data summary

Southern Surveyor Voyage ss2011_t02

CSIRO

MARINE NATIONAL FACILITY

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ss2011_t02

Title

"Towards an understanding of mid-trophic biomass, distribution, variability and energetics in ocean ecosystems"

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Ports

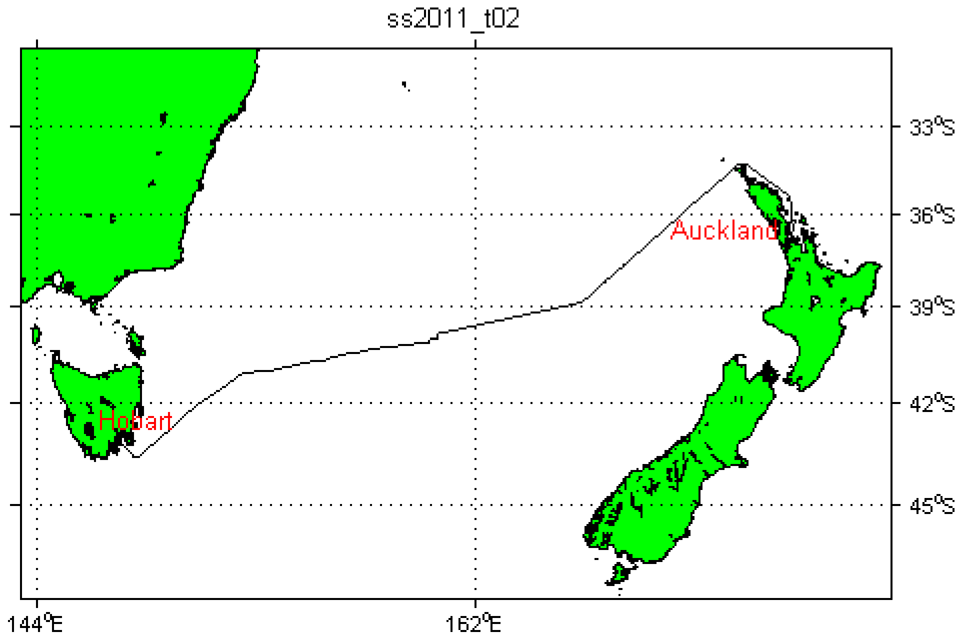
Original schedule (local time):

Depart Auckland 0800hrs, Tuesday 7 June, 2011
Arrive Hobart 1600hrs, Wednesday 15 June, 2011

Date

06-Jun-2011 19:59:30 to 14-Jun-2011 21:32:20 (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 28-Jul-2011 by running a Java application, written by Lindsay Pender of CMAR, UwyMerger version 1.3 with data time range of 06-Jun-2011 19:59:30 to 14-Jun-2011 21:32:20 (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 1.5 degrees, otherwise both sensors gave very close reading with the mean absolute difference of about 0.03 degrees). 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 10.2%) 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 0.67%. 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.

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 IMOSRain sensor (which is an optical type) was inconsistent with the foremast funnel/siphoning type rain sensor.
This was initially considered to be unusual because the optical IMOSRain sensor reading was expected to be similar to those from the foremast funnel/siphoning sensor. However, further investigation of this issue across a number of voyages indicated a very close correlation between periods of strong winds or rough sea/swells and the times that the optical IMOSRain sensor recordings indicated significantly higher rain level than the foremast funnel/siphoning rain sensor. It is suspected that the higher IMOSRain sensor recordings are due to water spray from the breaking of waves against the bow of the ship and wind-carried spray from the rough seas which are more likely to interrupt the optical sensor beam path and less likely to enter the funnel at the top of the funnel/siphoning sensor. The foremast rain sensors are virtually co-located. (Note: The reverse of this situation has also been observed, whereby during periods of relative calmness (i.e. low wind and slow/stationary ship) the funnel/siphoning sensor shows notably higher rain than the optical sensor).

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 Myriax Echoview software. Due to an incorrect setting on the EK60 for the sea depth there were some periods without echograms data. For such periods when EM300 depth data was available this was used for QCing of the depth data and the water depth QC flag was set to {‘good’ ,‘manually adjusted’, ‘no error’}, when EM300 data was not available the depth data could not be QCed at all and was set to NaNs. The notable periods without QCed depth data are listed below:

09-Jun-2011 04:15:15 to 09-Jun-2011 05:14:15
09-Jun-2011 09:21:25 to 09-Jun-2011 11:05:05

10-Jun-2011 10:59:30 to 10-Jun-2011 13:02:15
11-Jun-2011 04:32:00 to 11-Jun-2011 04:53:50
11-Jun-2011 11:05:35 to 11-Jun-2011 13:33:45
12-Jun-2011 11:18:05 to 12-Jun-2011 13:29:45
13-Jun-2011 11:05:10 to 13-Jun-2011 13:59:50
14-Jun-2011 06:25:45 to 14-Jun-2011 13:04:35
14-Jun-2011 19:00:55 to 14-Jun-2011 20:38:40

There were a few periods with noisy intake water temperature data; these have been set to NaNs and their QC flags set to {'bad','none','operatorFlagged'}. The most significant and longest of these was between 07-Jun-2011 06:24:10 to 13:34:30

During the processing of recent voyages TSG/CTD calibration runs, the examination of the overlapped salinity plots have shown a notable discrepancy in the TSG salinity relative to the CTD salinity. The investigation of this anomaly has not been conclusive so far. However examination of TSG data has revealed that if the TSG conductivity is advanced by about 32 seconds relative to the TSG sensor temperature, when calculating the derived salinity, a significant improvement in TSG salinity relative to the CTD salinity is obtained. Whilst this issue is being investigated further, a conductivity lag correction factor is introduced as part of TSG calibration and utilised for the calculation and processing of TSG salinity. This lag factor is henceforth documented in this processing report.

No CTDs were undertaken during this voyage. Therefore, a salinity scaling factor of 0.999921152937381 from the previous voyage, ss2011_v02 for the primary conductivity cell was used. This scaling factor along with the conductivity lag of 32 seconds was applied to the TSG salinity data and the Thermosalingraph salinity QC was set to {‘good’ ,‘manually adjusted’,‘no error’}.

Note: All 2011 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
ss2011_t02uwy10.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,	10 seconds

	atmPressureQC, waterTemp, waterTempQC, salinity, salinityQC, IMOSStbdRadiometer, IMOSStbdRadiometerQC, IMOStbdPyranometer, IMOSStbdPyranometerQC, IMOSRainRate, IMOSRainRateQC, IMOSRain, IMOSRainQC, IMOSWindSpeed, IMOSWindSpeedQC, IMOSWindDir,IMOSWindDirQC, IMOSPortRadiometer, MOSPortRadiometerQC, IMOSPortPyranometer, IMOSPortPyranometerQC, IMOSUncorrWindSpeed,MOSUncorrWindSpeedQC, IMOSUncorrWindDir,IMOSUncorrWindDirQC rain, rainQC	
ss2011_t02uwy5min.csv	Ditto 10 second data	5 minutes
ss2011_t02pdr10.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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