Real-time MET and TSG data acquisition

- Collaborating with R2R, the SAMOS data center plans to recruit additional UNOLS vessels
  - Our focus is the collection, quality evaluation, and distribution of underway meteorological and thermo-salinograph observations

Primary and secondary parameters for routine data acquisition from Shipboard Automated Meteorological and Oceanographic Systems (SAMOS) on research vessels.

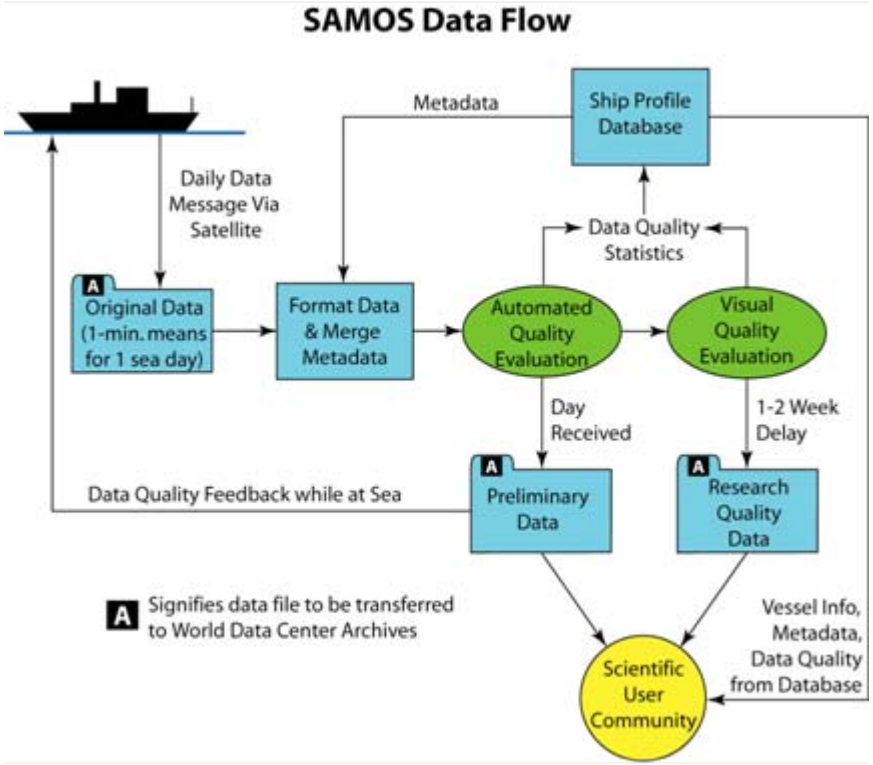
Primary	Secondary (desired if available)
• Observation time (UTC)	• Vessel pitch, roll, and heave
• Latitude	• Photosynthetically Active Radiation (PAR)
• Longitude	• Ultraviolet radiation
• Ship course over ground	• Total Radiation
• Ship speed over ground	• Visibility (from automated sensor)
• Ship heading	• Ceiling (from automated sensor)
• Ship speed over water (fore-aft and along beam components)	• Radiometric Sea Surface Temperature
• Ship-relative wind speed and direction *(as measured by anemometer)*	• Swell and wind wave heights and directions *(if measured by automated system)*
• Earth-relative (true) wind speed and direction *(calculated)*	• Weather, cloud cover, and cloud height *(desired, but not anticipated as automation is unlikely)*
• Earth-relative (true) wind speed	
• Atmospheric pressure	
• Air temperature	
• Moisture (dewpoint temperature, wet-bulb temperature, relative humidity, and/or specific humidity)	
• Precipitation	
• Shortwave radiation	
• Longwave radiation	
• Sea temperature *(both external and at the TSG)*	
• Salinity *(from TSG)*	
• Conductivity *(from TSG)*	

Why?

- SAMOS distributes MET/TSG data to a wide range of secondary users
  - Satellite sensor/product developers
  - Air-sea interaction and physical process research groups
  - Atmospheric and oceanic modelers
  - Operational weather centers

- Operator benefits
  - Routine quality evaluation
  - At-sea feedback when problems are detected
  - Decision support for vessels wishing to improve their sensor suites and/or instrument exposure
  - Expanded user community

Present SAMOS exchange



- Data reduction completed on vessels
  - Transmission to data center only includes one-minute averages, true winds, etc.
  - Data center does not receive higher frequency data
- Transmission are
  - completed using emails sent via HiSeasNet
  - once per day
- Format is key:value paired ASCII developed by SAMOS pilot project

Proposed SAMOS 2.0 transmission

- Transmissions will
  - include MET/TSG samples from any operator-owned sensors at the frequency collected by each vessel (1 sec, 5 sec, etc.)
  - be sent to a central real-time server at R2R
  - be transmitted more frequently than once per day (rate TBD)
- Data reduction (averaging, true wind calculation) will be done by SAMOS data center prior to quality processing

- A small working group has been exploring an exchange protocol
- Operator input is essential for success

Discussion Topics

- Format to use for data transfer from vessel to R2R server
- Frequency of transfer
  - Idealized
  - Will have periods when transfer schedule can not be met
- Types of feedback to operators

Proposed exchange format

- Navigation would use NMEA sentences
  - ZDA – Date/time
  - GGA, RMC, etc. – Position
  - VTG – Velocity/speed
  - HDG – Compass heading
- MET/TSG will require development of proprietary sentences
  - Could include multiple parameters in one sentence
  - Could develop sentences by sensor type
- Come to agreement on sentences to use
  - How to identify multiple sensors for same parameter?
  - Should we use combined or sensor specific sentences for MET/TSG?
  - Do any MET/TSG sentences exist?
  - How to time stamp individual observations (e.g., via network time server)?
  - What format would the time stamp use?

Proposed transfer rates

- Ideally, transfer would occur at least every 6 hours
  - 00, 06, 12, 18 UTC
  - Would support data use by operational forecast centers
- More frequent transmissions would be useful
- WHY?
  - In addition to processing data for secondary users, data received at R2R can be converted to standard World Meteorological Organization messages and transmitted via the Global Telecommunications System
- Type of electronic transfer needs to be discussed
  - Currently use email
  - Could explore FTP, Rsync, drop box, others…

Feedback to operators

- Vision includes routine reports back to operators
- Daily monitoring of data flow and sensor operation at SAMOS data center
- Subscription service to provide automated quality reports
  - Daily, weekly, monthly
- Suggestions welcome. What feedback would best support your daily operations?
  - E.g., one operator noted tracking quality of NAV sensors would be a real benefit