data summary

Southern Surveyor Voyage ss2009_v03

CSIRO

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Title

Hot Subduction – recycling of oceanic crust in a dynamic W Pacific setting Part 3.

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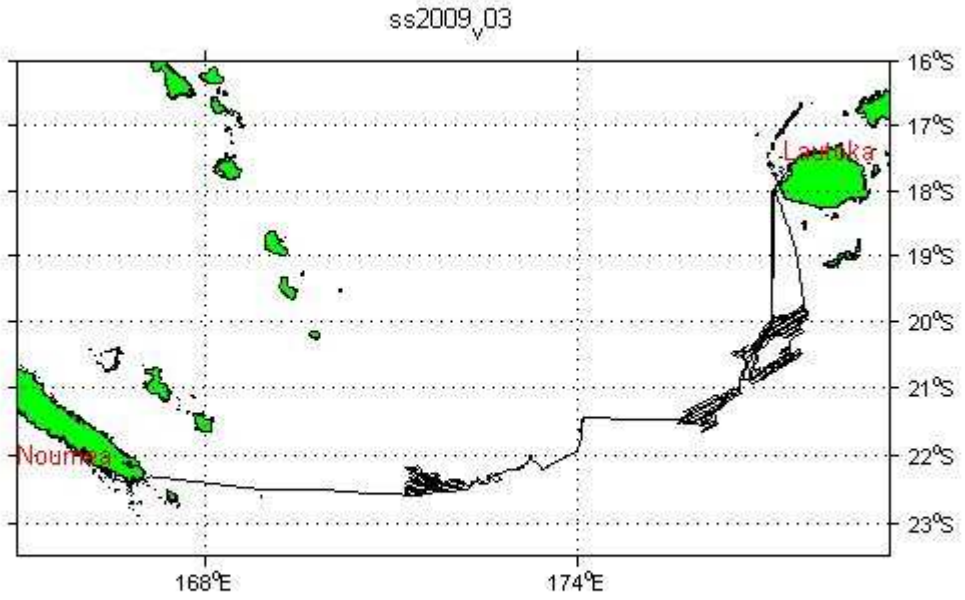
Ports

Original schedule:
Depart Lautoka, Fiji, 1600hrs Friday 3 July, 2009
Arrive Noumea, New Caledonia, 0800hrs Monday 27 July, 2009

Date

03-Jul-2009 04:01:05 to 26-Jul-2009 21:05:45 (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 17 June 2010 by running a Java application, written by Lindsay Pender of CMAR, uwyLogger version 7.11 with data time range of 03-Jul-2009 04:01:05 to 26-Jul-2009 21:05:45 (UTC).

Completeness and Data Quality

Navigation data (latitude and longitude, speed over ground); meteorological data (port and starboard air temperature, 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

The starboard humidity sensor calibration is suspect. Therefore the port humidity sensor data was used only to represent humidity. The humidity data was then flagged as {'good', 'none', 'none'}.

The ship had to returne to Latouka to Medivac the 2nd cook and to pick-up a replacement cook. The ship was in port at Latouka between around 07-Jul-2009 01:55:55 and 07-Jul-2009 21:37:45 UTC. During this period TSG salinity and water temperature, speedOG and course OG and shipHeading value were set to NaN with their QG flags set to {'bad','none','operatorFlagged'}; all other data were left in and their QCflags set appropriately.

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 not provided because of the uncertainty about which sensor is giving the correct out put. Furthermore, the introduced noise in the derived air temperature data, under the described circumstances, is not desirable.

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 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). Therefore 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 voyage 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.

There were no CTD/TSG calibration data available for this voyage. Therefore the calibration factor of 0.999748856709685 from the next voyage (ss2009_t02) was used along with a lag of 32 seconds and applied to the TSG data. The thermosalingraph salinity QC was set to {‘good’, ‘manually adjusted’, ‘no error’}.

Between 07-Jul-2009 01:53:20 and 07-Jul-2009 22:45:30 there is no water temperature or thermosalingraph salinity values as the TSG pump was turned off during the port period. The TSG salinity and water temp data during this period have been set to NaN and their QC flags set to {'bad','none','operatorFlagged'}.

Between 18-Jul-2009 15:43:40 and 21-Jul-2009 18:42:45 there is no water temperature or thermosalingraph salinity data. According to the DAP report the thermosalinograph data stream to fdcs was interrupted while an outage with Annex5 was resolved.

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, humidity, humidityQC, 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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