data summary

Southern Surveyor Voyage ss2010_t03

CSIRO

MARINE NATIONAL FACILITY

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ss2010_t03

Title

"*Next Wave* tomorrow's marine scientists"

Principal Investigators

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Ports

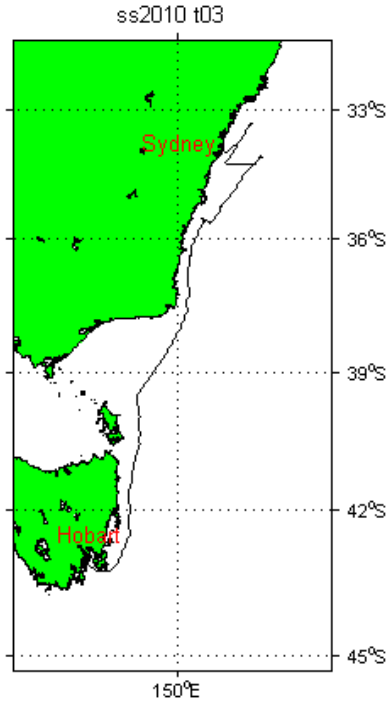
Original schedule:

Depart Hobart 1600 h, Thursday 16 September 2010
Arrive Sydney (local time) 1500 h, Tuesday 21 Sept. 2010

Date

16-Sep-2010 22:01 to 20-Sep-2010 22:19 (UTC)

Voyage Track



Underway Data

Navigation data is acquired using the Seapath 200 position and reference unit, which is also differentially corrected by data from the FUGRO DGPS receiver.

The Meteorological data consists of 2 relative humidity and temperature sensors; a barometer, wind sensor, and licor light sensor.

Thermosalinograph data is acquired with a Seabird TSG and remote temperature by SBE 3T. Data from a flow meter is also recorded.

Digital depth data is recorded from a Simrad EK60 sounder. Echograms are also recorded using SonarData's Echolog software. Digital depth data can be re-picked using SonarData's Echoview software.

Data from "IMOS" (Integrated Marine Observing System) sensors are also included. The sensors are port and starboard radiometers and pyranometers, wind speed and direction; rain and rainrate.

See Electronics report for this voyage for instruments used and their serial numbers.

Navigation, meteorological, thermosalinograph, IMOS and depth data are quality controlled by combining all data from hourly recorded files to 5 second values in a netCDF formatted file. The combined data is referred to as “underway data”.

A combined file was made on 29-Mar-2011 by running a Java application, written by Lindsay Pender of CMAR, UwyMerger version 1.3 with data time range of 16-Sep-2010 22:01 to 20-Sep-2010 22:19 (UTC).

Completeness and Data Quality

Navigation data (latitude and longitude, speed over ground, ship heading and course over ground); meteorological data (port and starboard air temperature, port and starboard humidity, wind direction and speed, maximum wind gust, light, atmospheric pressure, uncorrected wind direction, rain and speed) and IMOS data (port and starboard radiometers, port and starboard pyranometers, derived wind direction and speed, uncorrected wind direction and speed, rain and rain rate), thermosalinograph (salinity and water temperature) data and depth data were evaluated and quality controlled.

Processing Comments

A number of minor discrepancies between the port and starboard air temperature sensors were noted (max differences of about 1.2 degree otherwise both sensors gave very close reading with the mean absolute difference of about 0.0374 degree). These occurred usually during periods of rapid temperature increase or decrease. Investigation of these indicated that they have usually occurred when the ship was stationary with little wind or during/following periods of rainfall. This phenomenon has probably come about due to the rapid warming of air due to the ship becoming stationary or cooling of the air temperature due to the evaporation of the rain water around the sensor housing. It is unclear as to why there should be a notable temperature differential between the port and starboard temperature sensors.

A similar discrepancy (max differences of about 6.88%) between the port and starboard humidity sensors was observed. It should also be noted that the starboard humidity sensor appears to consistently give a higher humidity reading with the mean absolute difference of about 1.41%. The recorded values appear to be within instrument tolerance.

A number of rapid temperature changes were noted (e.g. rise or drops of around 3-5 degrees during a short period of time) for both port and starboard temperature sensors.
These rapid temperature changes were most likely due to the warming up effect of the ship’s metal structures and/or the engine exhaust blowing over the sensors, when the wind is blowing on the stern of the ship or the ship is stationary with little wind or being hit by a cold/warm front. The sensor values for the ship speed, uncorrected wind direction, wind speed and port/starboard temperature were closely examined for correlation and the following two conditions were indentified as usually prevalent during the periods of rapid temperature changes (in particular temperature rise):

1) The ship stationary with no or low wind speed in the region of 5 knots blowing on the stern (i.e. uncorrected wind direction around 135 to 225 degrees).
2) The ship cruising at about 8-10 knots with wind speed in the region of 10-40 knots blowing on the stern (i.e. uncorrected wind direction around 135 to 225 degrees).

Periods of rapid changes are suspect for reasons highlighted above, otherwise the data is good.

There are sections in the speedOG data, mainly between 17-Sep-2010 01:13 to 18-Sep-2010 21:11; which appear to be noisier than usual. This is most probably caused due to lack of DGPS (Differential GPS) availability at that locality. A peak speedOG of 18.05 knots and occasional fluctuation in the region of around 10 knots in 5 seconds was noted; given the capabilities of the Southern Surveyor, such values are improbable. This variability in the speedOG data is most likely due to the inaccuracies with the standard GPS and the rolling of the ship. The speedOG data was QCed as good as the noise in the data is as expected for the standard non corrected GPS. However it is recommended that the speedOG data is used with reference to the Doppler velocity log that records the ships speed through water. The Doppler velocity log variable name is 'shipsLog' in the netCDF underway file (ss2010_t03uwy.nc). It should be noted that Doppler velocity is not QCed as part of the underway processing and there can be obvious anomalous spikes in this data which should be ignored. However as this data is less noisy than some of the recorded speedOG (i.e. for periods without DGPS) it could provide a point of reference when using the speedOG data.

The wind speed had a number downward spikes. These were investigated and the cause was attributed to apparent anomalous raw wind direction (uncorrWindDir) data. The wind speed is derived from uncorrected wind speed and wind direction plus a few other parameters. Examination of the underlying data revealed possible anomalous raw wind direction data which coincided with the downward spikes in the derived wind speed.

After careful consideration of this problem by MNF electronics support, it was suggested that this is simply a phenomenon associated with disturbed airflow when the wind is generally from the stern of the vessel and the fact that this sensor is a wind vane or "weather-cocking" type (rather than ultrasonic).

Therefore obvious identifiable windSpeed spikes were manually set to NaN along with the corresponding values for uncorrWindDir, uncorrWindSpeed, windDir and maxWindGust with their QG flags set to {'bad','none','operatorFlagged'}. The QCing process was undertaken with reference to IMOSWindSpeed sensor.

The courseOG values when the ship is stationary are not true values as the ship is not travelling a course however this is a feature of the current acquisition system. The QC flags have been set as good however this feature should be noted if the values during the stationary periods are to be used.

The readings from the foremast funnel/siphoning type rain sensor was notably larger than foremast IMOSRain sensor (which is an optical type) on 17-Sep-2010 15:44 and 20-Sep-2010 22:14; moreover a few times IMOSRainRate indicated rain but neither rain sensors had registered any rain.

It was noted that IMOS starboard Radiometer recordings were mostly about 3 (W/m^2) greater than the port Radiometer recordings throughout the voyage.

The depth data was re-picked using Sonar Data's Echoview software. Due to incorrect system settings or too much noise occasionally no echogram data was recorded and similarly viable swath data was not available, therefore depth data could not be ascertained and QCed using echograms or swath single beam depth. The main periods without QCed depth data are noted below:

17-Sep-2010 14:37 to 18-Sep-2010 01:32
18-Sep-2010 06:06 to 18-Sep-2010 06:47
19-Sep-2010 06:37 to 19-Sep-2010 06:43
19-Sep-2010 08:31 to 19-Sep-2010 09:19
19-Sep-2010 13:37 to 19-Sep-2010 13:46
19-Sep-2010 16:09 to 19-Sep-2010 16:36
19-Sep-2010 16:55 to 19-Sep-2010 18:45
19-Sep-2010 18:59 to 19-Sep-2010 19:37
19-Sep-2010 19:43 to 20-Sep-2010 05:02

The TSG salinity values recorded during the whole voyage is unusable due to excess noise. The cause of the noise was diagnosed during the subsequent voyage and it was found to have been caused due to an air leak on the intake pipe. It was also noted that the TSG flow was highly noisy and irregular which was most likely caused by the same air leak.
The salinity values have all been left as is without any calibration and its QC flags marked as {'bad','none','operatorFlagged'}.

Note: All 2010 underway voyage data is acquired and preliminary processed by the TECHSAS and uwyMerger acquisition system respectively. It should further be noted that the following data and their QC flags are not supported in the TECHSAS/uwyMerger acquisition system: maxWindGustDir, maxWindGustDirQC, IMOSMaxWindGust, IMOSMaxWindGustQC, IMOSMaxWindGustDir, MOSMaxWindGustDirQC.

Final Underway Data

The navigation, meteorological, thermosalinograph, IMOS and depth data will be entered into the CMAR divisional data warehouse. All data timestamps are in UTC.

Filename	Parameters	Resolution
ss2010_t03uwy10.csv	latitude, latitudeQC, longitude, longitudeQC, speedOG, speedOGQC, courseOG, courseOGQC, shipHeading, shipHeadingQC, uncorrWindDir, uncorrWindDirQC, uncorrWindSpeed, uncorrWindSpeedQC, waterDepth, waterDepthQC, portAirTemp, portAirTempQC, stbdAirTemp, stbdAirTempQC, portHumidity, portHumidityQC, stbdHumidity, stbdHumidityQC, windSpeed, windSpeedQC, maxWindGust, maxWindGustQC, windDir, windDirQC, PAR, PARQC, atmPressure, atmPressureQC, waterTemp, waterTempQC, salinity, salinityQC, IMOSStbdRadiometer,	10 seconds

	IMOSStbdRadiometerQC, IMOStbdPyranometer, IMOSStbdPyranometerQC, IMOSRainRate, IMOSRainRateQC, IMOSRain, IMOSRainQC, IMOSWindSpeed, IMOSWindSpeedQC, IMOSWindDir,IMOSWindDirQC, IMOSPortRadiometer, MOSPortRadiometerQC, IMOSPortPyranometer, IMOSPortPyranometerQC, IMOSUncorrWindSpeed,MOSUncorrWindSpeedQC, IMOSUncorrWindDir,IMOSUncorrWindDirQC rain, rainQC	
ss2010_t03uwy5min.csv	Ditto 10 second data	5 minutes
ss2010_t03pdr10.csv	latitude, latitudeQC, longitude, longitudeQC, waterDepth, waterDepthQC	10 seconds

References

Subversion repository version of DPG Matlab generic tools 1488
Pender, L., 2000. Data Quality Control flags.
http://www.marine.csiro.au/datacentre/ext_docs/DataQualityControlFlags. Pdf

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