data summary

Southern Surveyor Voyage ss2009_v05

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Table of Contents

ss2009_v05

Title

Salps, eddies and entrainment in the Stockton Bight
Returning to the eddy dynamics at the East Australian Current separation zone, to assess the effects of salps, eddy size and its source waters.

Principal Investigators

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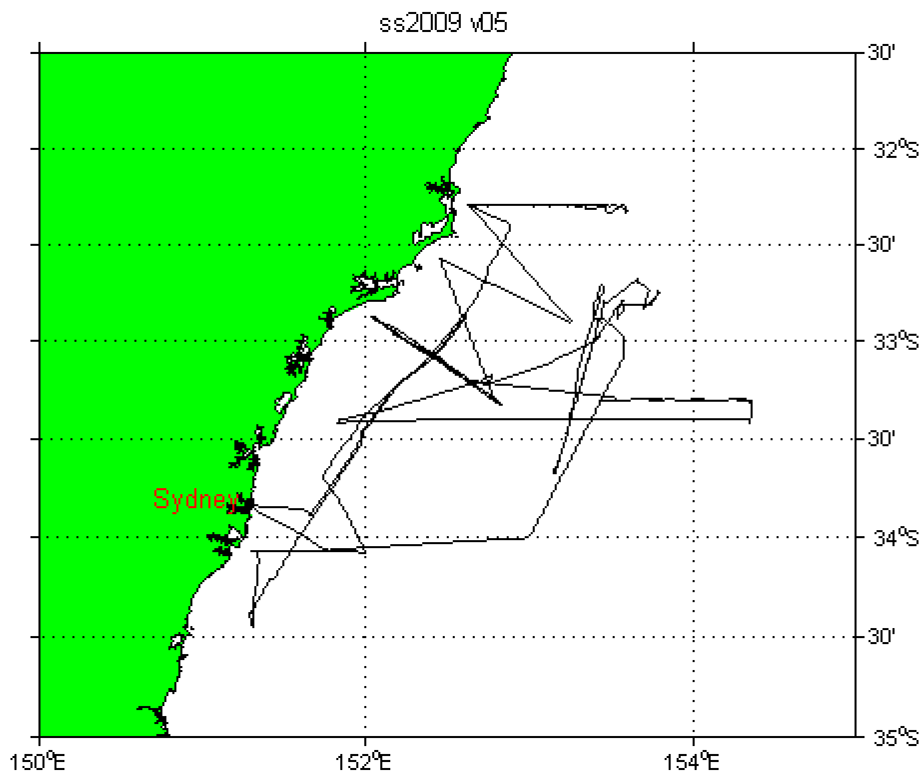
Ports

Original schedule:
Depart Sydney 1600hrs, Friday 16 October,
2009 Arrive Sydney 0800hrs, Tuesday 27 October,

Date

16-Oct-2009 05:05:45 to 26-Oct-2009 22:10:55 (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 30 June 2010 by running a Java application, written by Lindsay Pender of CMAR, uwyLogger version 7.11 with data time range of 16-Oct-2009 05:05:45 to 26-Oct-2009 22:10:55 (UTC).

Completeness and Data Quality

Navigation data (latitude and longitude, speed over ground); meteorological data (port and starboard air temperature, port and starboard humidity, wind speed, maximum wind gust, light, atmospheric pressure, uncorrected wind speed) and IMOS data (port and starboard radiometers, port and starboard pyranometers, derived wind speed, derived maximum wind gust, rain and rainrate, uncorrected wind speed), 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 1-2 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.
The result of the variation between the port and starboard temperature sensor causes the derived air temperature (as calculated by underway logger whereby it uses the sensor data output from the opposite side to the prevailing wind direction, e.g. using port sensor when the relative wind is on the starboard and vice versa) to alternate between the port and starboard air temperature values depending on the relative wind direction (i.e. wind direction alternating between the port and starboard bow of the ship). This has resulted in regular spikes (noise) in

the derived air temperature during these periods which is misleading. For this reason, it has been decided to include both port and starboard air temperature in the CSV output files. The derived air temperature is no longer provided due to the undesirable introduced noise by the derivation process under the described circumstances above.

A similar but less exaggerated discrepancy (around 5%) between the port and starboard humidity sensor was observed and similarly it was decided to include both port and starboard humidity in the CSV output files. Similar to the air temperature, the derived humidity is no longer provided due to the introduced noise.

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).

Similarly, a number of rapid temperature decreases were noted for both port and starboard temperature sensors. Correlation with other sensor values seem to indicate that these mainly coincided with period of rain falls as noted above.

All recorded port and starboard air temperature values have been left in the data set. Periods of rapid changes are suspect for reasons highlighted above, otherwise the data is good.

The wind speed had a large 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 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 rectified and set to NaN with their QG flags set to {'bad','none','operatorFlagged'}. However due to the numerous 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 directional interpolation algorithms for windDir, uncorrWindDir, IMOSWindDir, IMOSMaxWindGustDir, IMOSUncorrWindDir, shipHeading, courseOG
is suspect whereby when the direction oscillates around 0 and 360 degrees the interpolated value is incorrect (e.g. the interpolated value between 0.5 and 359.5 could be calculated as 180). The data is otherwise good. However, the windDirQC, uncorrWindDirQC,

IMOSWindDirQC, IMOSMaxWindGustDirQC, IMOSUncorrWindDirQC, shipHeadingQC, courseOGQC QC flags have been left in their original state of {‘noQC’,’none’,’preliminary’}.

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 averaged using figures obtained from voyage 1 (file: ss200901_ss200901128CTD.nc) and ss2009_v05 CTD processing report (first 15 deployments) by Lindsay Pender and a scaling factor of 0.99984 was calculated and applied to the CTD data. This data was then used to calibrate the TSG against the (calibrated) CTD data where an averaged scale factor of 1.000270112023760 was calculated (using CTD/TSG calibration CTD deployment 2 and 45 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’}.

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**
ss200901uwy10.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, IMOSMaxWindGust, IMOSMaxWindGustQC, IMOSMaxWindGustDir, MOSMaxWindGustDirQC, IMOSUncorrWindSpeed,MOSUncorrWindSpeedQC, IMOSUncorrWindDir,IMOSUncorrWindDirQC	10 seconds
ss200901uwy5min.csv	Ditto 10 second data	5 minutes
ss200901pdr10.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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