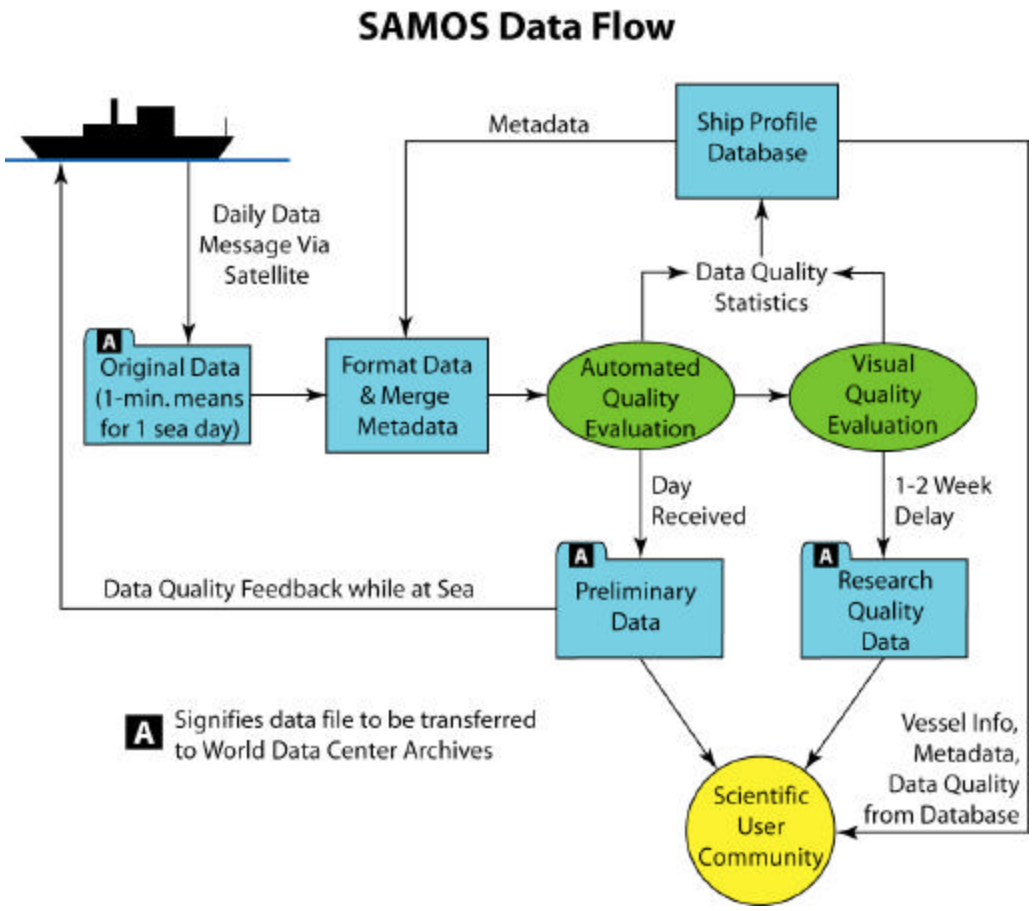
- Focus is on data from science instrumentation.
- Submitted measurements should be from permanently installed instruments.
- Measurements should be reported at 1-minute intervals.
  - May be spot or time averaged values based on your sensor system
- Detailed metadata is sought from all vessels.

Primary data

1. Observation time (UTC)
2. Latitude and Longitude
3. Ship course and speed over ground
4. Ship heading
5. Ship speed over water (*fore-aft and along beam components*)
6. Ship-relative wind direction and speed *(as measured by anemometer)*
7. Earth-relative (true) wind direction and speed
8. Atmospheric pressure
9. Air temperature
10. Moisture (dewpoint temperature, wet-bulb temperature, relative humidity, and/or specific humidity)
11. Precipitation
12. Shortwave and longwave radiation
13. Sea temperature
14. Conductivity and salinity (TSG)

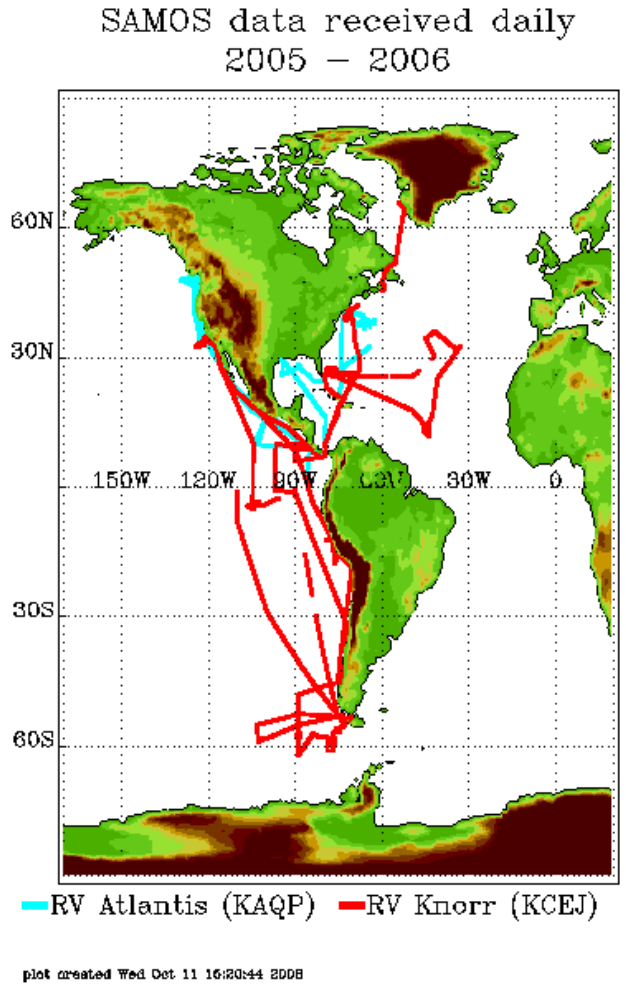
Flow of Science Observations

- Ship Tech ✍ Chief Scientist ✍ ?
  - Typically manual
  - In some cases, operator stores copies or sends to national data center
- SAMOS Initiative automates data flow
  - Ensures consistent data stewardship
  - Keeps data and metadata together from ship ✍ archive



SAMOS Data Flow (1)

- Ship to Shore
  - Data are transmitted as once daily email attachment.
  - Transfer takes advantage of 24/7 broadband from vessels.
  - Attachment contains all 1-minute data records for a single observing day.
  - Daily file generation and transmission are automated by each vessel operator.
  - Data are sent as near as possible to 0000 UTC.



SAMOS Data Flow (2)

- Ship Profile Database
  - Ship Info
    - Home port
    - Contacts
    - Call sign, IMO #
    - Vessel dimensions
  - Parameter specific
    - Instrument location, units, etc. ✍
  - Photos and schematics
    - Used for data quality evaluation
- Metadata are combined with daily data received from vessel.

Atlantis Metadata Sample

(u)(i)(a) platform relative wind direction

unit information

units	original_units	data_precision	wind_direction_convention
degrees (clockwise from bow)	degrees (clockwise from bow)	1.0	meteorological

observation_type
measured

instrument information

instrument	distance_from_bow	centerline_offset	height
R.M. Young 05103 (WND305)	2.1	0	19.8

last_calibration	zero_line_reference
January 2003	0

averaging information

average_center	average_length	average_method	sampling_rate
time at end of period	60	average	0.2

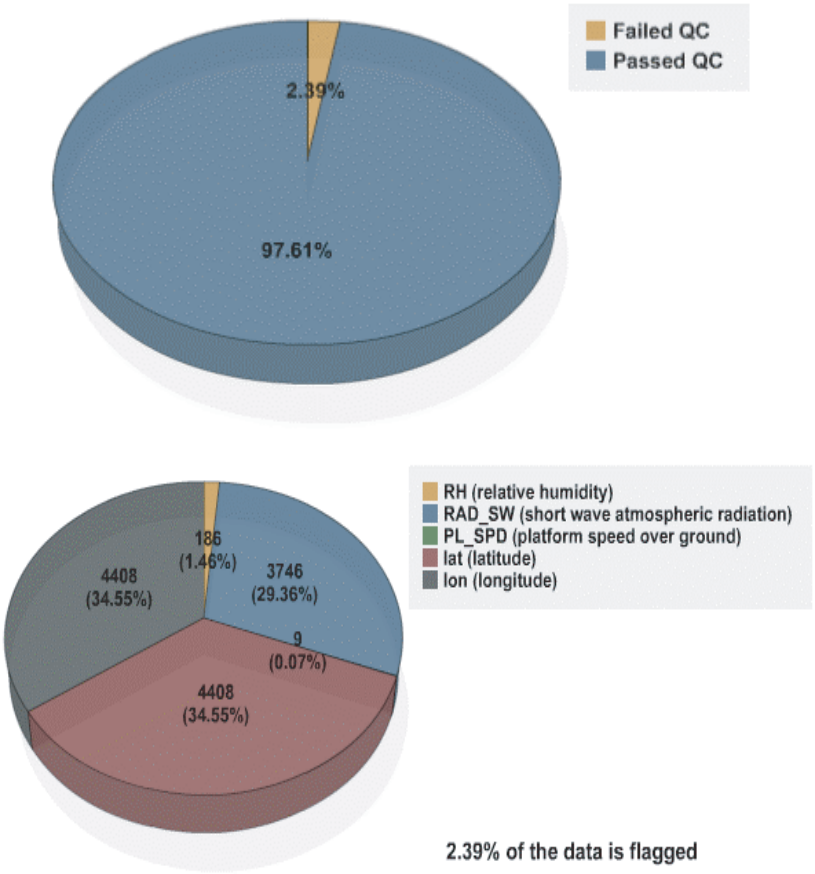
Why We Care About Metadata

Courtesy: Ben Moat, NOC

- Photos tell us a lot about the exposure of sensors.
- Exposures can be very good (left) or down right ugly (right).
- Sensor exposure directly affects the quality of the observation.

SAMOS Data Flow (3)

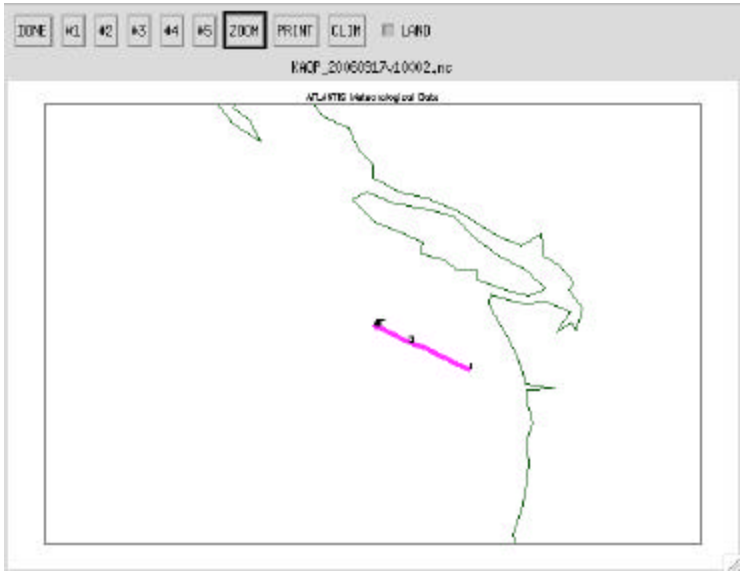
Past 30 days data quality for Knorr

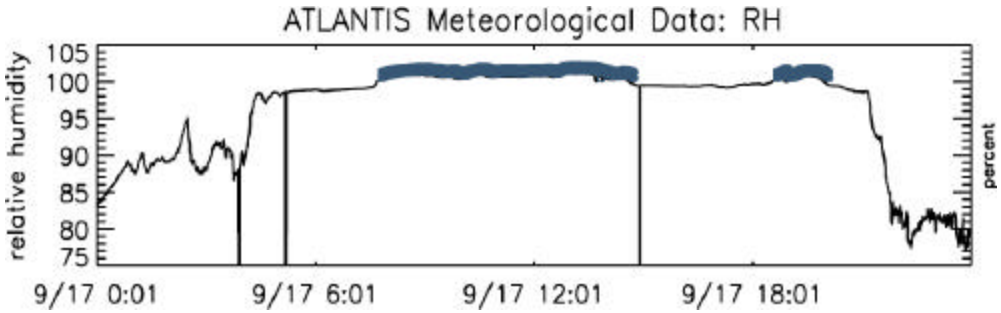


- After the metadata merge, a preliminary data quality evaluation is completed.
  - Fully automated
  - Includes tests for
    - Physically plausible values
    - Vessel speed and location
    - Statistical outliers
    - Sequential time/duplicates
- Quality flags are added to files and stored in database.
- Preliminary files are posted to web/ftp within 5 minutes of receipt by DAC.

SAMOS Data Flow (4)

- Preliminary files are monitored on daily basis.
  - Not 24/7
  - Viewed by trained meteorologist
- When problems or concerns are identified, the analyst notifies the vessel.
  - Either the home institution
  - Or the technician on board
  - Contacts stored in ship profile database

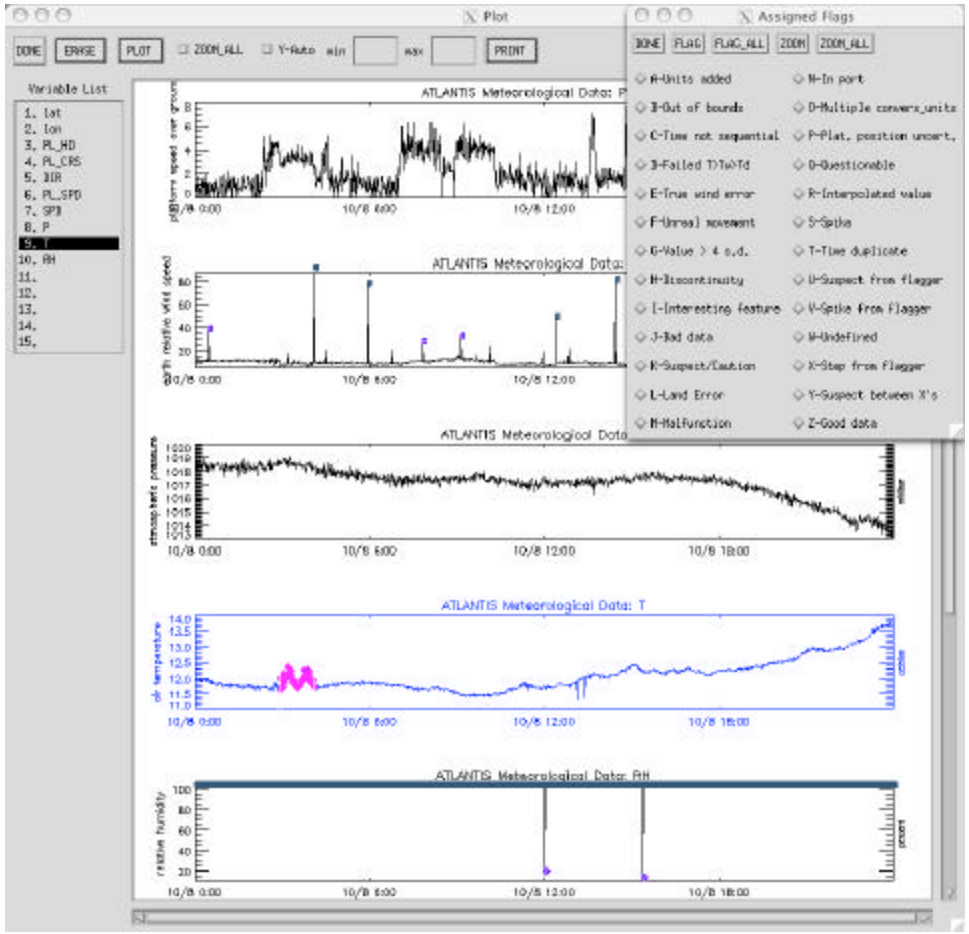




SAMOS Data Flow (5)

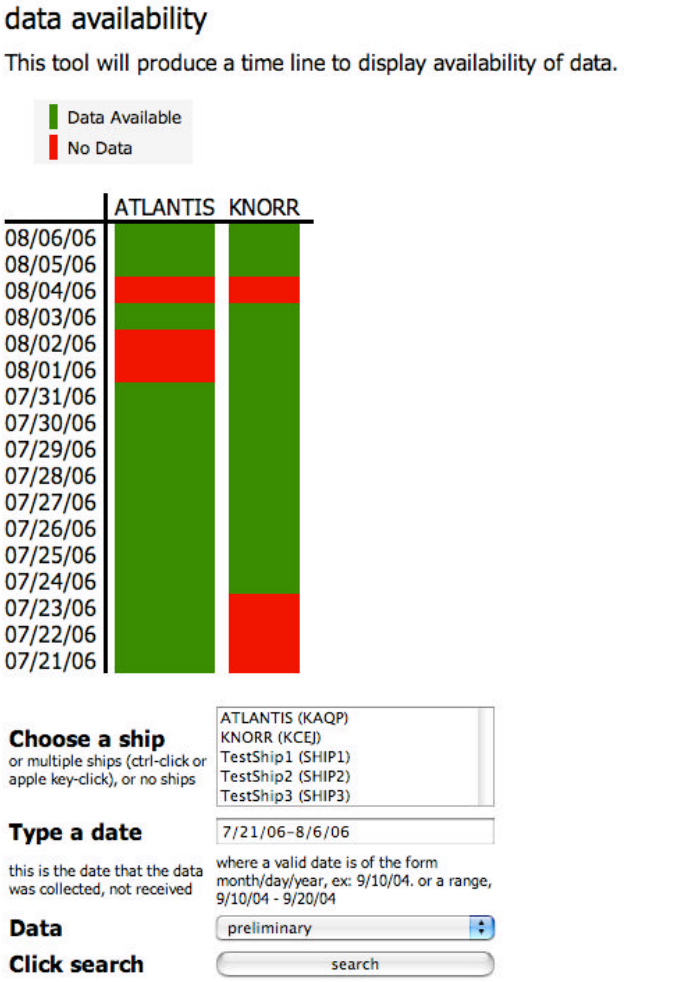
- After preliminary data are released, a delayed quality evaluation is completed.
  - Evaluation allows for receipt of delayed or corrected data.
  - All files for calendar day are merged and duplicates removed.
  - Additional automated and visual examination completed.
- Updated files and quality information are posted on web/ftp.

Atlantis: 8 October 2006



SAMOS Data Flow (6)

- Data distribution
  - Preliminary (currently) and delayed (soon) data files via web/ftp
  - http://samos.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
  - SAMOS DAC establishing protocol with NODC and NCAR for long term archival of all observations.



Benefits to Vessel Operators

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

Final Thoughts

- The SAMOS DAC is actively recruiting new vessels.
  - Interested institutions are asked to contact samos@coaps.fsu.edu
  - Please visit our “ship recruiting” page to learn the steps required to participate in SAMOS.
- Together we can build a network of high-quality, mobile ocean observing platforms to serve a wide user community.
- The DAC wishes to thank the NOAA Office of Climate Observation and WHOI CICOR for supporting the SAMOS Initiative.