data summary

Southern Surveyor Voyage ss2011_v05

CSIRO

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ss2011_v05

Title

“ The influence of natural hydrocarbon migration and seepage on the geological and biological systems of the offshore northern Perth Basin.”

Principal Investigators

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Ports

Schedule (UTC):

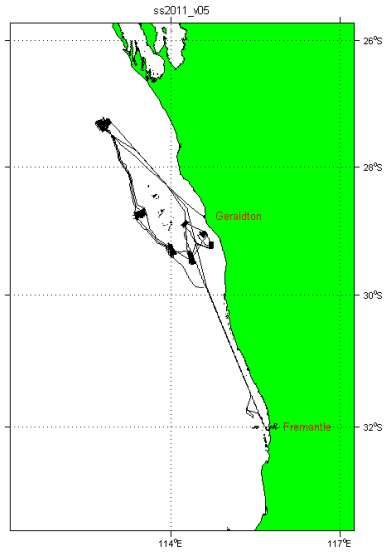
[LEG 1]
Depart Geraldton 21-Sep-2011 07:00
Arrive Fremantle 02-Oct-2011 22:48 mobilise ROV and crew change

[LEG 2]
Depart Fremantle 05-Oct-2011 10:00
Arrive Fremantle 17-Oct-2011 23:00

Date

From 21-Sep-2011 07:02 to 17-Oct-2011 23:02 (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 6-Mar-2012 by running a Java application, written by Lindsay Pender of CMAR, UwyMerger version 1.3 with data time range of From 21-Sep-2011 07:02 to 17-Oct-2011 23:02 (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.

Overview

The GA natural hydrocarbon seepage voyage, with PI Andrew Jones comprised two legs. The first leg departed Geraldton 21 September 2011, later than planned because the port was closed due to exposure to the prevailing swell.
The mobilization for the second leg of the voyage started in Fremantle 2 October 2011 rather than in Geraldton as planned. There were delays with commissioning the Dutch ROV winch. The ship departed Fremantle 10:00UTC, 5 October 2011 and arrived in Fremantle 23:00UTC, 17 October 2011.

Processing Comments

A number of minor discrepancies between the port and starboard air temperature sensors were noted (max differences of about 1.3 degrees, otherwise both sensors gave very close reading with the mean absolute difference of about 0.03 degrees). 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 5.6%) between the port and starboard humidity sensors was observed. It should also be noted that the starboard humidity sensor appears to consistently give a higher humidity reading with the mean absolute difference of about 0.89%. The recorded values appear to be within instrument tolerance.

A number of rapid temperature changes were noted (e.g. rise or drops of 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 port AirTemp and Humidity sensor recorded incorrect constant values from 08-Oct-2011 13:02:30 to 17-Oct-2011 06:03:30. This happened after a ship engine outage (see DAP report for further detail) and is likely caused due to a fault in the sensor not sending data after a power outage and a fault in TECHSAS for continuing to record its last good value. Therefore the port AirTemp and Humidity data for this period was set to NaNs and the QG flags set to {'bad','none','operatorFlagged'}.

During the voyage there were a number of metstation PC crashes. This has resulted in a few minor gaps in the data which have been QCed with appropriate QC flags.

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 wind speed had a number of 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 readings from the foremast sensor (which is an optical type) was inconsistent with the foremast funnel/siphoning type rain sensor. A software fault was discovered and fixed in the metsation siphoning rain gauge around March 2012. Therefore, the siphoning type rain sensor data QC flags have been marked as suspect for periods that there is no corresponding optical IMOSRain data. The siphoning rain data has been left in the data, its QC flag is set to {'suspect','none','operatorFlagged'}.

Where both rain gauges recorded rain values, it was noted that the optical rain gauge values were usually notably higher than the funnel/siphoning 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 therefore 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. (Note: The reverse of this situation has also been observed on some voyages whereby during periods of relative calmness (i.e. low wind and slow/stationary ship) the funnel/siphoning sensor shows notably higher rain than the optical sensor. However this was not the case on this voyage).

It was noted that IMOS starboard Radiometer recordings were mostly about 1.97 (W/m^2) greater than the port Radiometer recordings throughout the voyage.

The depth data was re-picked using Myriax Echoview software.
A small amount of depth data wasn't recorded for an unknown reason.
The periods without QCed depth data are listed below:
08-Oct-2011 12:18:05 to 08-Oct-2011 13:02:45
08-Oct-2011 00:01:35 to 08-Oct-2011 00:06:30

The ship was in port between 02-Oct-2011 22:48:05 and 05-Oct-2011 09:57:35 for the leg1 and leg 2 change over. During this period all sensors continued to record data. With the exception of the TSG data (i.e. salinity, sensorTemp and waterTemp) which have been NaNed due to the fact that the TSG pump was turned off during the port visit, all other sensor data have been QCed as usual and are good.

The TSG flow between 02-Oct-2011 22:00:00 to 05-Oct-2011 13:22:50 (leg1 and leg 2 changeover) and again 08-Oct-2011 12:18:20 to 08-Oct-2011 13:39:45 was zero therefore waterTemp and TSG sensorTemp and salinity have been set to NaNs during these periods with their QG flags set to {'bad','none','operatorFlagged'}.

No hydro-chemists were on board during this voyage and hence no water samples were taken for CTD calibration purposes and hence the TSG calibration. Therefore the TSG calibration factor from the previous voyage, ss2011_v04, was used.
Hence the scaling factor of 0.999778542392324 along with the lag of 32 seconds (Ref. ss2011_v04 processing report) was applied to the TSG salinity data and the thermosalingraph salinity QC was set to {'good' ,'manually adjusted','no error'}.

Note: All 2011 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
ss2011_v05uwy10.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
ss2011_v05uwy5min.csv	Ditto 10 second data	5 minutes
ss2011_v05pdr10.csv	latitude, latitudeQC, longitude, longitudeQC, waterDepth, waterDepthQC	10 seconds

References

Subversion repository version of DPG Matlab generic tools 3427
Pender, L., 2000. Data Quality Control flags.
http://www.marine.csiro.au/datacentre/ext_docs/DataQualityControlFlags. Pdf

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