RECORD OF CONVERSATION

Date:	**June 7, 2017**
Time:	**Approximately 1530 eastern daylight time**
Location:	**Telephone**
Person Contacted:	**Dr. Robert Grumbine** **Physical Scientist/Oceanographer** **National Weather Service/National Centers for Environmental Prediction/ Environmental Modelling Center**
Subject:	**Weather Reporting from Maritime Vessels**

On June 7, 2017, at approximately 1530 eastern daylight time (EDT), Mike Richards and Doug Mansell from the NTSB had a conversation with Dr. Robert Grumbine, Physical Scientist/Oceanographer at the National Weather Service's Environmental Modelling Center. The conversation took place via telephone. Dr. Grumbine reported the following:

Weather observations from vessels at sea are a great compliment to satellite data collection. Remotely sensed weather data – using infrared and microwave radiometers – provide a significant amount of valuable information for weather modelers, but they have limitations.

For atmospheric modelling, surface barometric pressure is the most useful meteorological parameter that could be provided by vessels at sea because barometric pressure can account for the entire atmospheric column above the pressure observation. Acquiring the raw (uncorrected to sea-level) barometric pressure is preferred over acquiring an already-corrected barometric pressure, provided that metadata on a particular vessel's pressure sensor (e.g. sensor height above waterline, sensor location on vessel) is available.

Information about ocean properties is important for atmospheric modelling because of the complex air-sea interactions. Thus, several other critical pieces of information that could be retrieved by vessels at sea are sea-surface temperature and a sea temperature profile beneath the surface. For this discussion, the "sea surface" is defined as the top 20 centimeters of the sea. Another important depth for a temperature reading is 10 meters. It may be possible to equip vessel hulls with sensors that go deep enough (given draught) to provide a valuable sea temperature profile.

Localized wind information is less useful to weather modelling, as there are issues with assimilation of these data. Air temperature information, particularly that which is reported by ships

near coastal areas, can be useful for ingestion into high resolution models. Information on wave height can be useful for model verification, and would also be particularly useful along the North Slope (Alaska), where satellite observations are limited.

There is no such thing as too much data. There is not a concern for "bad data" being ingested into models, as the models can reject data that do not agree with its expectation of what the environment could support. Thus, erroneous data from vessels is unlikely to harm weather modelling efforts, and increased ship observation reports would largely be considered beneficial. The most applicable times to receive meteorological data are at 00, 06, 12 and 18 UTC. Weather modelers, at agencies around the world, would seamlessly use data from ship observation reports if the data is included in the Global Telecommunications System (GTS).

Weather observations from vessels are also important because they provide surface data where infrared remote-sensing satellites do not cover for extended periods of time (e.g., due to clouds), and they fill in some gaps from the microwave remote-sensing satellites (which provide lower spatial resolution). Surface observations can also help identify bias or gradual drift of satellite data. Due to the method of observation, satellite data can be contaminated for several kilometers near coastlines; ship reports in these areas can be very beneficial. A 2003 paper published in the Bulletin of the American Meteorological Society highlights issues with sea surface temperature retrieval as being a major factor in problems with forecasting for a particular storm.

Mike Richards
Aviation Safety Investigator
Senior Meteorologist
Operational Factors Division
National Transportation Safety Board

Douglas Mansell
Recorder Specialist
Vehicle Recorder Division
Office of Research and Engineering
National Transportation Safety Board