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**FACILITY 10: eMarine Information Infrastructure (eMII)**

# **NORTEK ADCP DATA ERRORS**

**September 19th 2011**

**REPORT ON ISSUE AND ACTIONS**

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# 1 - A PROBLEM WITH NORTEK ADCP DATA DELIVERED TO EMII

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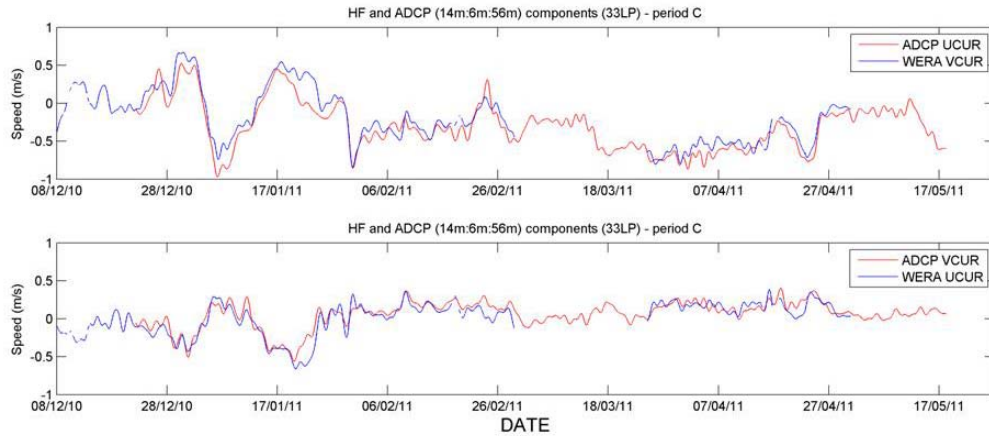
## 1.1 - Description of the error

IMOS data are submitted by IMOS facilities to eMII, the data management facility for the Integrated Marine Observing System. The ANMN facility provides data collected using a number of instruments including Nortek ADCPs which are deployed on moorings in Western Australia and Queensland. On 8<sup>th</sup> September 2011, Dr Charitha Pattiaratchi of WA-IMOS notified the IMOS office and eMII of errors in the ADCP data that had been provided to eMII by the WA moorings group. The problems identified were:

1. For two 200m moorings (Rottnest Canyon and Two Rocks, collected using Nortek instruments) the current directions had been switched, i.e. the data indicate EW currents when they are actually NS currents (e.g. Figure 1)
2. ADCP data from the 500m mooring at Two Rocks (collected using an RDI instrument) showed correct components
3. The error appeared to be due to the type of instrument used, with components in the RDI instrument correct whilst those in Nortek instruments were switched
4. There appears a discrepancy between time stamps on the ADCP's and HF radar data collected in the same location and for the same time period. The time stamp discrepancy is only present for some ADCP deployments and could be a time zone issue. This issue is not addressed in this document and needs to be the subject of further investigation.

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Two Rocks (200 m):  
HF Radar vs **ADCP (currents components switched)**



**Figure 1. Plot of corrected (switched UCUR and VCUR components) data from the Two Rocks 200m mooring ADCP for the time period 8 December to 17 May 2011. (Image supplied by Hrvoje Mihanovic and Charitha Pattiaratchi).**

## 2 - IDENTIFYING AND CORRECTING THE SOURCE OF ERROR

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Most, if not all, data supplied to eMII by the ANMN facility has been processed using the IMOS Matlab toolbox, originally built by Paul McCarthy to facilitate conversion of raw instrument output files to NetCDF files that comply with the IMOS NetCDF convention. There is a separate parser to reading the data from each instrument.

### 2.1 - Errors in Matlab toolbox parsers for Nortek instruments

Nortek parsers in the IMOS Matlab toolbox were checked against the most recent release of Nortek system documentation (system-integrator-manual-june-2011.pdf). It appears that the switching-error originates in the toolbox.

#### *2.1.1 - Nortek Instrument data affected by the error*

U and V components of the current were switched for these Nortek instruments:

- 
- Continental
  - Aquadopp Profiler
  - AWAC

These Nortek instruments are used to obtain data in WA, QLD and SA as follows:

- WA – Continental and Aquadopp profiler ADCPs (processed by Mark Snell)
- QLD – AWAC, Continental and Aquadopp profiler ADCPs (processed by Paul Rigby)
- SA – Aquadopp profiler ADCPs (processed by Lee-Ying Wu)

## 2.2 - Corrections made to Matlab toolbox code

Corrections have been made to the Nortek parsers for the next release of the Matlab Toolbox (anticipated at the end of September 2011).

# 3 - ACTIONS TAKEN TO REMOVE BAD DATA

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## 3.1 - ANMN Nortek ADCP data moved to archive

### *3.1.1 -Erroneous WA files removed from public view*

Staff at eMII moved files from the Two Rocks 200m and Canyon 200m OPeNDAP directories to an archive directory, see below. The following files were moved to:

[https://df.arcs.org.au/ARCS/projects/IMOS/archive/ANMN/WA/Bad\\_Nortek\\_ADCP\\_data](https://df.arcs.org.au/ARCS/projects/IMOS/archive/ANMN/WA/Bad_Nortek_ADCP_data)

From <http://opendap-vpac.arcs.org.au/thredds/catalog/IMOS/ANMN/WA/WACA20/catalog.html>

- IMOS\_ANMN-WA\_RVATE\_20100122T014000Z\_WACA20\_FV00\_PCY205-Jan2010-Continental-205\_END-20100531T024500Z\_C-20100602T172853Z.nc 34.68 Mbytes 2010-07-02 22:01:02Z
- IMOS\_ANMN-WA\_RVATE\_20100723T031000Z\_WACA20\_FV00\_PCY205-Jul2010-Continental-205\_END-20110128T033000Z\_C-20110202T175530Z.nc 39.07 Mbytes 2011-09-07 00:58:46Z

From <http://opendap-vpac.arcs.org.au/thredds/catalog/IMOS/ANMN/WA/WATR20/catalog.html>

- IMOS\_ANMN-WA\_RVATE\_20090713T091500Z\_WATR20\_FV00\_TR205-Jul2009-Continental-195\_END-20091124T041000Z\_C-20100114T133429Z.nc 309.8 Kbytes 2011-05-15 17:50:26Z
- IMOS\_ANMN-WA\_RVATE\_20100409T080000Z\_WATR20\_FV00\_TR205-Apr2010-Continental-195\_END-20101026T044000Z\_C-20101028T103411Z.nc 2.870 Mbytes 2010-10-28 13:51:03Z
- IMOS\_ANMN-WA\_RVATE\_20101222T080000Z\_WATR20\_FV00\_TR205-Dec2010-Continental-210\_END-20110518T051500Z\_C-20110519T161417Z.nc 35.84 Mbytes 2011-05-19 09:26:53Z

### *3.1.2 -Other IMOS data files containing the same error identified, and removed from public view*

All remaining Nortek ADCP data files were identified and moved from the public OPeNDAP directory to archive. They were all from QLD. No ADCP files from SA were present. The following files were moved to:

[https://df.arcs.org.au/ARCS/projects/IMOS/archive/ANMN/QLD/Bad\\_Nortek\\_ADCP\\_data](https://df.arcs.org.au/ARCS/projects/IMOS/archive/ANMN/QLD/Bad_Nortek_ADCP_data)

From <https://df.arcs.org.au/ARCS/projects/IMOS/opendap/ANMN/QLD/GBRELR/>:

- IMOS\_ANMN-QLD\_VATPE\_20080505T050000Z\_GBROOS-GBRELR-0805\_FV01\_Continental-6121-106.7\_END-20081023T220000Z\_C-20100127T153806Z.nc
- IMOS\_ANMN-QLD\_VATPE\_20081024T083000Z\_GBROOS-GBRELR-0810\_FV01\_Continental-6121-105.3\_END-20090418T214300Z\_C-20100120T154310Z.nc
- IMOS\_ANMN-QLD\_VATPE\_20090419T083000Z\_GBROOS-GBRELR-0904\_FV01\_Continental-6121\_END-20091019T234500Z\_C-20100121T102558Z.nc
- IMOS\_ANMN-QLD\_VATE\_20091020T020000Z\_GBROOS\_GBRELR\_0910\_FV01\_Continental-6114\_END-20100416T213700Z\_C-20110531T112038Z.nc

From <https://df.arcs.org.au/ARCS/projects/IMOS/opendap/ANMN/QLD/GBRHIS/>:

- IMOS\_ANMN-QLD\_VATPE\_20080511T053000Z\_GBROOS-GBRHIS-0805\_FV01\_AWAC-WPR-5130-10.4\_END-20081027T044100Z\_C-20100127T152709Z.nc
- IMOS\_ANMN-QLD\_VATPE\_20090425T050000Z\_GBROOS-GBRHIS-0904\_FV01\_AWAC-5130-9.7\_END-20091010T000500Z\_C-20100121T103849Z.nc

From <https://df.arcs.org.au/ARCS/projects/IMOS/opendap/ANMN/QLD/GBRLSH/>:

- IMOS\_ANMN-QLD\_VATPE\_20090603T040000Z\_GBROOS-GBRLSH-0906\_FV01\_AWAC-5492-28.4\_END-20091111T213000Z\_C-20100222T161216Z.nc
- IMOS\_ANMN-QLD\_VATE\_20091113T231100Z\_GBROOS\_GBRLSH\_0911\_FV01\_AWAC-5492\_END-20100606T223000Z\_C-20110608T092501Z.nc

From <https://df.arcs.org.au/ARCS/projects/IMOS/opendap/ANMN/QLD/GBRLSL/>:

- IMOS\_ANMN-QLD\_VATPE\_20071103T110000Z\_GBROOS-GBRLSL-0710\_FV01\_Continental-6120-204.2\_END-20080613T132900Z\_C-20100129T162759Z.nc

- IMOS\_ANMN-QLD\_VATE\_20091115T032500Z\_GBROOS\_GBRLSL\_0911\_FV01\_Continental-6121\_END-20100607T020500Z\_C-20110608T104109Z.nc

From <https://df.arcs.org.au/ARCS/projects/IMOS/opensap/ANMN/QLD/GBRMYR/>:

- IMOS\_ANMN-QLD\_VATPE\_20071030T113000Z\_GBROOS-GBRMYR-0710\_FV01\_Continental-6033-187.7\_END-20080619T081500Z\_C-20100129T162800Z.nc
- IMOS\_ANMN-QLD\_VATPE\_20080619T230000Z\_GBROOS-GBRMYR-0806\_FV01\_Continental-6120-196.2\_END-20081127T062400Z\_C-20100126T174930Z.nc
- IMOS\_ANMN-QLD\_VATPE\_20081128T223000Z\_GBROOS-GBRMYR-0811\_FV01\_Continental-6120-191.5\_END-20090526T203100Z\_C-20100119T133839Z.nc
- IMOS\_ANMN-QLD\_VATPE\_20090606T073000Z\_GBROOS-GBRMYR-0906\_FV01\_Continental-6120-200.2\_END-20091118T054600Z\_C-20100222T161213Z.nc
- IMOS\_ANMN-QLD\_VATE\_20091120T045000Z\_GBROOS\_GBRLSL\_0911\_FV01\_Continental-6120\_END-20100601T040000Z\_C-20110608T102316Z.nc

## 3.2 - Data processors notified

The data processors (Paul Rigby, Mark Snell and Ian Darby) were notified by email about

- The archival of these data files
- The pending release of a new version of the Matlab toolbox without the processing error

Lee-Ying Wu (SA data processor) has been notified that the error is present in the existing toolbox and has been requested to use the next version of the toolbox to process any forthcoming Nortek ADCP data.

## 4 - RECOMMENDATIONS

### 4.1 - Reprocessing of files

Files listed below need to be reprocessed following the next release of the Matlab toolbox (anticipated for end of September 2011), and then uploaded to the IMOS Data Fabric. The data processors (listed in 3.2 - above) have been asked to perform these tasks.

State	Mooring	Deployment	ADCP Type
WA	Perth Canyon 200m	Jan 2010 to May 2010	Continental

WA	Perth Canyon 200m	July 2010 to Jan 2011	Continental
WA	Two Rocks 200m	July 2009 to Nov 2009	Continental
WA	Two Rocks 200m	Apr 2010 to Oct 2010	Continental
WA	Two Rocks 200m	Dec 2010 to May 2011	Continental
QLD	Elusive Reef	May 2008 to Oct 2008	Continental
QLD	Elusive Reef	Oct 2008 to Apr 2009	Continental
QLD	Elusive Reef	Apr 2009 to Oct 2009	Continental
QLD	Elusive Reef	Oct 2009 to Apr 2010	Continental
QLD	Heron Island South	May 2008 to Oct 2008	AWAC
QLD	Heron Island South	Apr 2009 to Oct 2009	AWAC
QLD	Lizard Island Shelf	Jun 2009 to Nov 2009	AWAC
QLD	Lizard Island Shelf	Nov 2009 to Jun 2010	AWAC
QLD	Lizard Island Slope	Nov 2007 to Jun 2008	Continental
QLD	Lizard Island Slope	Nov 2009 to Jun 2010	Continental
QLD	Myrmidon	Oct 2007 to Jun 2008	Continental
QLD	Myrmidon	Jun 2008 to Nov 2008	Continental
QLD	Myrmidon	Nov 2008 to May 2009	Continental
QLD	Myrmidon	Jun 2009 to Nov 2009	Continental
QLD	Myrmidon	Nov 2009 to Jun 2010	Continental

## 4.2 - Improved protocol

IMOS strives to deliver only reliable, quality controlled data. The public release of bad data is a matter of serious concern. Adequate quality control procedures need to be put in place.

### *4.2.1 - Audit of existing IMOS Matlab toolbox parsers*

IMOS should conduct an audit of the IMOS Matlab toolbox parsers to check that all parameters and units are being interpreted correctly from raw data and written correctly to NetCDF formats. For each instrument type:

- A sample raw data file will be provided to the toolbox developer by a nominated ANMN scientist who is familiar with that data type.
- The sample raw data file will be processed using the Matlab toolbox



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- The output NetCDF file will be checked for errors by eMII/the toolbox developer
  - The output NetCDF file will be returned to the scientist and checked for errors

If errors are detected, then:

- eMII will be notified about which file types are affected
- eMII will quarantine the affected data
- Scientists who have provided the affected data will be notified
- The toolbox developer will correct the errors in the toolbox
- Data will be reprocessed using a corrected release of the IMOS Toolbox
- Any known users of the data will be notified

This audit should be performed before the next release of the IMOS Toolbox (if time allows).

#### *4.2.2 -Quality Control of new IMOS Matlab toolbox parsers*

Any new parsers added to the IMOS Matlab toolbox will undergo the same checking procedure as described in 4.2.1.

#### *4.2.3 -Quality Control checks of data before upload to eMII*

Ultimately, scientists in each IMOS facility are responsible for ensuring the quality of data uploaded to eMII. Each ANMN sub-facility should appoint a scientist to perform quality control checks on the data before they are submitted for public release. The scientist will ensure that the data are of a quality that they would be happy to work with and that would pass peer review.