data summary

Southern Surveyor Voyage ss2010_v01

CSIRO

MARINE NATIONAL FACILITY

Table of Contents

ss2010_v01

Title

PINTS – primary productivity induced by nitrogen and iron in the tasman sea

Principal Investigators

Dr. Christel Hassler (Chief Scientist) – Faculty of Science University of Technology, Sydney, POBox 123 Broadway Sydney NSW 2007
Phone: +61 2 9514 4159 **Email:** Christel.Hassler@uts.edu.au

Ports

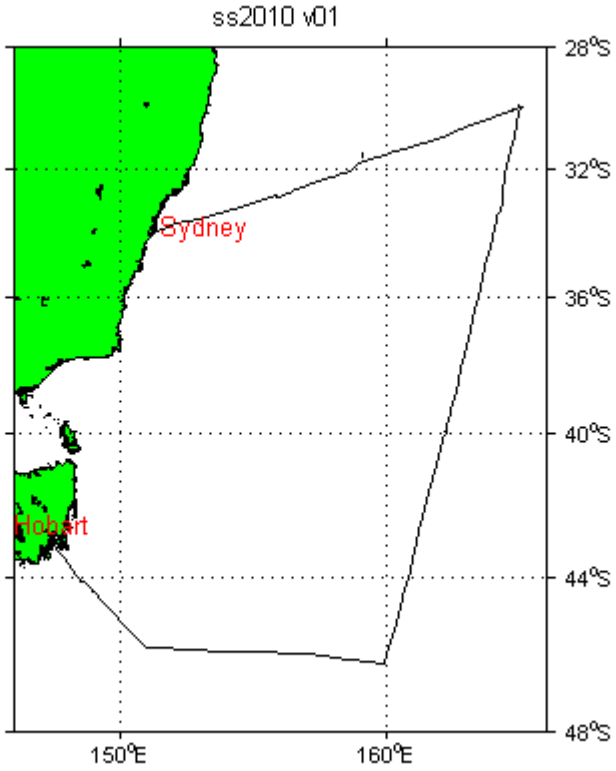
Original schedule:

Depart Sydney 1000hrs, Friday 22nd January, 2010
Arrive Hobart 1900hrs, Monday 15th February, 2010

Date

23-Jan-2010 05:06 to 15-Feb-2010 05:03 (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 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 14-Jan-2011 by running a Java application, written by Lindsay Pender of CMAR, UwyMerger version 1.3 with data time range of 23-Jan-2010 05:06 to 15-Feb-2010 05:03 (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 data acquisition systems were stopped when the ship was opposite the ironpot (just at the northern tip of Brunney island) on 15-Feb-2010 05:03:25 about 1-2 hours from Hobart port. The reason for this early termination is unknown but it is suspected it was to allow for an early data backups to be made.

Anomalous speed over ground was detected over the periods between 27-Jan-2010 15:39:45 and 27-Jan-2010 15:44:10 and other NAV sensor values looked suspect; therefore all NAV data for this period were set to NaN and their QC flag set to {'bad','none','operatorFlagged'}. Similarly the same operation was carried out for the same period on 'uncorrWindSpeed', 'uncorrWindDir', 'maxWindGust', 'windDir', 'windSpeed' because these sensor values appeared suspect.

On several occasions, the readings from the foremast IMOSRain sensor were significantly higher than those from the main mast rain sensor.
This initially appeared as unusual because the IMOSRain sensor readings were expected to be similar to those from the main mast sensor.
However, investigation of this issue indicated a very close correlation between periods of strong winds and the times that the IMOSRain sensor is recording notably higher rain than 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 difference of about 1.17 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 difference of about 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 0.66% on average). 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.

Due to incorrect setting on the EA500 sounder system no usable echogram depth data were collected. Moreover as swath was not running there were also no centre beam depth data available. Therefore it was not possible to quality control and correct sounder depth data by re-picking lines using Sonar Data’s Echoview software or Qcing it against swath centre beam depth data. Hence, the recorded depth data in the netCDF file or csv files are not QCed at all and their QCflag are left in the original state of {‘noQC’,’none’,’preliminary’}.

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_v01001Ctd (i.e. CTD offset and scale factor of -0.000628562288849029, 1.00010580848771). This data was then used to calibrate the TSG against the calibrated CTD data. Using CTD/TSG calibration run in CTD deployment 17 (ss2010_v01017Ctd.nc) with a TSG conductivity lag of 32 seconds, a salinity scaling factor of 0.999490223451789 was calculated for the CTD primary conductivity. This scaling factor was applied to the TSG salinity data and the salinity QC flag 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_v01uwy10.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_v01uwy5min.csv	Ditto 10 second data	5 minutes
ss2010_v01pdr10.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

Processed by: A Sarraf , CSIRO Marine and Atmospheric Research, Hobart, Tasmania, Australia