1. Purpose

This document provides guidance on completing the metadata forms for the SAMOS initiative. Collecting detailed metadata from participating vessels is essential to achieve the scientific and data stewardship goals outlined by the SAMOS initiative. The forms have been designed to be filled out when a vessel is recruited to participate in SAMOS data exchange. Updates to the forms should be submitted whenever necessary (instrument swap, new calibration, new sensor location, etc.). SAMOS plans to provide alternate methods (e.g., electronic forms) to ease initial metadata submission and updates in the future.

All metadata for recruited vessels will be available to the public via the metadata portal on the SAMOS web page: http://samos.coaps.fsu.edu/html/meta.php

This document represents the initial operational version of the metadata instructions. The list of requested metadata has been compiled from over 10 years of experience working with underway meteorology data from research vessels. The metadata listed are essential for many aspects of the SAMOS data quality evaluation and much of the metadata will be merged with the SAMOS observations for routine distribution. The SAMOS initiative reviewed the metadata lists from the VOS Climate Project (VOSClim) and the International Maritime Meteorologcial Archive format, and we have included some common elements. Definitions marked with the † were extracted from the VOSClim documentation to ensure consistency of content [From: Instructions for completing the VOSClim recruitment/update/ derecruitment advice Form 001]. The metadata list has been reviewed by members of the IODE Global Ocean Shipboard Underway Data (GOSUD) pilot project and several members of the SAMOS community. Comments on the metadata forms and instructions are welcome and may be incorporated into future versions.

The SAMOS Data Assembly Center (DAC) requests that vessel operators complete as much of the form as possible. Some requested items are listed as optional (e.g., home port), while others may not be applicable to research vessels that do not participate in the Voluntary Observing Ship (VOS) program (e.g., recruiting country). In the case of SAMOS equipped merchant vessels, the DAC is seeking information regarding the institution or agency responsible for installing and maintaining the SAMOS on the vessel.

2. Vessel Information

The vessel information is required to uniquely identify both the vessel and the personnel responsible for collecting and providing data to the SAMOS DAC. The contact information will be used by the SAMOS DAC to communicate both with the vessel at sea and with the vessel's home institution.

Vessel Name†
The registered name of the vessel (e.g., Melville)

Call Sign
Alpha-numeric call sign used to identify the vessel (e.g., WECB).

IMO Number†
The number issued by the International Maritime Organization (e.g. 8717283) to uniquely identify the vessel. This number stays with the vessel even if the name and call sign are changed.

Recruiting Country (if participating in VOS program)†
The International Organization for Standardization (ISO) code for the country whose Meteorological Service recruited the vessel (This will be a 2-character code, e.g. AU).

Vessel Type
A 2-letter code defining the type of vessel (Appendix 1).

Operating Country
The country operating the research vessel or responsible for installing and maintaining the SAMOS on a merchant vessel.

Home Port (optional)
The home port of the vessel or a commonly visited port, if no home port exists.

Date of Recruitment
Calendar date (YYYYMMDD) when a vessel agrees to participate in the SAMOS data exchange.

Data Reporting Interval
Typical temporal interval (in seconds) between reported values. Ideally the reporting interval should be the same duration for each desired navigation, meteorological, and oceanographic parameter. (e.g., SAMOS seeks 60 second interval, if possible).

Participation in other data exchanges (optional)
The SAMOS initiative would like to know if the vessel is participating in other routine data exchange programs (e.g., VOS, VOSClim, SOOP, ASAP, SEAS, GOSUD, etc.).

3. Contact Information

The contact information is essential to allow the SAMOS DAC to maintain the open exchange of data, metadata, and data quality information with the vessel and the vessel's home institution. SAMOS plans to provide data quality feedback while the vessel is at sea; therefore, reliable contact information (emails) is needed either for persons aboard each vessel or at each home institution.

Home Institution

Name and postal address of the institution that operates the vessel. For merchant ships, this would be the name and address of the institution that installs and maintains the SAMOS.

Contact Person

Name, email, phone, and fax for the primary SAMOS data contact at the home institution. This person should have overall knowledge of the SAMOS installation and data management procedures for the vessel. The person will serve as the primary point of contact for the SAMOS DAC.

Vessel Home Page (if available)

The URL for the vessel's home page. A link from the SAMOS DAC web page will be made to each participating vessel's home page.

Technician Name(s)

Name of marine technician(s) responsible for meteorological data collection and SAMOS service while at sea. For vessels lacking an onboard technician, please fill field with "no tech onboard".

Technician Email(s)

General or specific email address(es) that will allow the SAMOS DAC to reach the marine technician while the vessel is at sea. Along with the Alternate Contacts, this (these) email(s) will be used to provide data quality feedback to the vessel while it is underway. This field is only applicable to vessels with onboard technicians.

Alternate contact(s)

Alternate email(s) which will be used for real-time communication with the vessel for the purpose of data quality feedback. Contact points should be decided by vessel operators and could include a generic email for the chief scientist or a contact at the vessel's home institution when no onboard technician is available.

4. Vessel Layout

Metadata describing the overall dimensions and design of the vessel are valuable to the scientific data quality evaluation. Knowing the position of the instruments relative to upstream obstacles to the wind or in relation to the vessel exhaust stack can aid in the identification of suspect data values.

Dimensions†

The dimensions of the vessel expressed in meters to the nearest 1/10 m. These parameters are defined in WMO publication number 47, Annex V:

a. **Length**
   The length over all (LOA) of the vessel (e.g. 94.9 m),
b. **Breadth**
   The molded breadth (beam) of the vessel (e.g. 20.3 m),
c. **Freeboard**
   The average freeboard of the vessel as measured from the maximum summer loadline (e.g. 2.6 m),
d. **Draught**
   The average vertical distance between the vessel's keel and the maximum summer loadline (e.g. 7.9 m),
e. **Cargo ht.**
   The average height of the cargo above the maximum summer load line on the particular route where observations are made (e.g. 6.5 m). If the cargo is below the main deck (e.g. the vessel is traveling in ballast or is a bulk tanker), report the height of the main deck itself. *Note: may not be applicable to research vessels.*

Digital Photography and Vessel Schematics

Digital photos (.jpg format) and scanned schematics (.pdf format) of vessels and/or sensor locations provide a wide range of information for data quality assurance and applications.

Requested photos include (1) a side view of the entire vessel and (2) one or more photos of the masts or sites that house the SAMOS instrumentation. Mast or instrument photos are most useful when taken at a distance sufficient to show the sensor's environment and possible obstacles to air-flow around the sensor.

Desired schematics include a top, side, and bow or stern view of the vessel. Marking the location of the meteorological and oceanographic sensors on the schematics would be helpful, but is not required.

Please send any available digital images or schematics to samos@coaps.fsu.edu and provide the date submitted on the metadata form.

The naming convention† for the digital file(s) is in the following format:
xxxxxxxxxyyyymmddaaa...aaa.jpg where
xxxxxxxxx IMO number (a nine digit number, include leading zeros if applicable)
yyyymmdd year, month, day

aaa...aaa short description of the photo or schematic
Example: 00085124520020214anemometer_port_side.jpg
00085124520020214aft_view_schematic.pdf

Examples of requested files can be viewed on the SAMOS web page under the "digital imagery" button on the metadata portal (http://samos.coaps.fsu.edu/html/meta.php).

5. Data File Specification

SAMOS data exchange is designed around daily email attachments containing the SAMOS observations collected over the previous day. The data file specification provides information needed by the DAC to uncompress and process each attached file. Participating vessels should direct their automated daily file transmissions to samos_data@coaps.fsu.edu.

File Format

Name of the format used for emailed data file attachments. The format must be self-describing (what variables are where in the file), have a known delimiter between values, and have a known missing value. (E.g., SAMOS data exchange format).

Format Version

Version number of the file format (e.g., 001 for SAMOS format).

File Compression

If files provided to the SAMOS DAC are compressed, please indicate the compression algorithm used (e.g., zip, gzip, etc.)

Email Data Sent From

The email address that originated the SAMOS data message. This is used to verify that the files originate from a known provider.

6. Primary Instrument Metadata

This portion of the form provides metadata related to the individual parameters typically observed by a SAMOS. The information is critical for both the data quality evaluation and for the future scientific application of the data. Please provide the metadata for the primary sensor from which data are collected for the routine SAMOS data exchange. For vessels with multiple (e.g., port and starboard sensors) or redundant/back-up sensors, please add these on the Supplemental Instrument Metadata form (the supplemental data should be routinely provided to the SAMOS DAC). Gray areas on the form denote metadata that are not applicable to the listed parameter.

Logging System Name

Name or acronym identifies the combined instrument and data logging system used on the vessel (e.g., NOAA SCS, WHOI IMET).

System Version

Version number of data logging software.

Wind Direction Convention

Identify whether wind direction measurements represent the direction **to** which or **from** which the wind is blowing.

Anemometer Zero-line Reference

The installed orientation of the zero reference on the anemometer compass in degrees measured clockwise from the bow.

0˚ – reference pointed toward bow
90˚ – reference pointed toward starboard
180˚ – reference pointed toward stern
270˚ – reference pointed toward port

Having this reference will aid in the quality control of reported true winds.

Pressure Adjusted to Sea Level

Please state whether or not the measured atmospheric pressure has been adjusted to mean sea level.

Designator for SAMOS

The short alphanumeric tag used to identify the type of data value within each record provided to the SAMOS data center. For SAMOS version 001 data exchange format this designator appears in each line before the data value. The designator may also be column heading for a fixed format tabular file. Note that the time designator(s) should also be provided (e.g., HMS for hour, minute, seconds; YMD for year, month, day; etc.)

Instrument Make

Manufacturer of the instrument (e.g., R. M. Young).

Instrument Model

Model or series number of instrument (e.g., 5103).

Units
Original units for each parameter (e.g., Deg. +East, knots, ˚C, etc.) SI units are preferred, but as long as the DAC knows the original units, we can convert the values to SI units.

Instrument Location
The instrument locations are defined using a three dimensional set of measurements (to the nearest 1/10 m) that include:

a. **From Bow** - distance from the foremost point of the vessel above the mean water line (bow) back to the instrument on a line parallel to the vessel center line (positive value);
b. **From Center Line** - distance to port (P indicator or negative value) or starboard (S indicator or positive value) on a line perpendicular to the center line;
c. **Height/Depth** - height above (depth below) the mean water line (positive above the water, negative for a depth measurement).

Measured vs. Calculated
An indicator designating that the parameter was either directly measured (M) or was calculated (C) based on other measured parameters. An example of a calculated value is the true winds which must be derived from the vessel-relative winds, course, heading, and speed of the vessel. When possible, please provide (via email or an attached document) the formula used for each calculated value.

Data Averaging

a. **Spot vs. Average Value** – Indicate whether the parameter represents an instantaneous (spot) versus a time averaged value.
b. **Value Time Center** – When the value is time averaged, indicate whether the time stamp associated with the value represents the start, center, or end of the averaging period.
c. **Length** – When the value is time averaged, please provide the length of the averaging period (in seconds)

Sampling Rate
The typical sampling rate from each individual instrument (in Hertz).

Data Precision
The fractional value (decimal) to which the sensor can resolve changes in the measured parameter. This may be the manufacturer's precision, but preferable value would be the expected precision of the instrument as deployed in the field.

Date In or Last Calibration
At the minimum, SAMOS plans to record the installation date or the last date of calibration for each sensor. Please use a YYMMDD format.

Radiation direction convention
For each radiation measurement, indicate whether the sensor is measuring downwelling (dn) or upwelling (up) radiation.

7. Supplemental Instrument Metadata

The content of the supplemental instrument metadata form are identical to the primary instrument metadata form, with the exception that the parameter field is left blank. Please fill in the parameter field for the appropriate supplemental measurement (e.g., PAR, UV radiation, alternate sea temperature measurements, secondary wind measurements, back-up navigation system, etc.). If the supplemental measurements are from an secondary data logging system, the information on the logging system can be included on the top of the supplemental form.

8. Further information

Questions regarding the completion of these metadata forms can be directed to the SAMOS DAC: samos@coaps.fsu.edu. Forms can be either submitted via email or mailed to:

SAMOS DAC
Center for Ocean-Atmospheric Prediction Studies
The Florida State University
Tallahassee, FL 32306-2840 USA

Thank you for completing the SAMOS metadata forms.

Appendix 1: Vessel type codes as proposed for a revision to WMO Publication 47. The codes were prepared by the *Task Team on Metadata for Pub47*, established in 2003 at the 2nd Ship Observation Team meeting.

BA	1	Barges, including crane barges and tank barges
BC	*	Bulk Carriers, including Ore/Bulk/Oil (OBO) carriers and Ore/Oil carriers
CA	#	Cable ships
CG	*	Coastguard cutters, patrol ships and launches
CS	2	Container ships, including open and closed container ships and refrigerated container ships
DR	*	Dredgers including bucket, hopper, grab and suction dredgers
FE	3	Passenger ferries (carrying passengers only)
FP	#	Floating Production and Storage Units
FV	*	Fishing Vessels including purse seiners, long liners etc., but excluding trawlers
GC	*	General Cargo ships with one or more holds
GT	*	Liquefied gas carriers/tankers including LNG and LPG carriers
IC	#	Icebreaking vessels (dedicated vessel). If the vessel fits in another category and is ice strengthened then include 'ice strengthened' as a footnote
LC	#	Livestock Carrier: dedicated ship for the carriage of livestock
LT	*	Liquid tankers including oil product tankers, chemical tankers and crude oil tankers (including VLCC's and ULCC's)
LV	*	Light vessels
MI	#	Mobile installations including mobile offshore drill ships, jack up units, semi-submersibles
MS	*	Military ships
OW	*	Ocean Weather Ship (dedicated weather ship)
PI	#	Pipe Layers
PS	4	Passenger ships and Cruise liners
RF	*	Ro Ro ferries (carrying passengers and laden vehicles)
RR	*	Ro Ro cargo ships for carriage of road and/or rail vehicles and cargo, including containerised cargo
RS	5	Refrigerated cargo ships including banana ships
RV	*	Research Vessels, including oceanographic, meteorological and hydrographic research ships and seismographic research ships
SA	#	Large sailing vessels, including sail training vessels
SV	*	Support vessels including offshore support vessels, offshore supply vessels, stand-by vessels, pipe carriers, anchor handling vessels, buoy tenders (including coastguard vessels engaged solely on buoy tending duties), diving support vessels, etc.
TR	6	Trawler fishing vessels
TU	*	Tugs, including fire-fighting tugs, salvage tugs, pusher tugs, pilot vessels, tenders etc
VC	#	Vehicle Carriers: dedicated multi deck ships for the carriage of new unladen road vehicles
YA	7	Yachts and pleasure craft
OT	*	Other (specify in footnote)

Notes for vessel type Table

*	Code unchanged but possible expansion of the description
#	New addition to table
1	Previously code B
2	Existing code **CS** is amended to include both open and closed container ships that have similar profiles. To avoid confusion previous code **CC** (Closed Container) is therefore deleted from the list
3	Previously code F
4	This proposed addition to table replaces **PV** for Passenger Vessel and **PL** for passenger liner in order to avoid confusion regarding the variety of passenger ships and liners in service.
5	This proposed addition to table replaces previous code **BS** (banana ships), which represented only one particular type of refrigerated cargo ship
6	Previously code T
7	Previously code Y
Note 1	Code **IF** (inshore fishing vessel) is deleted as it is considered unnecessary to define where fishing is carried out, and because this type of fishing vessel is already adequately covered by codes **FV** and **TR**