data summary

Southern Surveyor Voyage ss2010_v05

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Title

"Biological Oceanography of Western Rock Lobster Larvae"

Principal Investigators

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Ports

Original schedule:

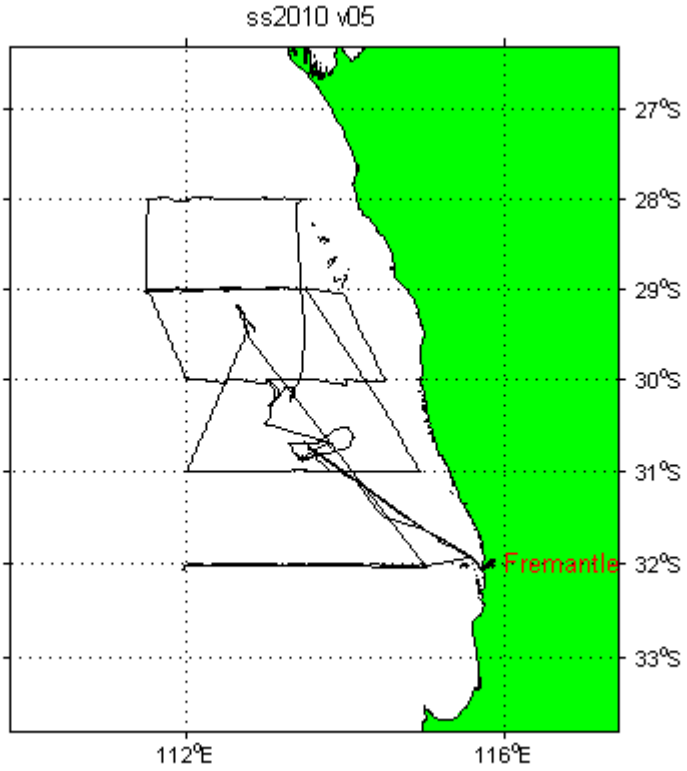
Depart Fremantle 6 July 2010 at 1000hrs

Arrive Fremantle 27 July 2010 at 0800hrs

Date

06-Jul-2010 05:07 to 26-Jul-2010 23:48 (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 gust along with 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 3 Feb 2011 by running a Java application, written by Lindsay Pender of CMAR, UwyMerger version 1.3 with data time range of 06-Jul-2010 05:07 to 26-Jul-2010 23:48 (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

The ship returned to Fremantle and was in port between approximately 07-Jul-2010 09:40 to 09-Jul-2010 10:47 for repairs to leaking fuel line. All recorded data during this period has been left in the data set apart from TSG salinity and waterTemp data where values are set to NaN and QC flags set to {'bad','none','operatorFlagged'} during the period 07-Jul-2010 09:39:55 to 09-Jul-2010 11:35:20.

Quality control of IMOSRain sensor data against the main mast rain gauge sensor indicated instrument recording problems. The following extract was noted in the electronics report: "The Optical Rain Gauge had not been displaying any data from the commencement of the voyage. Due to other priorities this was not investigated until later in the voyage.

A re-start of the complete Met System VB Application proved successful in obtaining a continuous data stream from the O.R.G. Data was not available from this instrument until July 23.".
The IMOSRain and IMOSRainRate sensor values and their QC flags from the start of voyage to 23-Jul-2010 00:00:00 were set to NaN and {'bad','none','operatorFlagged'} respectively.

The readings from the foremast IMOSRain sensor, when available, was notably higher than the main mast rain sensor.
This was initially considered to be unusual because the IMOSRain sensor reading was expected to be similar to those from the main mast sensor. However, further investigation of this issue indicated a very close correlation between periods of strong winds and the times that the IMOSRain sensor recordings indicated significantly higher rain level than the main mast 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.

A number of discrepancies between the port and starboard air temperature sensors were noted (max differences of about 1.1 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 12%) between the port and starboard humidity sensor was observed. It should also be noted that the starboard humidity sensor appears to consistently give a higher humidity reading (mean absolute difference of about 1.25%). The recorded values appear to be within instrument tolerance.

A number of rapid temperature changes were noted (e.g. 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 anomalous raw wind direction 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 wind direction data which coincided with the downward spikes in the derived wind speed. Most of the obvious anomalies during this period were manually set to NaN with their QG flags set to {'bad','none','operatorFlagged'}. However due to the number of spikes throughout the data it was not possible to ascertain if they were all caused due to the problem with the wind direction or not. Therefore due to this uncertainty it was decided to keep the rest of the data and its QCflag left in its initial {‘noQC’,’none’,’preliminary’} state, otherwise the data is of good quality.

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.

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.
A new echo sounder system, Simrad EK60, was used on this voyage. Due to incorrect system setting there were periods where no echogram data was recorded. During such periods the depth data was QC-ed against swath centre beam data and was marked as good. However where there were no centre beam data or echograms available the depth data is marked bad.
Major depth data intervals QC-ed against swath depths are:
13-Jul-2010 08:12:30 to 14-Jul-2010 23:15:55 and
16-Jul-2010 00:43:20 to 16-Jul-2010 03:52:35 and
16-Jul-2010 04:46:20 to 16-Jul-2010 10:23:29f
Bad data between 6-Jul-2010 12:28 to 7-Jul-2010 08:57 due to bad system setting.

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.

The CTD calibration data for the primary sensor was obtained from file ss2010_v05047Ctd (i.e. CTD offset and scale factor of 0.000867553971487582, 0.999629971000339). This data was then used to calibrate the TSG against the calibrated CTD data. Using CTD/TSG calibration run in CTD deployment 49 (ss2010_v05049Ctd.nc) with a TSG conductivity lag of 32 seconds, a salinity of 1.001250650118595 was calculated for the CTD primary conductivity. This scaling factor was applied to the TSG salinity data and the thermosalingraph salinity QC was set to {‘good’ ,‘manually adjusted’,‘no error’}.

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_v05uwy10.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, IMOSStbdRadiometerQC, IMOStbdPyranometer, IMOSStbdPyranometerQC, IMOSRainRate, IMOSRainRateQC, IMOSRain, IMOSRainQC, IMOSWindSpeed, IMOSWindSpeedQC, IMOSWindDir,IMOSWindDirQC, IMOSPortRadiometer, MOSPortRadiometerQC, IMOSPortPyranometer, IMOSPortPyranometerQC, IMOSUncorrWindSpeed,MOSUncorrWindSpeedQC, IMOSUncorrWindDir,IMOSUncorrWindDirQC rain, rainQC	10 seconds
ss2010_v05uwy5min.csv	Ditto 10 second data	5 minutes
ss2010_v05pdr10.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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