











SPRINT

SPaceborne **R**adar **IN**terferometric **T**echniques for Humanitarian Demining Land Release

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Researchers: Dr Ir MSc Nada MILISAVLJEVIĆ, Dr Damien CLOSSON (Royal Military Academy, CISS department)

Co-promoter: SARMAP SA (Dr Ir Paolo PASQUALI, Dr Francesco HOLECZ)

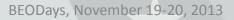




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Aim of the project



To find out a plausible limit of a minefield from the interpretation/analysis of a stack of ERS & Envisat images (Potential consequence : suspected mined area reduction)

Relation between human activities and interferometric coherence Minefields are zones that preserve interferometric coherence through time

FP7 TIRAMISU project

(Toolbox Implementation for Removal of Anti-personnel Mines, Submunitions and UXO) - aims at providing the foundation for a global toolbox that will cover the main mine action activities -



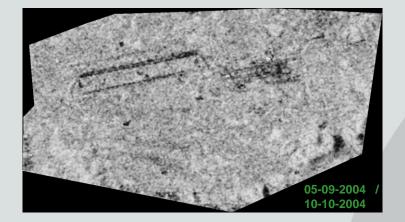
Nevatim airport, Israel

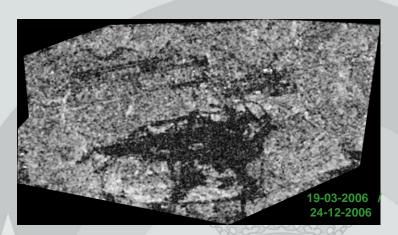
Background

Coherence

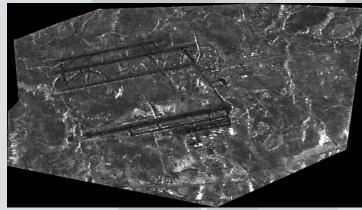


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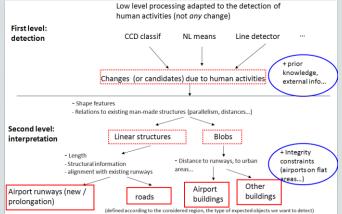
ASAR AMPLITUDE 28-03-2010

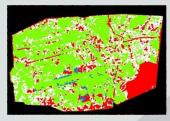




Background

Relation between human activities and interferometric coherence



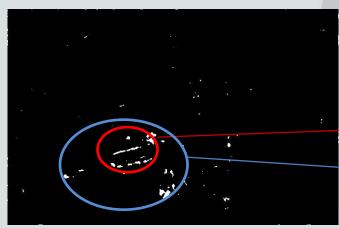


(1 - low, 2 - medium, 3 - high coherence)

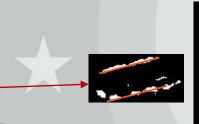
- 11, 12, 21 green
- 22 white
- 23, 32, 33 red
- 13 blue
- 31 purple







Two straight and parallel lines: Works on a new runway of the airport !







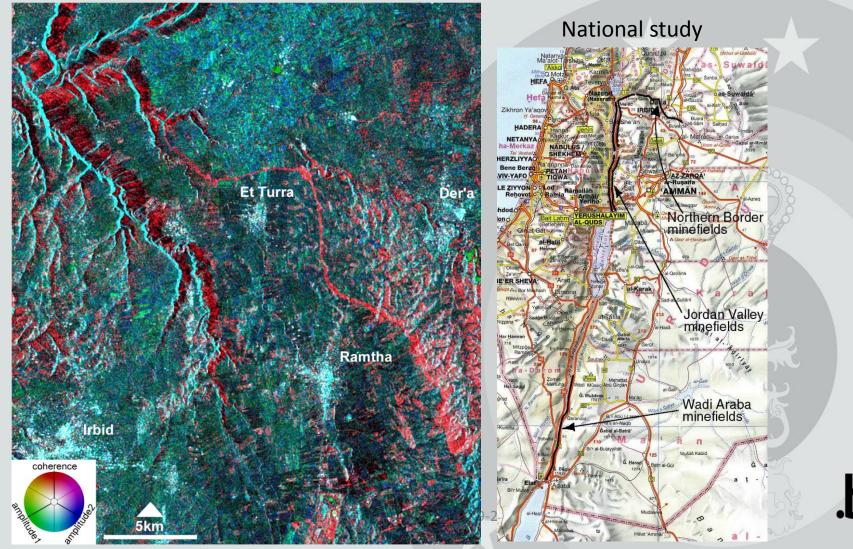
Background



Minefields are zones that preserve interferometric coherence through time

DEFENSIE A DÉFENSE Minefield along the borderline between Jordan and Syria

Colour composition of ERS images - 70 days between two acquisitions - Dates: 29 July 1995 - 7 October 1995





Background Limitations

COHERENCE 14-11-2004 / 19-12-2004









Background Tools



A. Sarcape/SBAS

SARscape Basic Tools Class		Tarbronni Filcor opec	tral Map Vactor Topographic	Radai indow Help	
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Interferometry	×.				
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Polarimetry and PolInSAR			Interferogram Generation	2000 C 2000	EQUES OF
Tools	•		SBAS Inversion Raster to Shape Conversion	1000	
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B. Available data processing and fusion tools and methodologies developed in other projects BEODays, November 19-20, 2013



Method

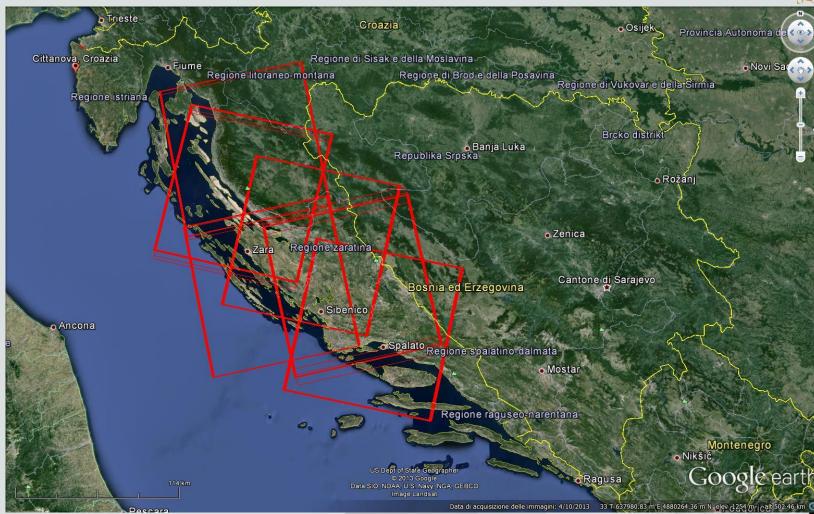


- 1. Selection of case studies in Croatia (e.g. reject steep slopes and moisture)
- 2. Image data selection (Asc/Dsc) from 1991 till 2011
- 3. Image data stacking & processing (adapted SBAS/Sarscape). Set up of a data cube
- 4. Detection of plausible limits of a minefield
- data analysis and fusion inside the data cube
- fusion with other sources (visible images, context information)
- 5. Validation in Information Management System for Mine Action (IMSMA) use of the true limits provided by CROMAC

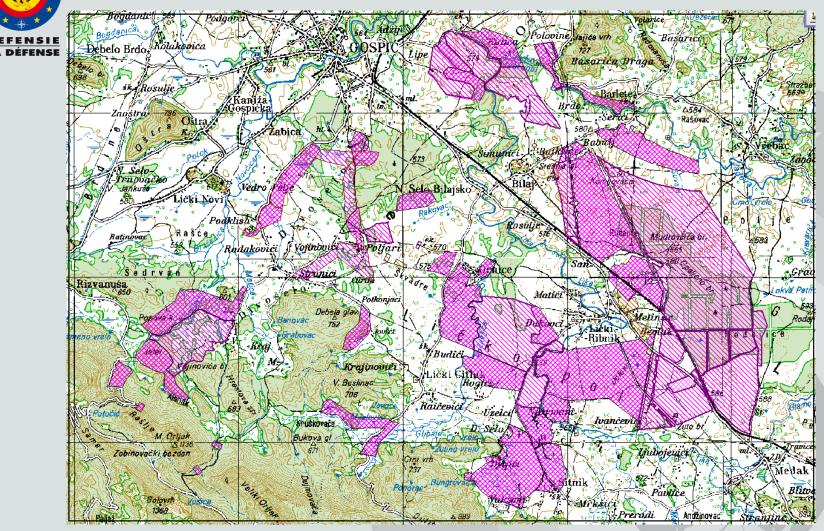


Method Selection of case studies in Croatia

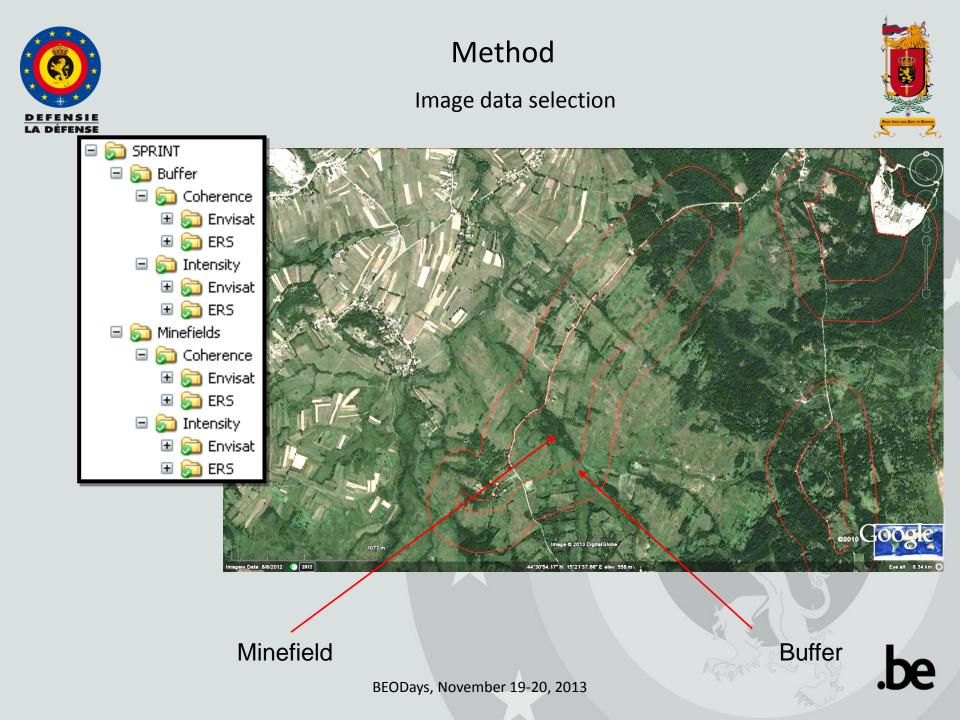




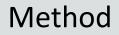
Method GOSPIC : 26 test areas



Suspected hazardous and confirmed hazardous areas shown in hatched and crosshatched red polygons (data from 2009)









Stacking approach: 42 ERS + 40 Envisat (1992-2010)

Mission	Product	Start	Stop	Orbit	Track	Pass	Mission	Product	Start	Stop	Orbit	Track	Frame	Swath	Pass	Delivery
ERS-1	SAR_IM0_0P	1992-08-01 21:09:48.07	1992-08-01 21:10:04.07	5470	315	A	ENVISAT-1	ASA_IM0P	2003-06-24 20:39:42.75	2003-06-24 20:39:57.84	6882	315	873	12	Α	9
ERS-1	SAR_IM0_0P	1993-07-17 21:09:42.36	1993-07-17 21:09:58.36	10480	315	A	ENVISAT-1	ASA_IM0P	2003-07-29 20:39:47.44	2003-07-29 20:40:02.53	7383	315	873	12	A	9
ERS-1	SAR_IM0_0P	1995-05-01 21:09:44.07	1995-05-01 21:10:00.07	19842	315	A	ENVISAT-1	ASA_IM0P	2003-09-02 20:39:50.66	2003-09-02 20:40:05.75	7884	315	873	12	Α	9
ERS-2	SAR_IM0_0P	1995-06-06 21:09:53.02	1995-06-06 21:10:09.02	670	315	A	ENVISAT-1	ASA_IM0P	2003-11-11 20:39:43.83	2003-11-11 20:39:58.92	8886	315	873	12	Α	y
ERS-1	SAR_IM0_0P	1995-07-10 21:09:49.07	1995-07-10 21:10:05.07	20844	315	A	ENVISAT-1	ASA IM OP	2004-06-08 20:39:48.87	2004-06-08 20:40:03.96	11892	315	873	12	Α	u l
ERS-2	SAR_IM0_0P	1995-07-11 21:09:54.29	1995-07-11 21:10:10.29	1171	315	A	ENVISAT-1	ASA IM OP	2004-07-13 20:39:49.37	2004-07-13 20:40:04.46	12393	315	873	12	Α	u l
ERS-1	SAR_IM0_0P	1995-08-14 21:09:51.07	1995-08-14 21:10:07.07	21345	315	A	ENVISAT-1	ASA IM OP	2004-08-17 20:39:46.98	2004-08-17 20:40:02.07	12894	315	873	12	Α	ų į
ERS-2	SAR_IM0_0P	1995-08-15 21:09:55.26	1995-08-15 21:10:11.26	1672	315	A	ENVISAT-1	ASA IM OP	2004-10-26 20:39:49.56	2004-10-26 20:40:04.65	13896	315	873	12	Α	u l
ERS-1	SAR_IM0_0P	1995-09-18 21:09:48.50	1995-09-18 21:10:04.50	21846	315	A	ENVISAT-1	ASA IM OP	2005-01-04 20:39:40.57	2005-01-04 20:39:55.66	14898	315	873	12	Α	u l
ERS-2	SAR_IM0_0P	1995-09-19 21:09:54.20	1995-09-19 21:10:10.20	2173	315	A	ENVISAT-1	ASA IM OP	2005-02-08 20:39:43.88	2005-02-08 20:39:58.97	15399	315	873	12	A	u l
ERS-2	SAR_IM0_0P	1996-03-12 21:09:48.95	1996-03-12 21:10:04.95	4678	315	A	ENVISAT-1	ASA IM OP	2005-03-15 20:39:42.31	2005-03-15 20:39:57.40	15900	315	873	12	A	
ERS-2	SAR_IM0_0P	1996-06-25 21:09:51.75	1996-06-25 21:10:07.75	6181	315	A	ENVISAT-1	ASA IM OP	2005-05-24 20:39:49.78	2005-05-24 20:40:04.87	16902	315	873	12	A	
ERS-2	SAR_IM0_0P	1996-07-30 21:09:50.21	1996-07-30 21:10:06.21	6682	315	A	ENVISAT-1	ASA IM OP	2005-08-02 20:39:48.57	2005-08-02 20:40:03.66	17904	315	873	12	A	
ERS-2	SAR_IM0_0P	1996-09-03 21:09:48.53	1996-09-03 21:10:04.53	7183	315	A	ENVISAT-1	ASA IM OP	2005-10-11 20:39:47.69	2005-10-11 20:40:02.78	18906	315	873	12	Â	
ERS-2	SAR_IM0_0P	1996-10-08 21:09:48.20	1996-10-08 21:10:04.20	7684	315	A	ENVISAT-1	ASA IM OP	2005-12-20 20:39:40.41	2005-12-20 20:39:55.50	19908	315	873	12	Â	9 U
ERS-2	SAR_IM0_0P	1997-04-01 21:09:45.99	1997-04-01 21:10:01.99	10189	315	A	ENVISAT-1	ASA_IMOP	2006-02-28 20:39:36.48	2006-02-28 20:39:51.57	20910	315	873	12	Â	
ERS-2	SAR_IM0_0P	1997-06-10 21:09:48.33	1997-06-10 21:10:04.33	11191	315	A	ENVISAT-1	ASA_IMOP	2006-02-28 20:39:38:48	2006-02-28 20:39:56.15	20310	315	873	12	A	
ERS-2	SAR_IM0_0P	1997-08-19 21:09:47.88	1997-08-19 21:10:03.88	12193	315	A	ENVISAT-1					315	873	12	A	9
ERS-2	SAR_IM0_0P	1998-04-2121:09:44.30	1998-04-21 21:10:00.30	15700	315	A		ASA_IMOP	2006-07-18 20:39:47.57	2006-07-18 20:40:02.66	22914					9
ERS-2	SAR_IM0_0P	1998-06-30 21:09:37.87	1998-06-30 21:09:53.87	16702	315	A	ENVISAT-1	ASA_IMOP	2006-12-05 20:39:45.53	2006-12-05 20:40:00.62	24918	315	873	12	A	у
ERS-2	SAR_IM0_0P	1998-09-08 21:09:44.94	1998-09-08 21:10:00.94	17704	315	A	ENVISAT-1	ASA_IM0P	2007-02-13 20:39:39.54	2007-02-13 20:39:54.63	25920	315	873	12	A	9
ERS-2	SAR_IM0_0P	1999-04-06 21:09:44.31	1999-04-06 21:10:00.31	20710	315	A	ENVISAT-1	ASA_IM0P	2007-04-24 20:39:39.72	2007-04-24 20:39:54.81	26922	315	873	12	A	9
ERS-2	SAR_IM0_0P	1999-06-15 21:09:39.97	1999-06-15 21:09:55.97	21712	315	A	ENVISAT-1	ASA_IM0P	2007-07-03 20:39:43.18	2007-07-03 20:39:58.27	27924	315	873	12	A	9
ERS-1	SAR_IM0_0P	1999-08-23 21:09:27.80	1999-08-23 21:09:43.80	42387	315	A	ENVISAT-1	ASA_IM0P	2007-09-11 20:39:40.51	2007-09-11 20:39:55.60	28926	315	873	12	A	y
ERS-2	SAR_IM0_0P	1999-08-24 21:09:37.86	1999-08-24 21:09:53.86	22714	315	A	ENVISAT-1	ASA_IM0P	2007-11-20 20:39:36.42	2007-11-20 20:39:51.51	29928	315	873	12	A	y
ERS-2	SAR_IM0_0P	1999-11-02 21:09:41.02	1999-11-02 21:09:57.02	23716	315	A	ENVISAT-1	ASA_IM0P	2008-01-29 20:39:36.12	2008-01-29 20:39:51.21	30930	315	873	12	A	9
ERS-2	SAR_IM0_0P	2000-05-30 21:09:38.39	2000-05-30 21:09:54.39	26722	315	A	ENVISAT-1	ASA_IM0P	2008-03-04 20:39:36.65	2008-03-04 20:39:51.74	31431	315	873	12	A	y
ERS-2	SAR_IM0_0P	2000-08-08 21:09:52.68	2000-08-08 21:10:08.68	27724	315	A	ENVISAT-1	ASA_IM0P	2008-04-08 20:39:36.01	2008-04-08 20:39:51.10	31932	315	873	12	A	y j
ERS-2	SAR_IM0_0P	2001-05-15 21:09:27.49	2001-05-15 21:09:43.49	31732	315	A	ENVISAT-1	ASA_IM0P	2008-06-17 20:39:37.40	2008-06-17 20:39:52.49	32934	315	873	12	Α	y
ERS-2	SAR_IM0_0P	2001-07-24 21:09:01.81	2001-07-24 21:09:17.81	32734	315	A	ENVISAT-1	ASA_IM0P	2008-08-26 20:39:35.52	2008-08-26 20:39:50.61	33936	315	873	12	Α	9
ERS-2	SAR_IM0_0P	2001-08-28 21:08:45.32	2001-08-28 21:09:01.32	33235	315	A	ENVISAT-1	ASA_IM0P	2008-11-04 20:39:34.22	2008-11-04 20:39:49.31	34938	315	873	12	Α	9
ERS-2	SAR_IM0_0P	2002-04-30 21:08:03.79	2002-04-30 21:08:19.79	36742	315	A .	ENVISAT-1	ASA_IM0P	2009-01-13 20:39:33.45	2009-01-13 20:39:48.54	35940	315	873	12	Α	9
ERS-2	SAR_IM0_0P	2002-07-09 21:08:11.50	2002-07-09 21:08:27.50	37744	315	A	ENVISAT-1	ASA IM OP	2009-03-24 20:39:32.65	2009-03-24 20:39:47.74	36942	315	873	12	Α	ų
ERS-2	SAR_IM0_0P	2002-08-13 21:08:17.60	2002-08-13 21:08:33.60	38245	315	A	ENVISAT-1	ASA IM OP	2009-06-02 20:39:35.63	2009-06-02 20:39:50.72	37944	315	873	12	Α	ų
ERS-2	SAR_IM0_0P	2003-02-04 21:08:11.07	2003-02-04 21:08:27.07	40750	315	A	ENVISAT-1	ASA IM OP	2009-08-11 20:39:35.88	2009-08-11 20:39:50.97	38946	315	873	12	Α	u l
ERS-2	SAR_IM0_0P	2003-04-15 21:08:05.61	2003-04-15 21:08:21.61	41752	315	A .	ENVISAT-1	ASA IM 0P	2009-10-20 20:39:31.11	2009-10-20 20:39:46.20	39948	315	873	12	A	i i i
ERS-2	SAR_IM0_0P	2003-09-02 21:08:20.77	2003-09-02 21:08:36.77	43756	315	A	ENVISAT-1	ASA IM OP	2009-12-29 20:39:29.72	2009-12-29 20:39:44.81	40950	315	873	12	A	L ú
ERS-2	SAR_IM0_0P	2005-09-06 21:08:22.54	2005-09-06 21:08:38.54	54277	315	A	ENVISAT-1	ASA IM OP	2010-03-09 20:39:28.16	2010-03-09 20:39:43.25	41952	315	873	12	A	
ERS-2	SAR_IM0_0P	2008-06-17 21:09:40.88	2008-06-17 21:09:56.88	68806	315	A .	ENVISAT-1	ASA IM OP	2010-05-18 20:39:26.07	2010-05-18 20:39:41.16	42954	315	873	12	Â	
ERS-2	SAR_IM0_0P	2008-07-22 21:09:42.44	2008-07-22 21:09:58.44	69307	315	A	ENVISAT-1	ASA_IMOP	2010-07-27 20:33:28:07	2010-07-27 20:39:42.83	43956	315	873	12	Â	
ERS-2	SAR_IM0_0P	2008-08-26 21:09:40.69	2008-08-26 21:09:56.69	69808	315	A	ENVISAT-1	ASA_IM0P	2010-10-05 20:39:24.02	2010-07-27 20:33:42.83	43356	315	873	12	A	
ERS-2	SAR_IM0_0P	2009-06-02 21:10:54.61	2009-06-02 21:11:10.61	73816	315	A	ENVIOATE		2010-10-00 20:33:24.02	2010-10-00 20:33:33.11	44306	310	013	12		<u> </u>





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Stacking approach: coherence – various combinations

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E COSPIC	ASAR_IS_20030621_m_1_2004050.6fw	ASAR_IS_20040117_m_4_2004112.tf.ovr	ASAR_35_20050101_m_10_200401.8F		ASAR_J5_20050625_m_13_200512.hF.auxml		ASAR_IS_20070526_m_25_200803.tf.ovr	AS4P_15_20080510_m_29_200807.hf	ASAR_IS_20080927_m_31_200710.tf.aml	ASAR_JS_20090214_m_33_200907.tf.aux.xml		
50 01	ASAR_25_20000621_m_1_2004090.8F	ASAR_IS_20040117_m_4_2004112.2f ami	ASAR_35_20050101_m_10_200401.8f.aux.xml		ASAR_15_20050625_m_13_200512.8f.ovr	ASAR_35_20060715_m_20_200701.8F	ASAR_IS_20070526_m_25_200803.tf .xml	asa4(_35_20080510_m_29_200807.bf.aux.xml		ASAR_15_20090214_m_33_200907.bf.ovr	ASAR_35_20090704_m_35_201004.8f	
😥 02	ASAR_J5_20030621_n_1_2004060.1fl.aux.xni		ASAR_15_20050101_n_10_200401.bf.ov	ASAR_IS_20060416_m_11_200406.1/	ASAR_J5_20050625_m_13_200512.tlf.xml	ASAR_15_20060715_m_20_200701.tif.aux.xmi		ASAR_35_20080510_n_29_200807.18.ovr	ASAR_JS_20080927_m_31_200803.18	ASAR_JS_20090214_m_33_200907.tl.xml	ASAR_35_20090704_m_35_201004.8F.aux.xmi	
🔂 03	ASAR_35_20000621_m_1_2004050.bf.ov ASAR_35_20000621_m_1_2004050.bf.ov	ASAR_IS_20040605_m_6_2004091.hf ASAR_IS_20040606_m_6_2004091.hf aux.xml	ASAP_35_20050001_m_10_200401.8f.xml ASAP_35_20050001_m_10_200406.8fw	ASAR_IS_20050416_n_11_200406.tf.aux.xnl ASAR_IS_20050416_n_11_200406.tf.ovr	ASAR_IS_20050903_m_14_200409.2FH	ASAR_35_20060715_m_20_200701.bf.ovr & ASAR_35_20060715_m_20_200701.bf.vml	ASAR_IS_20070004_m_26_200610.tf ASAR_IS_20070004_m_26_200610.tf aux.xml	ASAR_35_20000510_m_29_200007.bf.xml ASAR_35_20000510_m_29_200009.thm	ASAR_15_20000927_m_31_200003.tf.aux.xml ASAR_15_20000927_m_31_200003.tf.ovr	ASAR_DS_20090214_m_33_200909.0F	ASAR_35_20090704_m_35_201004.bf.ovr & ASAR_35_20090704_m_35_201004.bf.ovr	
s)) 04	ASAR 25 20031108 n 2 2004050.5fw	ASAR IS 20040605 m 6 2004091.2f.ort	ASAR 15 20050001 m 10 200406.8f		ASAR 15 20050903 m 14 200409.0f aux.xml		ASAR IS 20070804 m 26 200510.1f.ovr	ASAR US 2008/510 m 29 200809.26	ASAR 15 20080927 m 31 200803.tf .ml	ASAR 15 20090214 m 33 200909.bf.eur.aml		
🔂 05	ASAR 25 20031108 m 2 2004050.0f	ASAR IS 20040605 m 6 2004091 kf ami	ASAP 15 20090101 m 10 200406.8f.aux.xml		ASAR 15 20050903 m 14 200409.8f ovr	ASAR 15 20060715 n 20 200703.8f	ASAR IS 20070804 m 26 200610.tf ami	ASAP 15 20090510 m 29 200909 kf aux mi		AS4R 15 20090214 m 33 200909.26 ovr	ASAR 25 20090704 n 35 201006.0f	
🙀 05	ASAR 25 20031108 m 2 2004050.16.aux.vml		ASAR 15 20050001 re 10 200406.16.0vr		ASAR 15 20050903 m 14 200409.16.on	ASAR 15 20060715 m 20 200703.Mf. max. mi		ASAR 15 20080510 m 29 200809.16.0m	ASAR 15 20080927 m 31 200812.W	ASAR 15 20090214 m 33 200909.14 .ml	ASAR 25 20090704 rs 35 201006.8F.aux.oni	
😥 07	ASAR_15_20031108_n_2_2004090.tf.ow	ASAR_IS_20040605_m_6_2004112.1f	ASAR 15 20050101 m 10 200406.tdf.xml		ASAR 15 20050903 m 14 200512.8fw	ASAR 15 20060715 m 20 200703.tf.ow	ASAR_IS_20070804_m_26_200703.tf	ASAR 15 20080510 m 29 200809.0f.xml	ASAR 15 20080927 m 31 200812.tf.aux.yml	ASAR_J5_20090214_m_33_200911.th	ASAR 15 20090704 m 35 201006.th.ow	
	ASAR_IS_20031108_m_2_2004050.MF.sml	ASAR IS 20040605 m 6 2004112.M aut. 314		ASAR IS 20050416 m 11 200411.W.ovr	ASAR 15 20050903 m 14 200512.M	ASAR 15 20060715 m 20 200703.W. ml	ASAR_IS_20070804_m_26_200703.tf.aux.xml		ASAR IS 20080927 m 31 200812.W.ovr	ASAR IS 20090214 m 33 200911.M	ASAR 35 20090704 nr 35 201006.8F.xml	
10	ASAR 25 20031213 m 3 2003030.6w	ASAR 15 20040605 m 6 2004112.tf.ovr	ASAR_15_20050101_m_10_200409.bf	ASAR_15_20050416_m_11_200411.tf.aml	ASAR_15_20050903_m_14_200512.bf.aux.xml	ASAR_35_20061028_m_22_200606.tfw	ASAR 15 20070804 m 26 200703.tf ovr	ASAR_15_20080510_m_29_200812.8f	ASAR_IS_20080927_m_31_200812.tf ami	ASAR 15 20090214 m 33 200911.8f.aux.aml	ASAR_35_20090912_m_36_201006.t/w	
60 11 60 11	ASAR_J5_20031213_m_3_2003030.1#	ASAR_JS_20040606_m_6_2004112.tf.xml	ASAR_35_20050601_n_10_200409.6f.auxml	ASAR_IS_20060416_n_11_200505.tfw	ASAR_J5_20050903_m_14_200512.hlf.ovr	ASAR_35_20061028_m_22_200606.1#	ASAR_JS_20070804_m_26_200703.tf .xml	ASAR_35_20080510_n_29_200812.ht/.auxml	ASAR_JS_20080927_m_31_200904.tfw	ASAR_J5_20090214_m_33_200911.bl.ovr	ASAR_35_20090912_m_36_201006.18	
11 12	ASAR_25_20001213_m_3_2003030.6f.aux.xml	ASAR_IS_20040605_m_6_2005052.1fm	ASAR_35_20050001_m_10_200409.8f.ovr	ASAR_15_20050416_m_11_200505.tf	ASAR_15_20050903_m_14_200512.bf.xml	ASAR_35_20061028_m_22_200606.16F.aux.xml	ASAR_IS_20070804_m_26_200710.tfw	ASAR_35_20080510_m_29_200812.8f.ovr	ASAR_15_20080927_m_31_200904.tf	ASAR_J5_20090214_m_33_200911.tf.xml	a5AP_35_20090912_m_36_201006.bf.aux.xml	
13	KASAR_25_20031213_m_3_2003030.0f.ow	ASAR_US_20040606_m_6_2005052.1#	ASAR_35_20050101_m_10_200409.tdf.xml	ASAR_IS_20060416_m_11_200505.tf.aux.xni		KAR_15_20061028_m_22_200606.tf.ow	ASAR_US_20070804_m_26_200710.1#	ASAR_35_20080510_m_29_200812.hf.xml	ASAR_IS_20080927_m_31_200904.tf.aux.xni		🛃 ASAR_25_20090912_m_36_201006.tlf.ow	
S 14	ASAR_35_20031213_m_3_2003030.6f.xml	ASAR_IS_20040606_m_6_2005052.tf.auxml		ASAR_IS_20050416_m_11_200505.tf.ovr	ASAR_15_20050903_m_14_200607.bf	ASAR_35_20061028_m_22_200606.hf.sml	ASAR_IS_20070804_m_26_200710.tf.aurml		ASAR_IS_20080927_m_31_200904.bf.ovr	ASAR_I5_20090214_m_33_201001.tf	ASAR_35_20090912_m_36_201006.hf.xml	
S 15	ASAR_25_20031213_m_3_2003062.6fw	🛃 ASAR_IS_20040605_m_6_2009052.tf.ovr	ASAP_35_20050101_m_10_200410.8f		ASAR_JS_20050903_m_14_200607.8f.aux.xnl		ASAR_IS_20070804_m_26_200710.tf.ovr	ASAP_35_20080510_m_29_200904.8f	🐔 ASAR_IS_20000927_m_31_200904.tf .xml	&ASAR_J5_20090214_m_33_201001.8f.aux.xml		
50 16	ASAR_35_20001213_m_3_2003062.W	ASAR_JS_20040606_m_6_2006052.1f.xml	ASAR_35_20050101_m_10_200410.8F.aux.xml		ASAR_J5_20050903_m_14_200607.0F.ovr	ASAR_35_20061028_m_22_200710.M	ASAR_IS_20070804_m_26_200710.tlf.xml	ASAR_35_20080510_m_29_200904.1f. aux.xml		ASAR_J5_20090214_m_33_201001.tif.ovr	ASAR_25_20090912_m_36_201008.M	
17	& ASAR_IS_20001213_n_3_2003062.tf.aux.xml		ASAR_15_20050001_m_10_200410.bf.ovr		& ASAR_J5_20050903_m_14_200607.tf.xml	ASAR_15_20061028_m_22_200710.8f.aux.xml		ASAR_15_20080510_m_29_200904.bf.ov	ASAR_IS_20081206_m_32_200904.tf	& ASAR_IS_20090214_m_33_201001.bf.xml	ASAR_35_20090912_m_36_201008.8f.aux.xml	
62 10	ASAR_35_20031213_m_3_2003062.Mf.ow	ASAR_IS_20041023_m_8_2004060.18	ASAR_35_20090101_m_10_200410.8fl.xml	& ASAR_IS_20050416_m_11_200506.tf aux.xnl		ASAR_35_20061028_m_22_200710.MF.ow	ASAR_IS_20070904_m_26_200903.18	ASAR_35_20080510_m_29_200904.bf.vml	ASAR_IS_20081206_m_32_200904.tf .aux. sml	AS4R_JS_20090704_m_35_200807.tfw	ASAR_35_20090912_m_36_201008.MF.ov/	
ip 19	ASAR_35_20031213_n_3_2003062.0f.3ml	ASAR_IS_20041023_m_8_2004060.hf.aux.aml	ASAR 15 20050001 n 10 200411.0		ASAR_IS_20051112_m_15_200411.hf	ASAR_35_20061028_m_22_200710.1f.sml	ASAR_IS_20070004_m_26_200000.tf.aux.aml	ASAR_IS_20080719_N_30_200708.0%	ASAR_15_20001206_m_32_200904.tf.ovr	ASAR_IS_20090704_m_35_200007.nf	ASAR_35_20090912_m_36_201008.tf.xml	
20	ASAR_JS_20031213_n_3_2003110.tfw ASAR_JS_20031213_n_3_2003110.tfw	ASAR 15 20041023 m 8 2004060.0F.cm	ASAR 15 20050001 m 10 200411.8F aux and		ASAR 15 20051112 m 15 200411.0F.aux XM	ASAR_15_20070306_H_23_200703.0F	ASAR IS 20070804 m 26 200803.0F.ove	ASAP (15.20080/19 /n.30.200708.07 ASAP 15.20080719 /n.30.200708.05 aux.uni		ASAR 15 20090704 m 35 20080778 over	ASAR 15_20091121_N_37_200904.0F	
5 2 21	SAR_35_20031213_H_3_2003110.0F SAR_25_20031213_H_3_2003110.0F.azv.mi		ASAR_15_20050101_ft_10_200411.8F. W/J.SM		ASAR_15_20051112_m_15_200411.0F.om	ASAR_35_20070306_H_23_200703.0F.azx.xml		ASAR_15_20080719_n_30_200708.8F.ovr	ASAR_15_20090214_m_33_200603.tf	ASAR_JS_20090704_m_35_200007.bf.cm	#SAR_05_20091121_n_37_200904.0F.aux.xml	
22	ASAR_IS_20031213_m_3_2003110.0F.ov	ASAR_IS_20041023_m_8_2004091.tf	ASAR_15_20050001_m_10_200411.bf.xml	ASAR_IS_20050416_m_11_200512.tf aux.xml		ASAR_15_20070306_m_23_200703.0F.ov	ASAR_IS_20080301_m_28_200710.tf	ASAR_15_20080719_m_30_200708.8F.xml	ASAR_IS_20090214_m_33_200803.tf.auxml		ASAR_15_20091121_m_37_200904.8F.ovr	
🔁 23	ASAR 25 20001213 m 3 2003110.8f.xml		ASAR 15 20050101 m 10 200504.0m		ASAR 15 20051112 m 15 200504.0F	ASAR 25 20070306 m 23 200703.6f. ml		ASAR 15 20080719 m 30 200710.15M	ASAR 15 20090214 m 30 200003.tf.ovr	ASAR 15 20090704 m 35 200809.8f	ASAR 25 20091121 m 37 200904.8f.ml	
S 24	ASAR_15_20031213_m_3_2004050.tfw	ASAR IS 20041023 m 8 2004091.18 ovr	ASAR_15_20060001_m_10_200604.bf		ASAR 15 20051112 m 15 200504.bl.aux ml		ASAR IS 20080301 m 28 200710.18 ovr	ASAR 15 20080719 m 30 200710.18	ASAR_IS_20090214_m_33_200803.MF.ml	ASAR_IS_20090704_m_35_200809.tif.aurml		
<u>මා</u> ස බා ස	ASAR 25 20031213 m 3 2004050.6f	ASAR 15 20041023 m 0 2004091.tf.xml	ASAR 15 20050101 m 10 200504.tef.aux.xml		ASAR 15 20051112 m 15 200504.bf.ovr	ASAR 25 20070526 m 25 200606.1f	ASAR IS 20000301 m 20 200710.tf.xml	ASAR 15 20000719 m 30 200710.8f.aux.ml		ASAR 15 20090704 m 35 200809.2f.ovt	asan 15 20091121 m 37 200909.8f	
N (2) 15	ASAR_25_20031213_m_3_2004050.tf.aux.vml	ASAR_JS_20041023_m_8_2004112.tfw	ASAP_35_20050101_m_10_200504.tif.ovr	ASAR_IS_20050521_m_12_200411.1#	AS4R_JS_20051112_m_15_200504.tif.xml	ASAR_35_20070526_m_25_200606.tif.aux.xml	ASAR_IS_20080301_m_28_200812.tfw	ASAP_35_20090719_rr_30_200710.8f.ovr	ASAR_IS_20090214_m_23_200805.1#	ASAR_JS_20090704_m_35_200809.tf.xml	ASAP_35_20091121_m_37_200909.8f.aux.xmi	
	ASAR_35_20031213_m_3_2004050.hf.ovr	ASAR_IS_20041023_m_8_2004112.1f	ASAR_35_20050001_m_10_200504.bf.xml	ASAR_IS_20050521_m_12_200411.tf.aux.xml	ASAR_J5_20051112_m_15_200505.tfm	ASAR_35_20070526_m_25_200606.hf.ovr	ASAR_IS_20080301_m_28_200812.1f	ASAR_35_20080719_m_30_200710.8f.xml	ASAR_15_20090214_m_33_200805.tf .auxml	ASAR_15_20090704_m_35_200812.tfm	ASAR_35_20091121_m_37_200909.bf.ovr	
🕷 🐑 Envisat	& ASAR_15_20031213_n_3_2004090.tf.xnl	& ASAR_IS_20041023_m_8_2004112.htf.aur.xml			ASAR_JS_20051112_m_15_200905.0f	ASAR_35_20070526_m_25_200606.tf.xml	& ASAR_IS_20080301_m_28_200812.tf .aur.xml		🛃 ASAR_IS_20090214_m_33_200805.tf.ovr	ASAR_JS_20090704_m_35_200812.ht	ASAR_35_20091121_m_37_200909.tf.xml	
H D BS	ASAR_25_20040117_m_4_2003030.16w	KAR_IS_20041023_m_8_2004112.1f.ovr	ASAR_35_20050101_m_10_200505.hF	ASAR_IS_20050521_m_12_200411.1f.xml	ASAR_IS_20051112_m_IS_200505.bf.aux.xml		ASAR_IS_20080301_m_28_200812.1f.ovr	ASAR_35_20080719_m_30_200803.hF	ASAR_IS_20090214_m_33_200805.tF.xml	ASAR_IS_20090704_m_35_200812.hF.auxml		
🗏 😥 Minefields	ASAR_35_20040117_m_4_2003030.1f	asaR_IS_20041023_m_8_2004112.Xf.xmi	asar_15_20050001_n_10_200505.bf.aux.xml		ASAR_J5_20051112_m_15_200505.bf.ovr	ASAR_15_20070526_m_25_200610.1df	asaR_JS_20080301_m_28_200812.tf .vml	asar.j5_20080719_n_30_200803.kf.aux.xml		ASAR_J5_20090704_m_35_200812.hf.ovr	ASAR_35_20091121_m_37_201001.hf	
🖃 🔛 Coherence	& ASAR_JS_20040117_m_4_2003030.tf.aux.vni		ASAR_35_20050101_m_10_200605.6F.ov/		ASAR_JS_20051112_m_15_200505.tif.xml	ASAR_J5_20070526_m_25_200610.tif.aux.xml		AS4R_35_20080719_m_30_200803.bf.ovr	ASAR_IS_20090214_m_33_200807.1/	ASAR_JS_20090704_m_35_200812.tif.xml	ASAR_35_20091121_m_37_201001.6F.aux.xml	
🗷 😜 Envisat	asan_25_20040117_m_4_2003030.tf.ovr	ASAR_IS_20041023_m_8_2006041.2F	A5AP_35_20050101_m_10_200505.8f.xml	ASAR_15_20050521_m_12_200512.tf.aux.>ml		ASAR_25_20070526_m_25_200610.8f.ov/	ASAR_15_20000510_m_29_200705.tf	ASAP_35_20080719_m_30_200803.bf.xml	ASAR_25_20090214_m_33_200007.tf .aux.xml		ASAR_35_20091121_m_37_201001.8f.ovr	
🕷 🐑 BRS	& ASAR_35_20040117_n_4_2003030.18f.sml	ASAR_JS_20041023_m_8_2005041.1#.aur.cml		ASAR_JS_20060521_m_12_200512.tf.ovr	ASAR_J5_20051112_m_15_200506.18	ASAR_35_20070526_m_25_200610.18f.sml	& ASAR_IS_20080510_m_29_200705.tll.aur.xml	2 ASAR JS_20080719_N_30_200809.0%	ASAR_US_20090214_m_33_200807.tlf.ovr	ASAR_IS_20090704_m_35_200904.bl	ASAR_35_20091121_n_37_201001.bf.sml	
🖃 🐑 Intensity	#1ASAR_15_20040117_m_4_2003062.6fm #ASAR_15_20040117_m_4_2003062.0fm	ASAR IS 20041023 m 0 2005041.28 SH	ASAP_35_20050001_m_10_200506.8F @ ASAP_35_20050001_m_10_200506.8F.aux.ml		ASAR_J5_20051112_m_15_200506.bf.aux.xml & ASAR_J5_20051112_m_15_200506.bf.aux.xml	ASAR_35_20070526_H_25_200703.0F	ASAR_IS_20000510_m_29_200705.tf.ovr ASAR_IS_20000510_m_29_200705.tf.ovr	ASAR_IS_20080719_R_30_200809.8P & ASAR_25_20080719_R_30_200809.8F.aux.xml		ASAR_IS_20090704_m_35_200904.tf.aux.aml & ASAR_IS_20090704_m_35_200904.tf.aux.aml	ASAR_IS_20091121_H_37_201004.0F	
📧 🐑 Envisat	#SAR_15_20040117_n_4_2003062.0f #SAR_15_20040117_n_4_2003062.0f.aux.xni		ASAP 15 20050001 m 10 200506.0F. 0/r		ASAR 15 20051112 m 15 200506.0F.cm	ASAR_25_20070525 m 25_200703.0F.aux.cml		ASAR US 20080719 m 30 200809.8F.ovr	ASAR_IS_20090214_m_33_200809.tf	ASAR 15 20090704 m 35 200904.bf.cm	ASAR_E_5_20091121_n_37_201004.0F ASAR_25_20091121_n_37_201004.0F.aux.xml	
H 🔂 BIS	ASAR 15 20040117 n 4 2003062.1f or	ASAR IS 20041023 m 8 2005052.1f	ASAP 15 20090101 n 10 200906.8f.xnl	ASAR IS 20050625 n 13 200409.tf apr. ml		ASAR 15 20070526 n 25 200703.8f.or	ASAR IS 20080510 m 29 200708.tf	ASAR 15 20080719 m 30 200809 kf.xml		ASAR 15 20090704 m 35 200909.th	ASAR 25 20091121 n 37 201004.0f.ovr	
😜 SARMAP	ASAR 25 20040117 m 4 2003062.1f .ml	ASAR IS 20041023 m 8 2005052 M aur. 314		ASAR IS 20050625 m 13 200409.M ove	ASAR 15 20051112 m 15 200509.14	ASAR 25 20070526 m 25 200703.MF. ml	ASAR IS 20080510 m 29 200708.18 aur. and		ASAR 15 20090214 m 30 200809.W.ovr	ASAR 15 20090704 m 35 200909.14	ASAR 25 20091121 m 37 201004.8F.ml	
SSR_Martin	ASAR 15 20040117 m 4 2004050.tfw	ASAR 15 20041023 m 8 2005052.tf.ovr	ASAR 15 20050101 m 10 200509.8f		ASAR 15 20051112 m 15 200509.bf.aux.xml		ASAR IS 20080510 m 29 200708.tf.ovr	asan 15 20080719 m 30 200812.8f	ASAR 15 20090214 m 33 200809.tf ami	ASAR 15 20090704 m 35 200909.0f.aux.xml		
54 Skymep_Rohit 10 U2_Neilb	ASAR 15 20040117 n 4 2004050.0F	ASAR_IS_20041023_m_8_2005052.ML xml	ASAR 15 20050001 m 10 200509.0f. aux.xml		ASAR 15 20051112 m 15 200509.bl.ovr	ASAR 15 20070526 m 25 200708.W	ASAR IS 20080510 m 29 200708.tf am	ASAP_15_20080719_m_30_200812.hf.aux.xml		ASAR IS 20090704 m 35 200909.M.ovr	ASAR_25_20091121_m_37_201006.MF	
Expression	ASAR 25 20040117 m 4 2004050.tf.aux.vml		ASAR_35_20050001_m_10_200509.bf.ovr	ASAR_15_20050625_m_13_200411.tf	ASAR_15_20051112_m_15_200509.bf.xml	ASAR_35_20070526_m_25_200708.bf.aux.xmi	ASAR 15 20080510 m 29 200710.tfw	ASAR_35_20080719_m_30_200812.8f.ovr	ASAR_15_20090214_m_33_200012.tf	ASAR 15 20090704 m 35 200909.8f.xml	ASAR_35_20091121_m_37_201006.8f.aux.xm	
Gooreader	ASAR_15_20040117_m_4_2004050.tf.ow	ASAR_JS_20041023_m_8_2006062.1#	ASAR_35_20060101_m_10_200609.tif.xml	ASAR_IS_20060625_n_13_200411.tf.aux.xnl		ASAR_35_20070526_m_25_200708.tdf.ow	ASAR_IS_20080510_m_29_200710.1#	asar_15_20080719_n_30_200812.hf.xml	ASAR_IS_20090214_m_33_200812.tlf.acc.xnl		ASAR_35_20091121_n_37_201006.bf.ow	
Storedor	ASAR_15_20040117_m_4_2004050.tf.sml		ASAP_35_20050001_m_10_200511.6fw	ASAR_15_20050625_m_13_200411.tf.ovr	ASAR_15_20051112_m_15_200512.6F	ASAR_35_20070526_m_25_200708.8f.sml	ASAR_IS_20080510_m_29_200710.tf.aurml	ASAR_35_20080719_m_30_200904.8fm	ASAR_15_20090214_m_33_200812.tf.ovr	ASAR_J5_20090704_m_35_200911.8f	ASAR_35_20091121_m_37_201006.bf.sml	
M Promotion	ASAR_25_20040117_m_4_2004060.tfw	ASAR_IS_20041023_m_0_2006062.1#.ovr	ASAR_35_20050101_n_10_200511.8f		ASAR_J5_20051112_m_15_200512.0f.aux.cml		ASAR_IS_20080510_m_29_200710.tf.ovr	ASAR_35_20080719_m_30_200904.bf	ASAR_25_20090214_m_30_200012.tf.xml	& ASAR_IS_20090704_m_35_200911.bf.aux.xml		
B Ply Pictures	ASAR_15_20040117_m_4_2004060.tf	ASAR_IS_20041023_m_8_2005062.tf.xml	ASAR_15_20050101_m_10_200511.16F.aux.cml		ASAR_J5_20051112_m_15_200512.tif.ovr	ASAR_35_20070526_m_25_200710.8F	ASAR_IS_20080510_m_29_200710.tf.xml	ASAR_15_20080719_m_30_200904.tif.auxml		ASAR_JS_20090704_m_35_200911.tif.ovr	ASAR_35_20091121_m_37_201008.bF	
Thy Videos	SAR_25_20040117_n_4_2004060.8f.aux.xml	AGAR_IS_20041023_m_0_2006090.tfw	ASAR_35_20050101_m_10_200511.8f.ovr	200509.tf	& ASAR_J5_20051112_m_15_200512.6f.xml	ASAR_35_20070526_m_25_200710.8f.aux.xml	<pre>W_AGAR_IS_20080510_m_29_200803.tfw</pre>	🛃 ASAR_35_20080719_m_30_200904.bf.ovr	200904.tf	& ASAR_JS_20090704_m_35_200911.8f.xml	asaP_35_20091121_m_37_201000.8f.aux.xml	
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On-going work



- The 6-month project ends December 31, 2013
- We are currently busy with:
 - Segmentation and classification through analysis of stacks of
 - ENVISAT amplitude
 - ERS amplitude
 - ENVISAT coherence
 - ERS coherence
 - Combination of the above results using various fusion methods
 - Reduction of mine suspected zones based on all the above
 - Validation using ground-information
- Hoping to see you during the next BEODays with a summary of our results ⁽²⁾