

The BOUSSOLE project technical reports; report #7-12, issue 1.

BOUSSOLE buoy deployment & maintenance log.

October 27, 2009 - April 22, 2010

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BOUSSOLE project

ESA/ESRIN contract N° 17286/03/I-OL

Deliverable from WP#300/100

April 22, 2010

Foreword

This report is part of the technical report series that is being established by the **BOUSSOLE** project.

BOUSSOLE is funded/supported by the following Agencies, Institutions or Programs



European Space Agency



Centre National d'Etudes Spatiales, France



National Aeronautics and Space Administration of the USA



Centre National de la Recherche Scientifique, France



Institut National des Sciences de l'Univers, France



Université Pierre & Marie Curie, France



Observatoire Océanologique de Villefranche sur mer, France

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1. SCOPE OF DOCUMENT

The BOUSSOLE buoy deployment and maintenance log is a record of all events that occur from the deployment to the recovery of one of the two upper sections of the buoy.

The aim is to keep track of all maintenance operations, such as instruments cleaning or rotations, instruments malfunctions, incidents with the buoy structure, if any, biofouling development and so on.

This information is crucial to a subsequent correct interpretation of the data.

Keeping track of these events also allows their analysis in view of the permanent improvement of protocols.

The present report concerns "buoy deployment IX", from October 27 of 2009 to April 22 of 2010.

2. DESCRIPTION OF OPERATIONS

2.1 UPPER SECTION PREPARATION (2009-09)

The buoy System (called system #2) was delivered from Satlantic on September 09th, and installation on the structure begun immediately having the deployment scheduled by the end of September. A first deployment attempt was made on September 30, but it was cancelled since though wave and wind conditions were good, currents didn't allow divers to work properly. Then the deployment had place on 27th October 2009.

The Buoy was equipped with sensors used for the deployment of the buoy VII recovered on April 2008 plus a new PAR sensor. The system was prepared in the CCI local in Villefranche-Sur-Mer and since 22nd September was ready for deployment. Copper sheets and pieces were again fixed wherever possible to avoid biofouling arising. Aluminium plates (3 mm thickness) have again been fixed on the back side to reinforce them. The system was tested for some days running both with solar panel or ground alimentation. The following anomalies were observed:

- high dark values for PAR sensor.
- Bad dark values on OCI#040 Eu 683 nm on OCP sn040

Dark IOPs measurements were also made for dark corrections.





2.2 MOORING DEPLOYMENT

2.2.1 Tuesday 27th October 2009

The upper structure to be deployed was brought to the Rochambeau field at local 06:40am with the help of 6 people from the LOV. The 4 arms were assembled and connected to the buoy, the helicopter left Carros at 09:15am. As usual the go/return trip lasted about one hour. At about 13h the ARGOS messages arrived but only the position was sent and no data were sent. After few hours the dispatch stopped.





At this date, buoy is equipped with

- DACNet #011
- CLC #004
- Junction Box #004
- Rads set: OCI #035_Eu4m, #040_Ed4m, #109_Eu9m, #047_Ed9m #095_Es, OCR #035_Lu4m and #038_Lu9m), MVDS #053, OCP #040(4m) and OCP 041(9m)
- Hyper spectral units HOCR #241_Lu4m, #242_Lu9m, #279_Es, STOR-X #032 and Bio-shutters #085_Lu4m and #086_Lu9m.
- HS4 #H4070403
- No Strain-100
- Transmissometers C-Star #1057-PR (4m) and #1058-PR(9m)
- ECOFLNTUs #726 (4m) and #727 (9m)
- ARGOS beacon #18797 (prog id#26021)
- CTD #37SI 46113-5325
- No Strain gauge
- PAR #097

The lower part of the buoy is still equipped with the emergency ARGOS beacon #5433 (prog. id. #12237).

2.2.2 Sunday 01th November 2009

A private boat was rent at Bordighera port to go at the Boussole site. A diver was onboard (a second one didn't come).

The diver found one of the two Bioshutter and the two ECO-FLNTU shutters in the open position. First I tried 3 times to connect to the buoy through CISCO using the AK connector, unsuccessfully.

Then the buoy was switched off and the DACNET dismantled.

I tried a first direct connection on the DACNET (again using the AK connector). The current on the alimentation display showed the disk booted but I got no connection. A second attempt was successful.

Telemetry files were only recorded on October 27th to 29th.

Few data were recorded on 27th and 28th on OCPs, MVD, CTD and HS.

Nodeman files show irregular timings for booting, but they are mainly concentrated in the daytime.

Telsrc files were in some cases (AB-AC-AD-AE) recorded only on 27th and 28th, in other cases on 29th too (AF-AG-AH-AI-AJ-AO). Most of these files contain just strange characters or only some comprehensible parts of a string. I then exchanged the microdrive with a spare, I've got a connection and I've uploaded the good

configuration file. The DACNET was then re-installed on the buoy and system switched on.

I've tried again to connect to the system through CISCO (AK connector) several times unsuccessfully.

Diver also observed the system several times during theoretical measurements periods and nothing was observed (and all shutter stayed in their position). All the alimentation cable connectors (J/BOX-CLC; CLC-Battery; CLC-DACNET) were found in good conditions.

Voltage from J/BOX was about 19.8 V.

Further consideration will get to the conclusion (then verified) that the problems resides in the Battery magnetic switch changed its orientation.

2.2.3 Thursday and Saturday 12th and 14th November 2009

These days are part of the BOUSSOLE#92 mission. When arrived on site, divers went at sea to change the buoy battery#2 with the battery recovered from the buoy system#1. During the diving, buoy optical sensors were also cleaned and the hydrophone was taken off. After the diving, an attempt of CISCO connection with the buoy failed. A second attempt of CISCO connection also failed. Then 5 direct connections were attempted using the AK connector, but no connection was got. CISCO connectors were also cleaned.

On the 14th divers went at sea to take off the buoy Dacnet. On board, the Dacnet was rebooted through the AK connector but no connection appeared so the micro drive on Dacnet was changed. Then, the Dacnet was rebooted and a direct connection was got. Since the shutdown of the Dacnet from the pc was not completed correctly (there was current on the power supply display) the Dacnet was rebooted and then it shut down correctly from the pc. Then, divers reinstalled the Dacnet on the buoy but nothing happened and the following attempt of CISCO connection with the buoy failed. Finally, the system was shut down and the CLC was taken off for testing in the lab.

2.2.4 Thursday 10th December 2009

These day is part of the BOUSSOLE#93 mission. When at sea, divers dismantled the Dacnet and reinstalled the CLC. On the boat we opened the Dacnet and changed the Microdrive with the new 4GB one. I've then connected to the Dacnet (AK) and verified the node.xml file was the same of the previous one. Dacnet time was also synchronized. (config: laptop--->Dacnet<---12V battery). At sea again, divers reinstalled the Dacnet. Te system was powered. At least one of the Bio-Shutters has been seen to move (in the meantime an ARGOS message was received too). Then at the nominal measure time the divers didn't notice any sign of life. We then tried 2 connections directly on the buoy (AK) unsuccessfully (some intermittent connection on the Network was seen but then stopped). Then I powered directly the Dacnet from the battery and tried other 2 AK connections unsuccessfully). (config: laptop--->CISCO cable<---->Dacnet<---12V battery). At this point the system was switched off again.

Data collected from the Microdrive formerly on the Dacnet (the one originally on the system) showed the system started and stopped

during the first measurement. The .log files had all the .log.lock, maybe it is extension (this means files were still opened for writing before the shutdown).
Instruments were cleaned too.

2.2.5 Tuesday 12th January 2010

This day a private boat (Pava Olto) from ABYSS company in Antibes was rent for going at the Boussole site. Two divers from Mare Nostrum were on board. When at sea divers unplugged the bioshutters at 4 and 9 m, the battery and J/Box were turned on. Some connections, first through CISCO then directly connected on the top of the buoy, were attempted using the AK plug for rebooting the system. No connection was obtained. While connected with the buoy, the icon of the Network on the laptop was noticed to turn on and off.

Packets of data were only sent from the laptop to the network before stopping and nothing was received. The last of these connections was of the order of the minute. At least one of these Network connections was obtained at the nominal buoy wake up time (it was 10h15 UTC) and far from the AK reboots. Then the J/Box and the battery were turned off again, the StoreX was unplugged from the Dacnet (AG plug) and the system was turned on again. Some connections directly connected on the top of the buoy were again attempted using the AK plug for rebooting the system and no connection was obtained. Again the Icon of the Network on the laptop was noticed turning on and off. The battery level measured at the ARGOS beacon was good (13.4 V). The ARGOS beacon was exchanged again. ARGOS messages without data were dispatched.

At this date, buoy is equipped with

- ARGOS beacon #003 (prog id#26021)

2.2.6 Tuesday 13^h January 2010

Surprisingly data were sent from this day. Data were not sent regularly and many of the messages had a bad flag.

2.2.7 Tuesday 01st February 2010

From this day ARGOS message dispatch stopped.

2.2.8 Saturday 13th February 2010

This day is part of the Boussole94 Cruise. When on site, one of the solar panels resulted to be broken. Then divers went at sea to remove the two emergency ARGOS beacon for testing. Both beacons transmitted messages, however only the old one sent location messages. Then optical sensors were cleaned and two Micrel Inclimeters given from the DT-INSU were installed close to the end of the two arms at 9m (see graph in the appendix). The inclinometers were installed for comparison with the tilt from the DACNet, and they are supposed to start working from February 14 at 00h00 UTC.

While divers were at sea two CISCO connections with the buoy were attempted unsuccessfully.

Then divers went again at sea to reinstall the emergency ARGOS beacons and verified during three hypothetical measurements that no sensors were running. Two times divers also attempted to reboot the system (AK connector). No more operations were possible due to difficult working conditions, so a second diving was organized for the next Monday to troubleshoot the buoy.

From divers' pictures one of the inclinometers emplacement was not optimal: it was too high respect the Ed sensor and multispectral radiometers cables were too tightened.

2.2.9 15th February 2010

This day is part of the Boussole94 Cruise. When on site, divers went at sea to dismount the DACNet and well place the inclinometer and cables. When DACNet was on board, three direct connection were attempted (DACNet on a power supply, and AK connector reboot). Current was ok on the alimentation display but no connection was got. So the DACNet was opened and the Microdrive was exchanged. The 3GB disk originally on the buoy was put in place of the new 4GB disk. The fuses on the motherboard were verified to be ok and the 9V battery too. Then a connection with the "new" microdrive was established, the set-up was verified to be correct, and clock set. The first shutdown was not successful so a reboot and a second shutdown were made. The O-ring was cleaned and greased before closing the DACNet. Then DACNet was re-installed on the buoy and the system switched on again. Divers didn't see sensors running, a reboot was also attempted but no sensor worked. The ARGOS beacon on the buoy head was exchanged. CISCO and ARGOS connectors were also cleaned. The solar panel was not exchanged since the broken one was that hosting the MVD.

At this date, buoy is equipped with:

- ARGOS beacon #18797 (prog id#26021)

2.2.10 Tuesday 18th February 2010

From this day ARGOS messages dispatch restarted. In a first moment only location was sent. Then some constant values were intermittently sent.

2.2.11 Tuesday 18th February 2010

From this day, the buoy restarted sending ARGOS messages correctly.

2.2.12 Saturday 06th March 2010

This day is part of the Boussole95 Cruise. When on site divers went at sea for cleaning the sensors and performing dark measurements. In the meantime a connection on the top of the buoy was attempted unsuccessfully. When dark measurements were finished, 3 AK connections were attempted before getting a communication with the

buoy and downloading data. During data transfer the captain asked to go back to the Tethys since a BMS was forecasted to arrive on the zone soon. Data download was nonetheless accomplished, but no other operation was possible.

A verification of the data showed that a problem on the data of the system has occurred. On February 21 the buoy restarted at 1 January 1970, with the following delay on files:

1970-01-01_00-45-00 is 2010-02-21_20-32-00.

A CISCO connection was also attempted unsuccessfully, so the gap on the buoy clock will continue.

2.2.13 Saturday 20th March 2010

From this date ARGOS message stopped.

2.2.14 Tuesday 23th March 2010

This day a private boat, Lollipop, from Darkpelican in Villefranche was rent for going to the Boussole site. At 10h UTC a direct connection on the top of the buoy was attempted through AK.

AT the 2nd attempt we got a connection and downloaded data. The clock was also put on the right time (time gap was saved).

CISCO, ARGOS and MVD were cleaned and grease was put on J/B switch.

A dummy plug was put on the broken solar panel broken and J/B.

Divers then cleaned the sensors and put neoprene covers for dark measurements. (11h10 dark measurements: 11h15-11h30-11h45)

11h15 attempted CISCO connection did not work.

Data were then downloaded with a direct connection (AK). Data were good and the lab confirmed ARGOS message dispatch restarted regularly, and site was left. However the same night ARGOS stopped again.

2.2.15 Friday 02th April 2010

This day is part of the Boussole96 Cruise. Sea state was not optimal, but divers went nonetheless at sea to dismount the Dacnet. While the microdrive was changed and the the Dacnet tested and configured, sea state worsened and remounting the Dacnet was not more feasible.

2.2.16 Tuesday 06th April 2010

This day a private boat, Lollipop, from Darkpelican in Villefranche was rent for going to the Boussole site. The Dacnet was installed on the buoy and several connections from the top of the buoy were attempted through the AK connector. We also attempted more than 1 hour waiting for a regular connection on the top of the buoy unsuccessfully. No data were sent through the ARGOS.

The day after ARGOS dispatch restarted but only constant values were sent. At this point we abandoned the idea to troubleshoot the buoy and anticipate as soon as possible the rotation.

2.2.17 Thursday 22th April 2010

This day the buoy upper structure was dismounted for the rotation with the system #2. The helicopter delivered the buoy at about 09h45. The structure was in good conditions. The buoy was then first

cleaned with Karcher on the Rochembau site and then transported into the CCI local. A test was then run on external power supply at. The 2C-Star, the HS, the 4m Flntu, and the 2 Bioshutters were seen to run. Then the system was powered on Battery and nothing worked. A verification of the power supply indicated low voltage coming out from the CLC (about 2 V) whereas voltage from Battery cable was OK (12.8 V), and from solar panels too. Data collected when the system was well powered, were recorded only for the Tilt, HS, CTD and Flt4, and empty files were recorded for other instruments. Then the buoy was dismantled in the following days. Instruments were shipped for calibration on April 28th, whereas the aluminium structure was sent to the CNB on May 10th.

3. QUANTITATIVE SUMMARY

The deployment lasted 177 days, among which 126 days were without data acquisition! Problems to the system came from: the magnetic switch of the battery, the hyperspectral ensemble and the DACNet microdrive.

4. INSTRUMENT SCHEDULE

1 minute acquisition every 15 minutes. The opening of the shutters are slightly delayed one from the other for avoiding high current demand and possible system shutdown for low voltage.

5. ANY PROBLEMS ENCOUNTERED ?

- 1- The Battery did not power the system after the buoy deployment though it was put on the ON position.
- 2- The buoy started only after disconnecting the Stor-X from the DacNET.
- 3- The ARGOS dispatch stopped frequently.

6. LESSONS LEARNED

- 1- The switch of the battery uses a magnetic contact that may invert its poles after long use. It will hereinafter change at each deployment.
- 2- The hyperspectral ensemble has still problems though the delay in the switch opening. A test of the system in salt water will be asked.
- 3- The ARGOS cable should be changed at each buoy rotation.
- 4- When files with .log.lock extension are created it means that files were still open for writing before the shutdown.

7. ACKNOWLEDGEMENTS

The BOUSSOLE project has been set up thanks to the work of numerous people, and thanks to the support and funding of several Agencies and Institutions. The latter are listed in the foreword of this report. Specifically, the following contracts are acknowledged : the French Space Agency CNES provided funds through the TAOB and TOSCA scientific committees, ESA through ESTEC contract N°14393/00/NL/DC, including CCNs #1, #2 and #3, ESRIN through contract N° 17286/03/I-OL, and NASA through a "Letter of Agreement". Funding has been also obtained from the French CSOA committee and the "Observatoire Océanologique de Villefranche".

The crews and Captains of the following ships are also warmly thanked for their help at sea: the Castor-02 vessel from the Fosevel Marine company (buoy/mooring operations), the INSU R/V Téthys-II and Georges Petit (regular monthly cruises), the GG-IX from the Samar company and the Nika-III (on-demand short operations on site). Pilots and crew members of the Valair and Commerçair helicopter companies are also thanked for their willingness in accomplishing for us unusual survey missions above the BOUSSOLE site. Emmanuel Bosc, Maria Vlachou, Guillaume Lecomte, who have occasionally provided some help in collecting data, are also thanked for their help.

The French institute IFREMER and the Norwegian Marintek company are also thanked for their help and fairness in the engineering studies that were ordered to them after the major failure of the buoy in spring of 2002.

The data that are collected for several years near the BOUSSOLE site by the French weather forecast Agency, "Meteo France", and which are provided in real time on the internet, have been of great help in the day-to-day management of the monthly cruises.

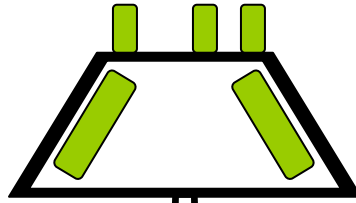
Two companies have largely contributed to the BOUSSOLE project, namely the ACRI-in/Genimar company, Sophia Antipolis, France (buoy conception) and Satlantic Inc., Halifax, NS Canada (buoy centralized acquisition system and radiometers); their help is specifically acknowledged here.

8. APPENDIX

The following page contains the schema of the buoy and the list of the calibration files.

- SATLANTIC
- HOBILABS
- WETLABS
- SEABIRD
- GARROS

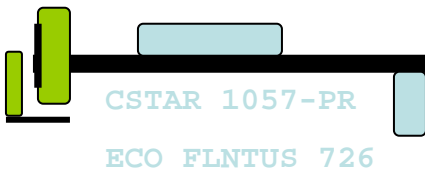
MVD (OCI) 095
 ARGOS 17152 (18797)
 Es (HOI) 279
 Junction Box SJB 004
 MVDS 053
 PAR 097
Feux: 218102
 Solar Panels:
20207182206688



Ed (OCI) 040
 Eu (OCI) 035
 Lu (OCR) 035

Lu (HOCR) 241
 bio shutter 85

OCP 040

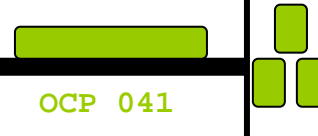
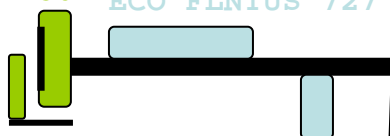


STOR-X 032
 CLC 004
 DACNet (mSM) 011
 Battery ?
 Strain-100 001

Lu (HOCR) 242
 bio shutter 86

CSTAR 1058-PR
 ECO FLNTUS 727

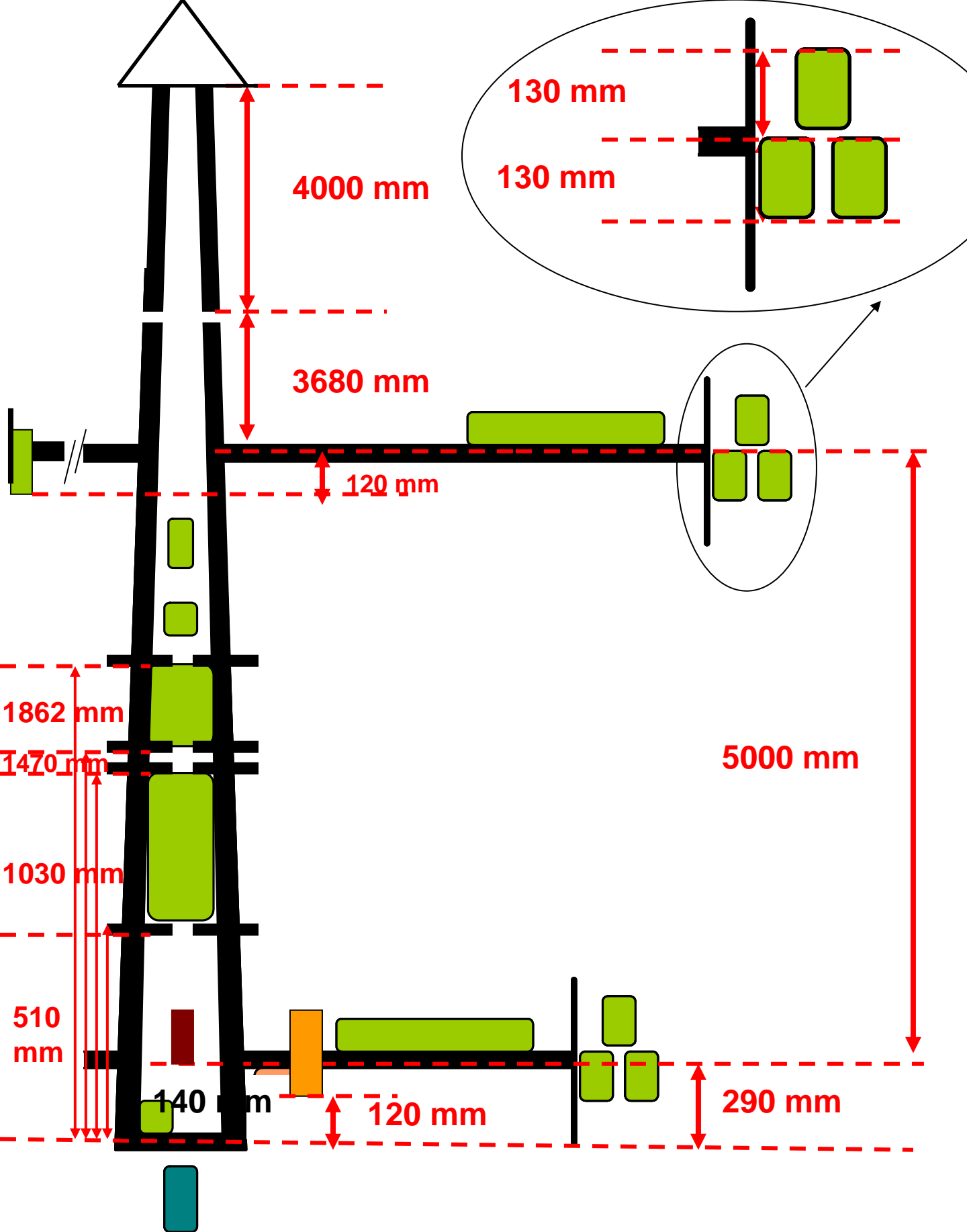
CTD 37SI 46113-5325

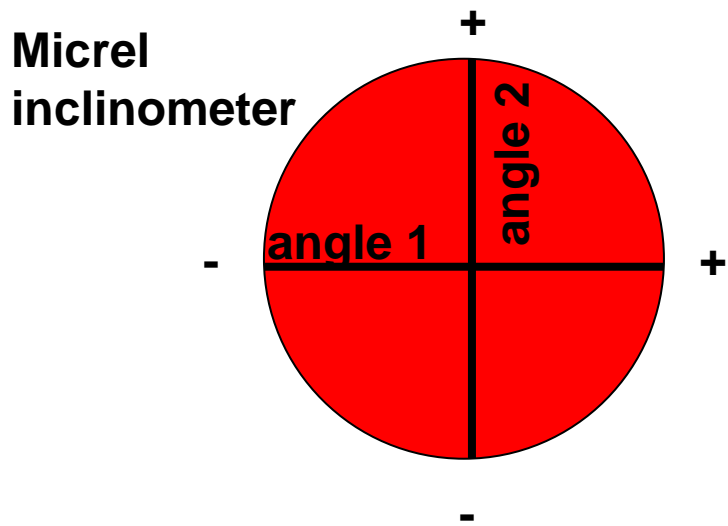
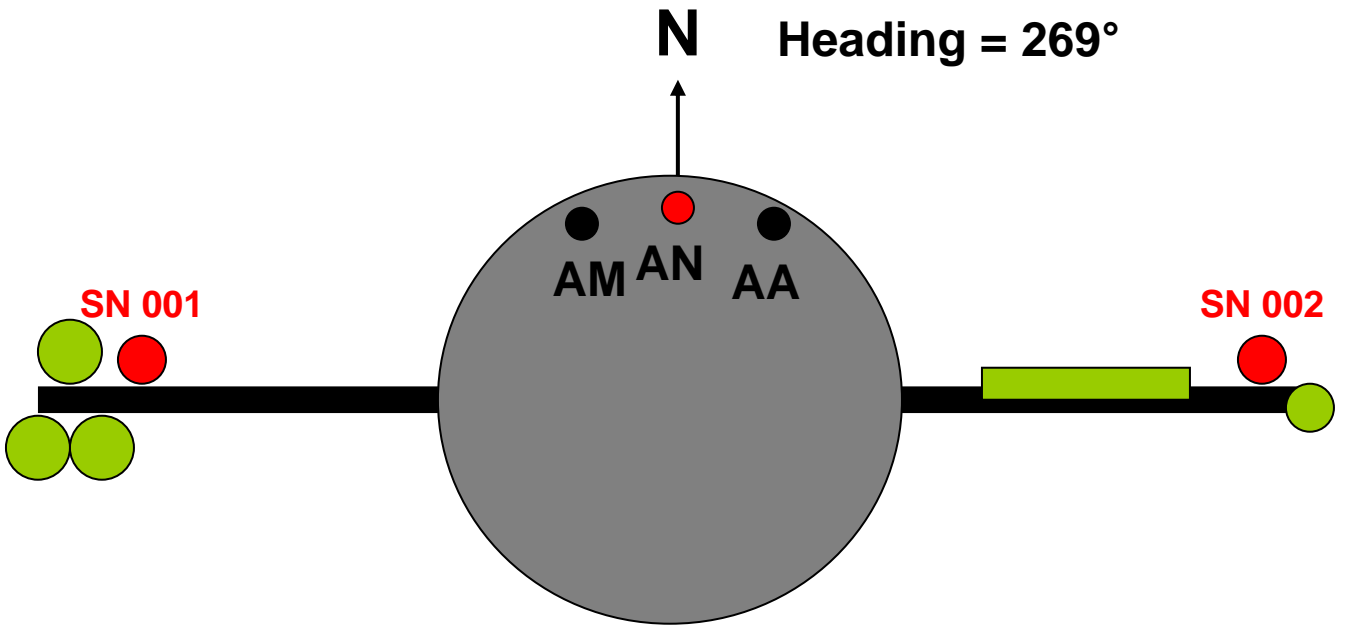


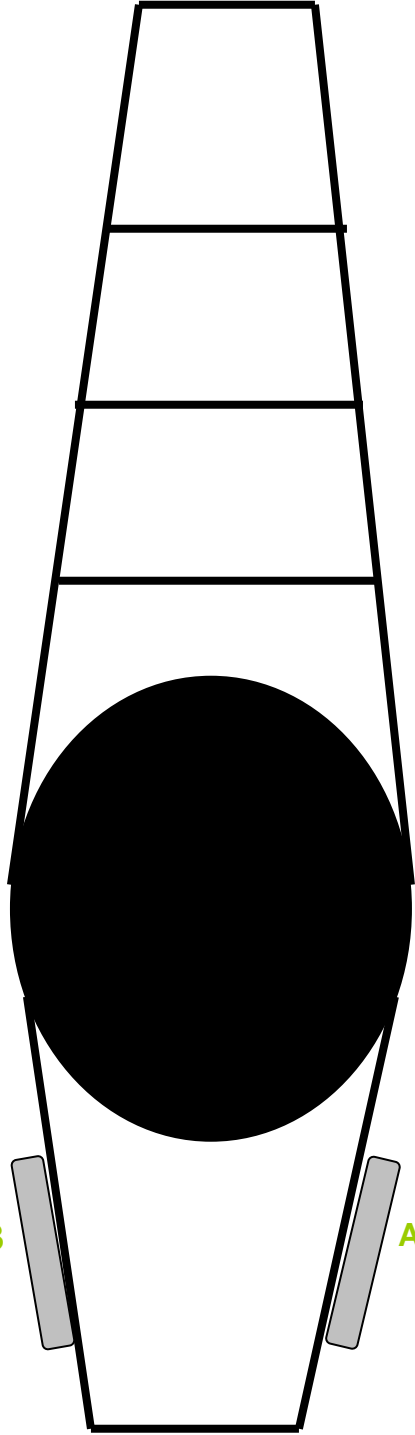
Ed (OCI) 047
 Eu (OCI) 109
 Lu (OCR) 038

HS4 H4070403
 GAROS OML CSCB40K



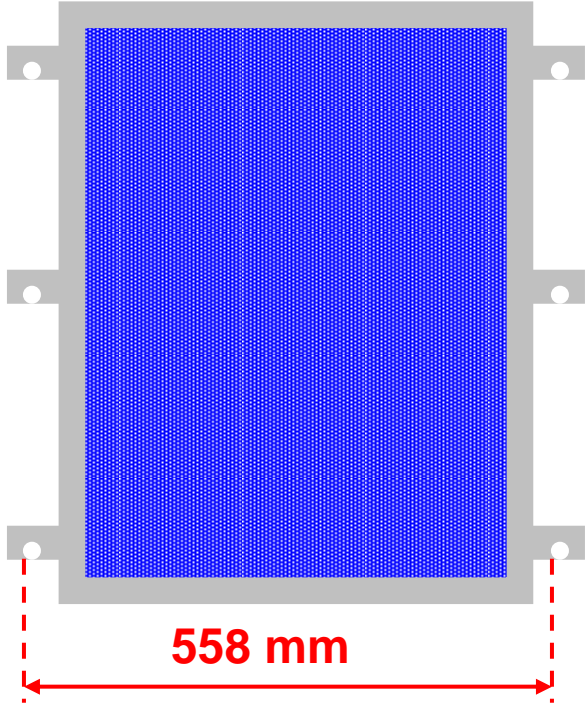






ARGOS 5433

ARGOS 74605



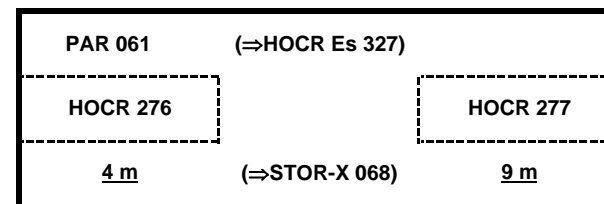
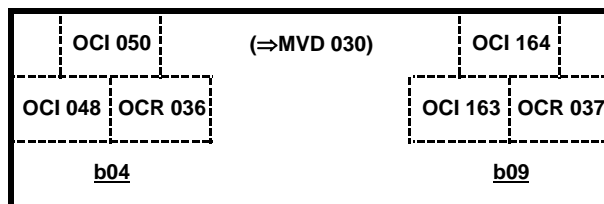
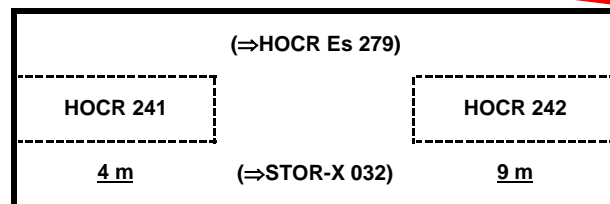
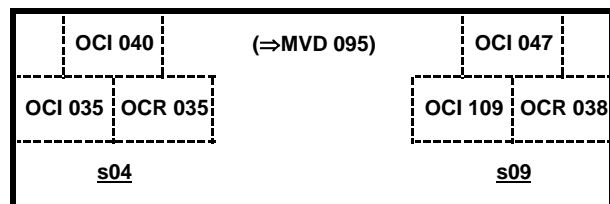
558 mm

2009

2009																
JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER					
5-Jan	19-Feb <small>(only rads cleaning)</small>	2-Mar	14-Mar	15-Apr	04-May	18-May	16-June	30-June	16-July	05-Aug	25-Aug	2-Sep	28-Sep	10-Oct	12-Nov	10-Dec
4 m																
ocp040c_s04_20080623.cal								ocp036h_bis.cal				ocp040e.cal				
tx-meter : CST-1057PR fl-meter : 726_2008-06-23								tx-meter : CST-626PR fl-meter : 608_2009-04-05				CST-1057PR 726_2009-10-27				
HPL241b.cal & PLD241b.cal								HPL276a_new.cal & PLD276a_new.cal				HPL241d & PLD241d.cal				
9 m																
ocp041c_s09_20080623.cal								ocp037h_bis.cal				ocp041e.cal				
tx-meter : CST-1058PR fl-meter : 727_2008-06-23								tx-meter : CST-847PR fl-meter : 609_2009-04-05				CST-1058PR 727_2009-10-27				
HPL242b.cal & PLD242b.cal								HPL277a_new.cal & PLD277a_new.cal				HPL242d & PLD242d.cal				
MVD																
mvd053g.cal								mvd062g.cal				mvd053i.cal				
HED279b.cal & Hse279b.cal								HED327a.cal & Hse327a.cal				HED279d.cal & Hse279d.cal				
H4070403 2008-5-2.cal								H4080705 2008-10-31.cal				H4070403 2009-8-8.cal				
Strain100_001b.cal								Strain100_002b.cal								
SATSTX0032a.cal								SATSTX0068a.cal				SATSTX0032b.cal				

buoy VIII deployment (2009-04-05, vf2)

buoy IX deployment (2009-10-27, vf1)



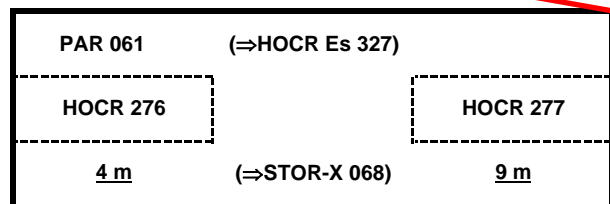
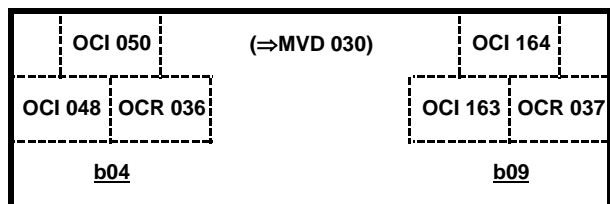
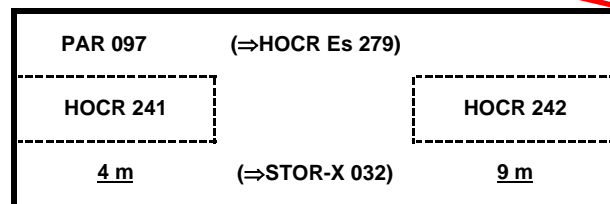
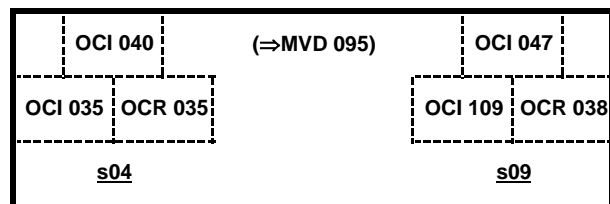
same conf. of start 2009 +
PAR 097

2010

2010																		
JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER							
12-Jan	13-Feb	06-Mar	23-Mar	06-Apr	25-Apr	0-May	21-May	12-Jun	28-Jun	12-Jul	28-Jul	06-Aug	20-Aug	01-Sep	23-Sep	15-Nov	11-Dec	
(only rads cleaning)																		
4 m																		
ocp040e.cal		ocp036j_bis.cal		21 May		ocp040_replaced_036.cal		ocp036l.cal										
CST-1057PR 726_2009-10-27		HPL241d & PLD241d.cal		tx-meter : CST-626PR fl-meter : 608_2010-04-09		HPL276b.cal & PLD276b.cal		CST-1057PR 726_2010-08-25		HPL241e & PLD241e.cal								
9 m																		
ocp041e.cal		ocp037j_bis.cal		ocp041h.cal														
CST-1058PR 727_2009-10-27		HPL242d & PLD242d.cal		tx-meter : CST-847PR fl-meter : 609_2010-04-09		HPL277b.cal & PLD277b.cal		CST-1058PR 727_2010-08-25		HPL242f & PLD242f.cal								
MVD																		
mvd053i.cal		mvd062i.cal		mvd053j.cal														
HED279d.cal & Hse279d.cal		HED327c.cal & Hse327c.cal		HED279e.cal & Hse279e.cal														
H4070403 2009-8-8.cal		H4080705 2009-11-22.cal		H4070403 2010-5-15.cal														
SATSTX0032b.cal		Strain100_002b.cal		Strain100_001b.cal														
		SATSTX0068b.cal		SATSTX0032c.cal														

buoy X deployment (2010-04-22, vf2)

buoy XI deployment (2010-09-04, vf1)



same configuration of buoy IX

