INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

WORLD METEOROLOGICAL ORGANIZATION

DATA BUOY COOPERATION PANEL DBCP-XXIV/Doc. 7.1

(8.IX.2008)

TWENTY-FOURTH SESSION ITEM: 7.1

CAPE TOWN, SOUTH AFRICA 13-16 OCTOBER 2008 **ENGLISH ONLY**

IRIDIUM PILOT PROJECT UPDATE

(Submitted by Ms Hester Viola, DBCP Technical Co-ordinator)

Summary and Purpose of the Document

This document provides information on:

- the DBCP Iridium Pilot Project status and deployments;
- comments on lifetimes;
- coverage across the global ocean for the project to-date; and
- Update on Iridium Processing by CLS.

ACTION PROPOSED

The Panel will review the information contained in this report and comment and make decisions or recommendations, as appropriate. See part A for the details of recommended actions.

Appendices: A. Iridium Pilot Project status and maps as of July 2008;

- B. DBCP Iridium Pilot Project website; and
- C. Iridium Pilot Project daily status files and metadata.

- A - DRAFT TEXT FOR INCLUSION IN THE FINAL REPORT

- 7.1.1 The Technical Co-ordinator (TC) presented the current status of the buoy network within the Iridium Pilot Project: 51 active buoys (out of 75 deployed during the project) as of August 2008. The updates made to the project website were demonstrated, as well as the new automated daily status file (csv file on the JCOMMOPS website) (see Appendix B).
- 7.1.2 The TC thanked the project participants for e-mailing one another to notify deployment information and committed to creating a new notification form for use by the participants for deployment notification and planning. The Iridium Upgrade scheme offered for this pilot project has been very successful and has allowed many buoy operators to test the technology thus far.
- 7.1.3 The Technical Co-ordinator then presented some statistics about lifetimes of project buoys by manufacturer. Some manufacturers were working very actively on improving lifetimes. The TC noted that the data format recommended for the project has been working well for the needs of the project and had not been revised. The Technical Co-ordinator expressed her appreciation to Météo-France for undertaking GTS distribution for the project and ongoing analysis of delays and performance of pilot project buoys.
- 7.1.4 The coverage of the buoys so far was presented in a series of maps showing current positions of the buoys and historical tracks of all buoys in the project (see Appendix A). The coverage is restricted to the Northern Atlantic, Southern Atlantic, Indian Ocean and small regions of the Northern Pacific. Buoys are needed in the Central and Southern Pacific and in the Central Atlantic.

7.1.5 CLS processing

- 7.1.5.1 CLS has implemented an Iridium processing center and set-up an operational link between the Iridium and the Argos processing systems. As a result, drifters transmitting through Iridium can now benefit from the entire Argos processing capabilities including the GTS processing. This system was tested with the support of Météo-France, and delays were slightly higher than the existing Pilot Project processing system, but were still acceptable. The sources of the additional delay are currently being investigated by CLS.
- 7.1.5.2 As offered by CLS at the previous DBCP Session, the data processing is free of charge during the duration of the IPP project (i.e., until end July 2009). The IPP participants will pay for airtime via their Iridium VAR (CLS or other).
- 7.1.5.3 Buoy operators opting to use Iridium via CLS, and who wish to request GTS distribution of the data, should follow the process below:
 - A) Send CLS (Mr Yann Bernard) an e-mail: <u>iridium-buoy@cls.fr</u> with: IMEI(s), data format(s) and WMO ID(s); and
 - B) After Mr Bernard provides a confirmation e-mail (that all is okay and ready) one can ask to the respective Iridium provider to add the CLS e-mail address to the list of e-mail addresses (plus dbcpiridium@gmail.com) for the IMEI(s) concerned.
- 7.1.5.4 CLS will be able to accept data formats outside of the one recommended by the pilot project in future, as required by buoy operators or manufacturers.

7.1.6 The Meeting made the following recommendations:

7.1.6.1 Manufacturers are to supply information about new Iridium IMEI numbers to JCOMMOPS either via e-mail (iridium-pp@jcommops.org) or through the Metadata Entry tool (http://wo.jcommops.org/cgi-bin/WebObjects/meta) when they are testing new buoys.

- 7.1.6.2 To be considered as part of the project, and for buoys to appear on maps and in status reports, the notification of deployment must be completed by the buoy operator as soon as possible after the deployment.
- 7.1.6.3 Buoy operators are encouraged to communicate via e-mail (iridium-pp@jcommops.org) or through the Metadata Entry tool (http://wo.jcommops.org/cgi-bin/WebObjects/meta) with approximate deployment areas for all new IMEI numbers once they are manufactured (plus ships they are going on) ahead of time. In future, this operation can be completed via the JCOMMOPS dedicated notification page. The WMO number can then be entered upon deployment, along with details of the deployment. This information would then be automatically e-mailed to the project participants.
- 7.1.4 All manufacturers are encourage to work together to develop best practice concerning buoy development, especially regarding buoy lifetimes and share that with project participants.

Appendices: 3

IRIDIUM PILOT PROJECT STATUS AND MAPS AS OF JULY 2008

Network Status

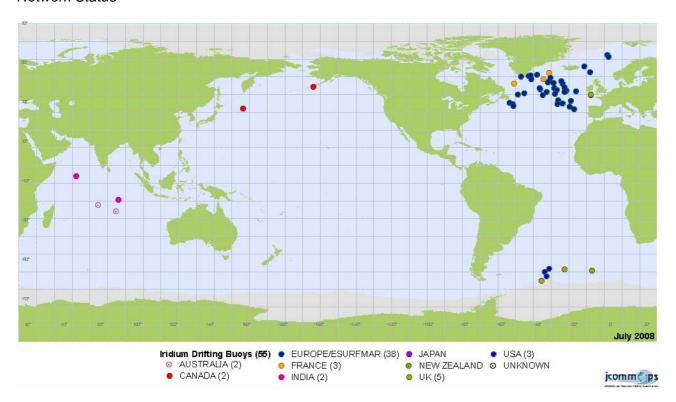
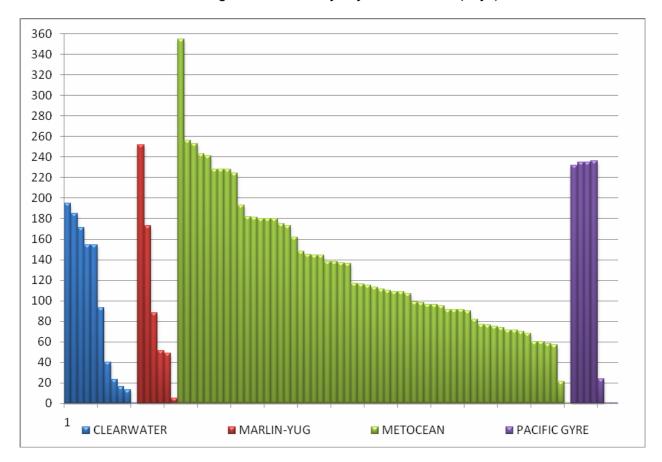


Figure 1: Status of iridium Pilot Project drifting buoys - July 2008

Lifetimes

Average lifetime of buoys by Manufacturer (days)



Graph 1: Lifetimes in days by manufacturer (not including initial deployments)

The average lifetime so far for all buoys in the project (including failed buoys) is 125 days. (up until 04/09/2008)

Manufacturer	All	buoys	Activ	e buoys	Inactive/Failed buoys		
	Number	Average lifetime days	Number	Average lifetime days	Number	Average lifetime days	
CLEARWATER	11	94.9	2	14.5	9	112.8	
MARLIN-YUG	6	103.0	4	99.0	2	111.0	
METOCEAN	59	131.6	45	130.6	14	134.9	
PACIFIC GYRE	7	137.4	4	182.5	3	77.3	
All project buoys:	83	125.2					

Table 1: Lifetime averages by manufacturer

Network Coverage

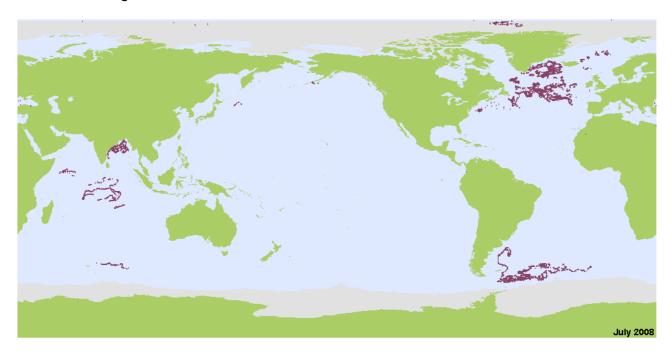


Figure 2: Iridium Tracks for all buoys participating the project (2006 - 2008)

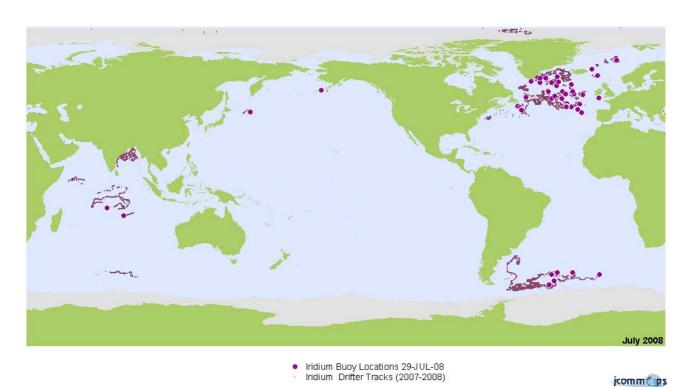


Figure 3: Iridium Tracks for all buoys participating the project and positions at the end of July 2008

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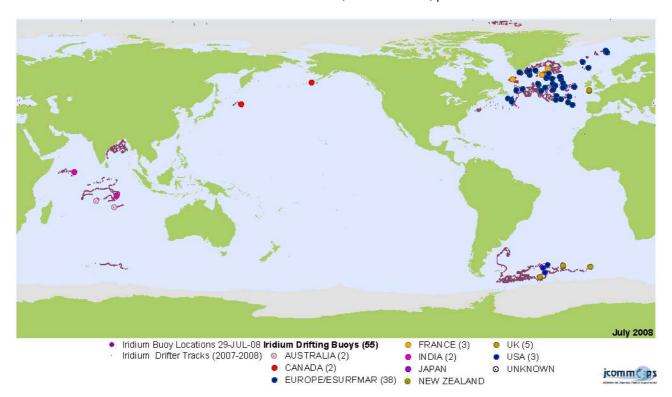


Figure 4: Iridium Tracks for all buoys participating the project and buoys symbolised by country (end of July 2008)

DBCP IRIDIUM PILOT PROJECT WEBSITE

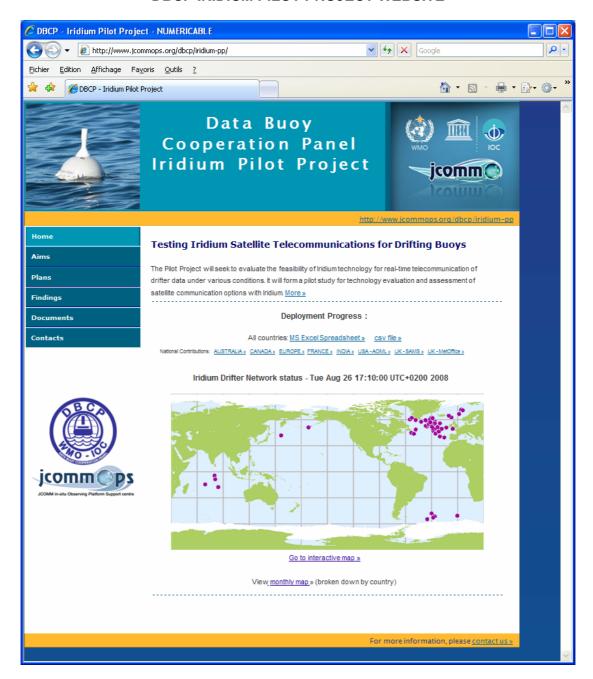


Figure A1: Updated Iridium Pilot Project website

Changes made include:

- Menu structure updated and presentation improved; and
- Links to programs participating in the project on the JCOMMOPS website;
 National Contributions:
 AUSTRALIA » CANADA » EUROPE » FRANCE » INDIA » USA AOML »
 UK SAMS » UK MetOffice »;
- Automatically updated map (Web Map Service linking to web mapping tool at: http://w4.jcommops.org/website/DBCP_RT/viewer.htm?Layers=0000111111&ActiveLayer=4;

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- Link added to the monthly map; and
- Content added to the Findings page and plans updated with recent information.

DBCP-XXIV/Doc. 7.1, APPENDIX C

STATUS FILES (TEXT AND EXCEL)

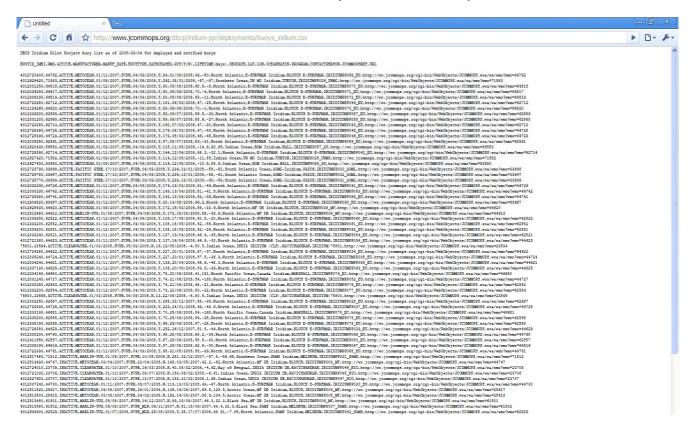


Figure B1: Screen capture of the Iridium Status (csv) file produced every day (http://www.jcommops.org/dbcp/iridium-pp/deployments/buoys iridium.csv)

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N86	3 Q 3 -	MORTH AT		+ (m +	10 3	Σ - 2.	Á↓ <u>□</u> 4	60%	6	9 7	: Aa	ıb					
A pdated	B 25/08/2008	С	D	Е	F	G	н	1	J	K	L	М	N	0	P	0	R
#2			Buoy Informs		3 2				Deployment I	Informatio	on.			0	peratorInformation	JCOMMOPS Reference	Community
oyld_IMEI	VM0	Status	Manufacturer	Manuf_Date	BuoyType	DateCeased	GTS Lit	etime	Dep. date	Lat	Lon	Upgrade(Y/N)	OceanBasin	ContactPerson	ContactAquacy		Commo Costs paid by Meteo France, Marion Dufresne from
527620 626420	16538	laactive laactive	PACIFIC GYRE METOCEAN	1/08/2007	SVPB	19/11/2007	N N	0	19/11/2007		71,9	N	INDIAN SOUTH ATLANTIC	SYBRANDY TURTON	PACIFIC GYRE/METEO FRANCE UK MO	iridiumpp013_mf iridiumpp024_ukmo	03. FAILED ON DEPLOYMENT
624420	71513	Inactive	METOCEAN	1/09/2007	SVPB	26/04/2008	N	36	21/01/2008	-55.1	-57.46	N	SOUTHERN	TURTON	UK MO AOML	iridiumpp023_ukmo	HMS Endurance
623420	33690 71511	Inactive Inactive	PACIFIC GYRE METOCEAN	1/11/2007	SVPB	13/01/2008 16/02/2008	N	57	13/01/2008 21/12/2007	-50	-56.15	Y	SOUTHERN ATLANTIC SOUTHERN	TURTON	UK METOFFICE	iridiumpp036_soml iridiumpp022_ukmo	Possible problems with GPS HMS Endurance
725380 528600	64623 23593	lauctive lauctive	METOCEAN CLEARWATER	1/11/2007	SVPB	10/04/2008	N N	195	18/11/2007	61.4	-29 89.3	N	NORTH ATLANTIC BAY OF BENGAL	BLOUCH RAVICHANDRAN	METEO FRANCE INCOIS	iridiumpp033_mf iridiumpp015_nio	EUMO-06 Reykjafoss from Reykjavík Deployed from Indian Research Vessel ORV Sagar Kanya
632400	62526	Inactive	MARLIN-YUG	1/07/2008	SVPB-Mini	22/07/2008		5	17/07/2008	43.31	-7.85	Y	NORTH ATLANTIC		SAMS	iridiumpp081_sams	RSS James Cook
524620	44616	Inactive	PACIFIC GYRE	410010007	SVPB	7/07/2008	700	232	18/11/2007	54	-49.5		NORTH ATLANTIC	SYBRANDY	PACIFIC GYRE/METEO FRANCE	iridiumpp012_m/	Comms Costs paid by Meteo France. Deployed off Nova Sc clock problem occured. Unaccurate AP measurements since t
621440	14531	Inactive	METOCEAN	1/09/2007	SVPB	28/06/2008	N ·	193	18/12/2007	-9	73	Ñ	INDIAN	BLOUCH	METEO FRANCE	iridiumpp027_mf	Maido from La Reunion
51240	44730 23705	lauctive lauctive	METOCEAN CLEARWATER	20/10/2007	SVPB	4/07/2008 16/03/2008	N N	113	13/03/2008 5/02/2008	-4	-46.7 62	N Y	NORTH ATLANTIC BAY OF BENGAL	BLOUCH RAVICHANDRAN	ESURFMAR INCOIS	iridiumpp042_cu iridiumpp048_niot	Deployment planned off Nova Scotia Reykjafoss from Reykja Indian Research ressel ORV Sagar Kanya.
721030	23706	Inactive	CLEARWATER	22/10/2007	SVP	9/07/2008		154	6/02/2008	-6	61	Ÿ	BAY OF BENGAL ARABIAN SEA	RAVICHANDRAN	INCOIS	iridiumpp043_niot	Indian Research respel ORV Sagar Kanya
20.8666 C.C.	23707	Inactive	CLEARWATER	Section Control	AND CARLE	13/07/2008	0.00	55 Ca	10/02/2008	100000	68		(C20/1031004 VIII)	RAVICHANDRAN		iridiumpp047_niot	Indian Research ressel ORY Sagar Kanya SAMS - deployed in Drake Passage from RRS James Clark I
517480	71512 62697	lauctive Active	MARLIN-YUG METOCEAN	1/08/2007	SVPB Mini	26/08/2008	Y	252	2/12/2007	-57.8 58	-56.65 -35	Y N	SOUTHERN NORTH ATLANTIC	MELDRUM	SAMS ESURFMAR	iridiumpp021_sums 1 iridiumpp028_mf	slight see Reukipfoss from Reukjavik
726380 623420	44629	Active	METOCEAN	1/11/2007	SVPB SVPB	26/08/2008	Y :	244	26/12/2007	51.5	-44 -56.7	N	NORTH ATLANTIC	BLOUCH	ESURFMAR ESURFMAR	iridiumpp023_mf	Reykjafoss from Reykjavík HMS Endurance
723790	33648	Active Active	PACIFIC GYRE	17/10/2007	SVPB	26/08/2008	Y :	234	12/01/2008		-59.9	Ý	SOUTHERN ATLANTIC	DOLK	AOML	iridiumpp026_ukmo iridiumpp030_soml	Possible problems with GPS
729780	33647 33649	Active Active	PACIFIC GYRE PACIFIC GYRE	17/10/2007	SVPB SVPB	26/08/2008	Y	26 26	13/01/2008	-58 -60	-61 -53	Y	SOUTHERN ATLANTIC SOUTHERN ATLANTIC	DOLK	AOML AOML	iridiumpp032_soml iridiumpp031_soml	Possible problems with GPS Possible problems with GPS
5240	44724	Active	METOCEAN	1/11/2007	SVPB	26/08/2008	Y	219	20/01/2008	57.5	-36.9	N	NORTH ATLANTIC	BLOUCH	METEOFRANCE	iridiumpp035_ce	EUMO-02 Replijafoss from Rojkjavik
724380 627420 729390	71582	Active Active	METOCEAN METOCEAN	1/11/2007	SVPB SVPB	26/08/2008	Y	219 219 215 173	20/01/2008	60.6 -57.1	-56.13	- 10	NORTH ATLANTIC SOUTHERN	TURTON	METEO FRANCE UK MO	iridiumpp034_cu iridiumpp025_ukmo	EUMO-05 Rephipfoss from Rephipvik Alkaline Batteries
729390 723380	44725 62712	Active Active	METOCEAN METOCEAN	1/11/2007	SVPB SVPB	26/08/2008	Y.	215	24/01/2008 6/03/2008	43		N	NORTH ATLANTIC NORTH ATLANTIC	BLOUCH	ESURFMAR ESURFMAR	iridiumpp037_ce iridiumpp044_ce	EUM0-08 Reykjafoss from Reykjavík Deployed by Mississauga Express from Southampton
722380	62713	Active	METOCEAN	1/11/2007	SVPB	26/08/2008	Y	172	7/03/2008	47.2	-29.9	N	NORTH ATLANTIC	BLOUCH	ESURFMAR	iridiumpp043_cu	Deployed by Mississauga Express from Southampton
728380	44728	Active Active	METOCEAN METOCEAN	1/11/2007 1/11/2007	SVPB SVPB	26/08/2008	Y	171 171	8/03/2008	46.5 46.3	-50	N N	NORTH ATLANTIC NORTH ATLANTIC	BLOUCH BLOUCH	ESURFMAR ESURFMAR	iridiumpp052_cu iridiumpp045_cu	Deployed by Mississauga Express from Southampton Deployed by Mississauga Express from Southampton
728390	44729	Active	METOCEAN	1/11/2007	SVPB SVPB	26/08/2008	Y	171 166 164	8/03/2008	46.3 51	-45	N N	NORTH ATLANTIC NORTH ATLANTIC	BLOUCH	ESURFMAR ESURFMAR	iridiumpp046_ou	Deployed by Mississauga Express from Southampton
	44620	Active Active	METOCEAN	1/09/2007	2VPB	26/08/2008	Y	164	15/03/2008	58	-33.6	- ii	NORTH ATLANTIC	BLOUCH	METEO FRANCE	iridiumpp041_cu iridiumpp038_cu	Deployment planned off Nova Scotis Reykjafoss from Reykj planned off Nova Scotis Reykjafoss from Raykjavík
725390	44612 62714	Active Active	MARLIN-YUG METOCEAN	1/11/2007	SVPB SVPB	26/08/2008	Υ .	136	12/04/2008		-32.1	N N	NORTH ATLANTIC NORTH ATLANTIC	BLOUCH	METEO FRANCE ESURFMAR	iridiumpp033_cu iridiumpp052_cu	Deployment planned off Nora Scotia Reykjafoss from Reykj EUMO-07 Reykjafoss from Reykjarik
725390 30230 729380	44742	Active	METOCEAN METOCEAN	1/11/2007	SVPB SVPB	26/08/2008	Ÿ	135 135	13/04/2008	51	-41.5 -38	N N	NORTH ATLANTIC NORTH ATLANTIC	BLOUCH BLOUCH	ESURFMAR ESURFMAR	iridiumpp053_cu iridiumpp058_cu	EUMO-00 Reykjafoss from Reykjavík EUMO-10 Reykjafoss from Reykjavík
33240	62521	Active	METOCEAN	1/11/2007	SVPB	26/08/2008	Υ .	129	19/04/2008	46.4	-35	N	NORTH ATLANTIC	BLOUCH	ESURFMAR	iridiumpp054_ou	EUMO-13 Mississauga Express from London
721380 34240	44623	Active	METOCEAN METOCEAN	1/11/2007	SVPB SVPB	26/08/2008	Y	128	20/04/2008	46.9 45.6	-30 -48.3	N N	NORTH ATLANTIC NORTH ATLANTIC	BLOUCH	ESURFMAR ESURFMAR	iridiumpp056_cu iridiumpp055_cu	EUMO-15 Mississauga Express from London EUMO-14 Mississauga Express from London
620430 627430	56550	Active	METOCEAN METOCEAN	1/09/2007	SVPB SVPB	26/08/2008	Y	107	11/05/2008	-14.6 -10.3		N N	INDIAN	BALL	AUST BOM AUST BOM	iridiumpp057_su iridiumpp053_su	MERINO EXPRESS MERINO EXPRESS
039250	62522	Active	I METOCEAN	12/2007	SVPB	26/08/2008	Ý	106	17/05/2008	50.8	-20.1	Ñ	NORTH ATLANTIC	BLOUCH	ESURFMAR	iridiumpp060_cu	EUMO-24 Tourville from Brest
333200 334200		Active	METOCEAN METOCEAN	12/2007	SVPB SVPB	26/08/2008	Υ .	100	18/05/2008	52 51.5	-27.3	N N	NORTH ATLANTIC NORTH ATLANTIC	BLOUCH	ESURFMAR ESURFMAR	iridiumpp061_cu iridiumpp062_cu	EUMO-37 Tourville from Brest EUMO-36 Tourville from Brest
337190	44625 65561	Active	METOCEAN	12/2007	SVPB SVPB	26/08/2008	Y	98 93	20/05/2008	53.6	-39	N	NORTH ATLANTIC ARCTIC	BLOUCH MELDRUM	ESURFMAR SAMS	iridiumpp063_eu	EUMO-43 Tourville from Brest
	65563	Active	7	Ŷ	SVPB	26/08/2008	Ÿ	92	26/05/2008	?	?	Ŷ	ARCTIC	MELDRUM	SAMS	iridiumpp064_sams iridiumpp065_sams	
330200 339190	64516	Active Active	METOCEAN METOCEAN	12/2007 12/2007	SVPB SVPB SVPB	26/08/2008	Ť	92 90 89	28/05/2008 29/05/2008	58.2 62.9	-30	N N	NORTH ATLANTIC NORTH ATLANTIC	BLOUCH BLOUCH	ESURFMAR ESURFMAR	iridiumpp066_cu iridiumpp067_cu	
722390	44761 44762	Active	METOCEAN METOCEAN	1/11/2007	SVPB SVPB	26/08/2008	Y	87 86	31/05/2008	51 43	-46.6	N	NORTH ATLANTIC NORTH ATLANTIC	BLOUCH	ESURFMAR ESURFMAR	iridiumpp068_cu iridiumpp063_cu	EUMO-4 Repkjafoss from Repkjavik EUMO-3
31250	64518	Active	METOCEAN	1/12/2007	SVPB	26/08/2008	Y	82	5/06/2008	68.5	-8	N	NORTH ATLANTIC	BLOUCH	ESURFMAR	iridiumpp070_eu	EUMO-30
336130	64517	Active	METOCEAN METOCEAN	1/12/2007	SVPB	26/08/2008	Y	82 82	5/06/2008	70 67.2	-11.1	N N	NORTH ATLANTIC	BLOUCH	ESURFMAR ESURFMAR	iridiumpp071_cu iridiumpp072_cu	EUM0 - 29 EUM0 - 44
124260 334190	64520	Active	METOCEAN METOCEAN	2/12/2007	SVPB SVPB	26/08/2008	ÿ	81 67	6/06/2008	70.1		N	NORTH ATLANTIC	BLOUCH	ESURFMAR ENVIRONMENT CANADA	iridiumpp073_cu	EUMO-32
333190	46681	Active	METOCEAN	1/10/2007?	SVPB	26/08/2008	Y	62	25/06/2008	54 54	-160	Ý	NORTH WEST PACIFIC NORTH WEST PACIFIC	COOK	ENVIRONMENT CANADA	iridiumpp074_cc iridiumpp075_cc	
332200	62553	Active	METOCEAN	1/12/2007	SVPB SVPB	26/08/2008	Y	66 65	21/06/2008	48	-20.9	N N	NORTH ATLANTIC NORTH ATLANTIC	BLOUCH	ESURFMAR ESURFMAR	iridiumpp076_cu iridiumpp077_cu	Thalassa from Brest EUMO-26 Thalassa from Brest EUMO-38
335200	62555	Active	METOCEAN METOCEAN METOCEAN		SVPB	26/08/2008	Y	62	25/06/2008	54 57	-25.5	N	NORTH ATLANTIC	BLOUCH	ESURFMAR ESURFMAR	iridiumpp078_cu	Thalassa from Brest EUMO-35
338190 411650	62557	Active	METOCEAN	4/12/2007 5/12/2007	SVPB SVPB	26/08/2008	Ÿ	61 59 40	5810615008 5910615008	57 58.5 49.91	-30	N N	NORTH ATLANTIC NORTH ATLANTIC	BLOUCH	ESURFMAR ESURFMAR	iridiumpp073_cu iridiumpp080_cu	Thalassa from Brest EUMO-42 Thalassa from Brest EUMO-31
639400 721390	62529	Active Testing	MARLIN-YUG METOCEAN	1/07/2008	SVPB-Mini	26/08/2008	Y	40	17/07/2008	49.91	-7.85	Y	NORTH ATLANTIC	MELDRUM TURTON	SAMS UK MO	iridiumpp082_sams iridiumpp083_ukmo	RSS James Cook Lithium
724020	?	Active	CLEARWATER	?	?	26/08/2008	3		40100104				BAY OF BENGAL	RAVICHANDRAN	INCOIS	iridiumpp084_niot	
637060 638070		Active Active	CLEARWATER CLEARWATER	1/03/2008	SVPB SVPB	26/08/2008		7 4	22/08/2008	-8	80 80	Y	INDIAN	RAVICHANDRAN RAVICHANDRAN	INCOIS	IRIDIUM:75801 IRIDIUM:75800	Indian Research ressel ORV Sagar Nidhi Indian Research ressel ORV Sagar Nidhi
336200 331200		Active	METOCEAN METOCEAN	12/2007	SVPB SVPB	26/08/2008	Y	51 51	6/07/2008	56.5	-30 -27	N N	NORTH ATLANTIC	BLOUCH	ESURFMAR ESURFMAR	iridiumpp087_cu iridiumpp088_cu	Thologou from Breet EUMO-34 Thologou from Breet EUMO-
35250	62561	Active	METOCEAN	12/2007 12/2007	SVPB	26/08/2008	Y	49	8/07/2008	53.7	-21.1	N	NORTH ATLANTIC	BLOUCH	ESURFMAR	iridiumpp083_cu	Thalassa from Brest EUMO-
521630 9520	63667	Active	PACIFIC GYRE METOCEAN	1/08/2007	SVPB SVPB	26/08/2008	Y	15	11/08/2008	42.3 66	2	N N	NORTH ATLANTIC NORTH ATLANTIC	BLOUCH	METEO FRANCE ESURFMAR	iridiunpp040_mf iridiunpp030_cu	Environment Conada from Saint-John Polarfront from Aslesand EUMO-33
727390 721030	?	Ordered Planed	METOCEAN CLEARWATER		SVP			0		?	?		INDIAN	TURTON RAVICHANDRAN	UK MO		Lithium Packs
721020	?	Planed	CLEARWATER	23/10/2007	SVP			0		2	?		INDIAN	BAVICHANDRAN	INCOIS		
524430 511480	?	Planned Planned	CLEARWATER MARLIN-YUG	24/10/2007 1/08/2007	SVP SVPB			0		?	?		ARABIAN SEA	RAVICHANDRAN	INCOIS MARLIN-YUG		Marlin-Yuq development
335130		Ready For Deployment			2112					2	-		NORTH EAST PACIFIC	СООК	ENVIRONMENT CANADA		

Figure B2: Excel spreadsheet with full details of all buoys on the project (http://www.jcommops.org/dbcp/iridium-pp/deployments/buoys_iridium.xls)