data summary

Southern Surveyor Voyage ss2010_v04

CSIRO

MARINE NATIONAL FACILITY

Table of Contents

ss2010_v04

Title

Assessing oceanographic delivery of nutrients to Ningaloo Reef

Principal Investigators

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Ports

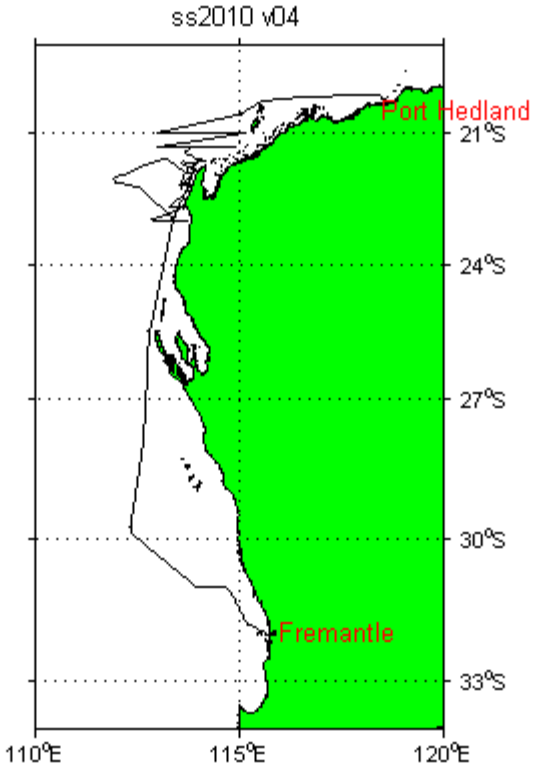
Original schedule:

Depart Port Hedland 1000 hrs, May 8th 2010
Arrive Fremantle 0800 hrs, Thurs 27 May 2010

Date

08-May-2010 02:09:40 to 26-May-2010 23:10:00 (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 SBE 3T. Data from a flow meter is also recorded.

Digital depth data is recorded from a Simrad EA500 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 2 August 2010 by running a Java application, written by Lindsay Pender of CMAR, uwyMerger version 1.3 with data time range of 08-May-2010 02:09:40 to 26-May-2010 23:10:00 (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 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 discrepancies between the port and starboard air temperature sensors were noted (differences of about 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 (between 1 to 10%) 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 around 1% higher and an occasional spike differences of around 10% were noted. The recorded values appear to be within instrument tolerance.

A number of rapid large temperature increases were noted (e.g. around 3-4 degrees during a short period of time followed by similar falls) 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. 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:

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.

The depth data was re-picked using Sonar Data's Echoview software.

During processing of recent voyages TSG/CTD calibration runs and 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_v04020Ctd and a CTD scale and offset factor of 0.999780043920893 and 0.000579074866494204 respectively was applied to the CTD data. This data was then used to calibrate the TSG against the (calibrated) CTD data where an averaged salinity scale factor of 1.000683356767277 was calculated, [using CTD/TSG calibration run in CTD deployment 111 and 112 (ss2010_v04111Ctd.nc ss2010_v04112Ctd.nc)] with a TSG conductivity lag of 32 seconds and applied to the TSG salinity data. 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_v04uwy10.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	10 seconds
ss2010_v04uwy5min.csv	Ditto 10 second data	5 minutes
ss2010_v04pdr10.csv	latitude, latitudeQC, longitude, longitudeQC, waterDepth, waterDepthQC	10 seconds

References

Subversion repository version of DPG Matlab generic tools 1147
Pender, L., 2000. Data Quality Control flags.
http://www.marine.csiro.au/datacentre/ext_docs/DataQualityControlFlags. Pdf

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