data summary

Southern Surveyor Voyage ss2010_v08

CSIRO

MARINE NATIONAL FACILITY

## *Table of Contents*

# ***ss2010_v08***

## ***Title***

"Krill in 3D – Vertical stratification and spatial distribution of krill communities in the East Australian Current."

## ***Principal Investigators***

Dr. Matt Taylor – Sydney Institute of Marine Science
c/o School of B.E.E.S., University of NSW, UNSW SYDNEY, New South Wales 2052
**Phone:** (02) 9385 2079 **Fax:** (02) 9385 1558 **Email:** mattytaylor@unsw.edu.au

Prof. Iain Suthers – Sydney Institute of Marine Science
c/o School of B.E.E.S., University of NSW, UNSW SYDNEY, New South Wales 2052
**Phone:** (02) 9385 2065 **Fax:** (02) 9385 1558 **Email:** i.suthers@unsw.edu.au

## ***Ports***

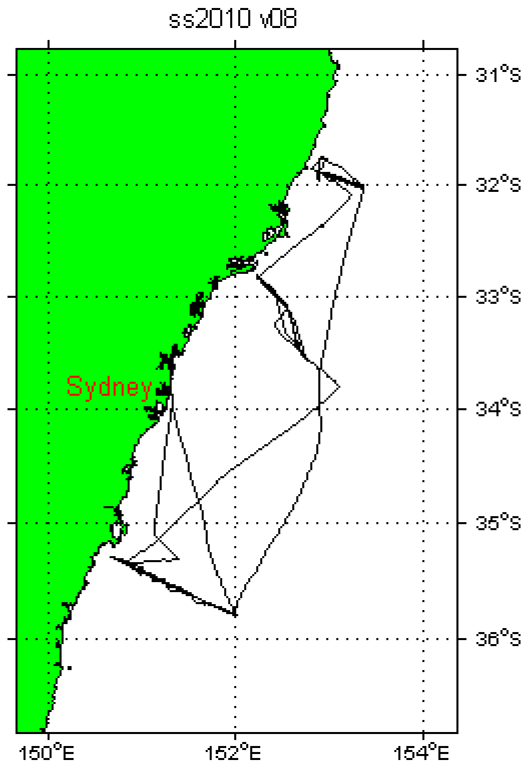
Original schedule:

Depart Sydney 1600, Wednesday 22 September, 2010
Arrive Sydney 1100, Tuesday 5 October, 2010

## ***Date***

22-Sep-2010 06:00 to 04-Oct-2010 23:33 (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 19 Mar 2011 by running a Java application, written by Lindsay Pender of CMAR, UwyMerger version 1.3 with data time range of 22-Sep-2010 06:00 to 04-Oct-2010 23:33 (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 discrepancies between the port and starboard air temperature sensors were noted (max differences of about 1.6 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 7.67 %) 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 1.31%). 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 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) when available, was notably higher than the readings from 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. Moreover, 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 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 Sonar Data's Echoview software. Due to incorrect setting on the sounders occasionally there were no echograms and depth data available. The period between 3/10/2010 15:14 to 23:4 and 04-Oct-2010 08:49 to 09:32) for which depth echograms were not recorded were QCed using the swath centre beam depth data.

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_v08010Ctd (i.e. CTD offset and scale factor of `-0.000583134284588863, 0.999910551360231`). This data was then used to derive the TSG salinity calibration against the calibrated CTD data. Using CTD/TSG calibration run in CTD ss2010_v08001Ctd.nc and ss2010_v08042Ctd.nc with a TSG conductivity lag of 32 seconds, an averaged salinity scaling factor of `0.999671857091514` was calculated for the CTD primary conductivity cell. This scaling factor was applied to the TSG salinity data and the thermosalingraph salinity QC was set to {'good' ,'manually adjusted','no error'}.

Due to a bad connection on TSG input pipe, air bubbles were introduced to the water intake. This resulted in very spiky data during the initial part of the voyage until the problem was rectified. These spikes have been taken out manually and set to NaN with the QG flags set to {'bad','none','operatorFlagged'}. The major anomalous period taken out are approximately

```
22-Sep-2010 07:58:55 to 22-Sep-2010 08:06:25
22-Sep-2010 09:35:10 to 22-Sep-2010 09:54:15
```

```
22-Sep-2010 10:02:10 to 22-Sep-2010 10:05:25
22-Sep-2010 11:21:25 to 22-Sep-2010 11:29:35
22-Sep-2010 12:26:10 to 22-Sep-2010 12:44:35
22-Sep-2010 12:48:50 to 22-Sep-2010 12:50:30
22-Sep-2010 13:18:05 to 22-Sep-2010 13:37:50
22-Sep-2010 14:05:05 to 22-Sep-2010 14:43:35
22-Sep-2010 14:50:30 to 22-Sep-2010 19:17:25
22-Sep-2010 19:22:40 to 22-Sep-2010 19:26:15
```

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_v08uwy10.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_v08uwy5min.csv | Ditto 10 second data | 5 minutes |
| ss2010_v08pdr10.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