



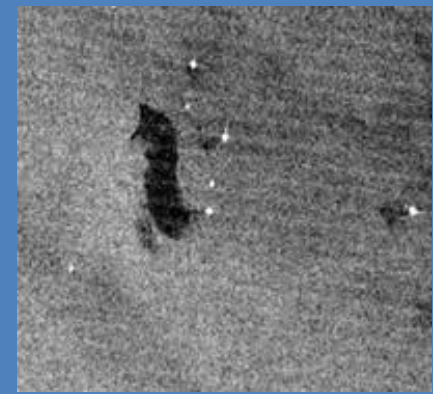
Bonn Agreement
Accord de Bonn

Seminar on remote sensing, MARPOL regulations & initiating legal proceedings **14 – 16 April 2015**



Setting the scene

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Sjon Huisman, RWS



Remote Sensing within the Bonn Agreement

- Aerial surveillance from '80s, all CPs since 1989
Operational discharges → *Marine pollution control flights*
Accidental spills → *aerial monitoring & guidance in response*

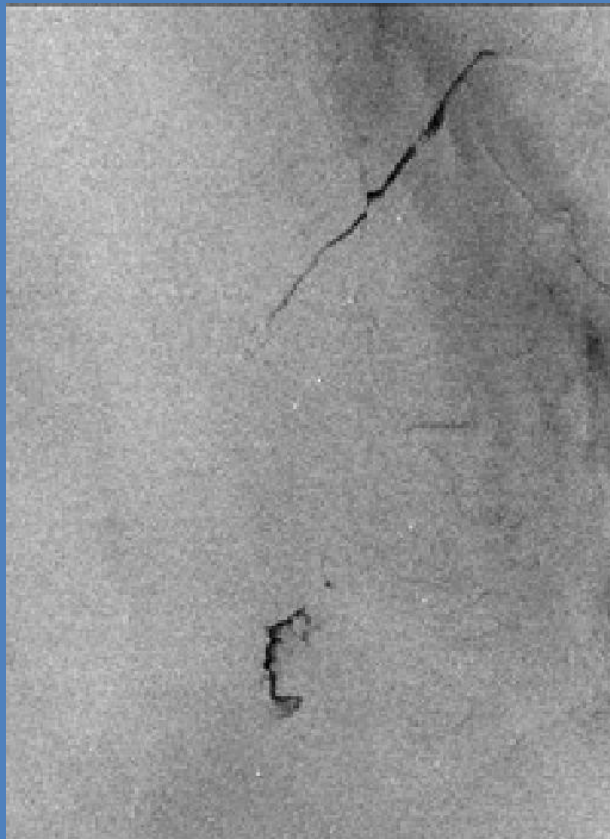


• Satellite surveillance from early '90s

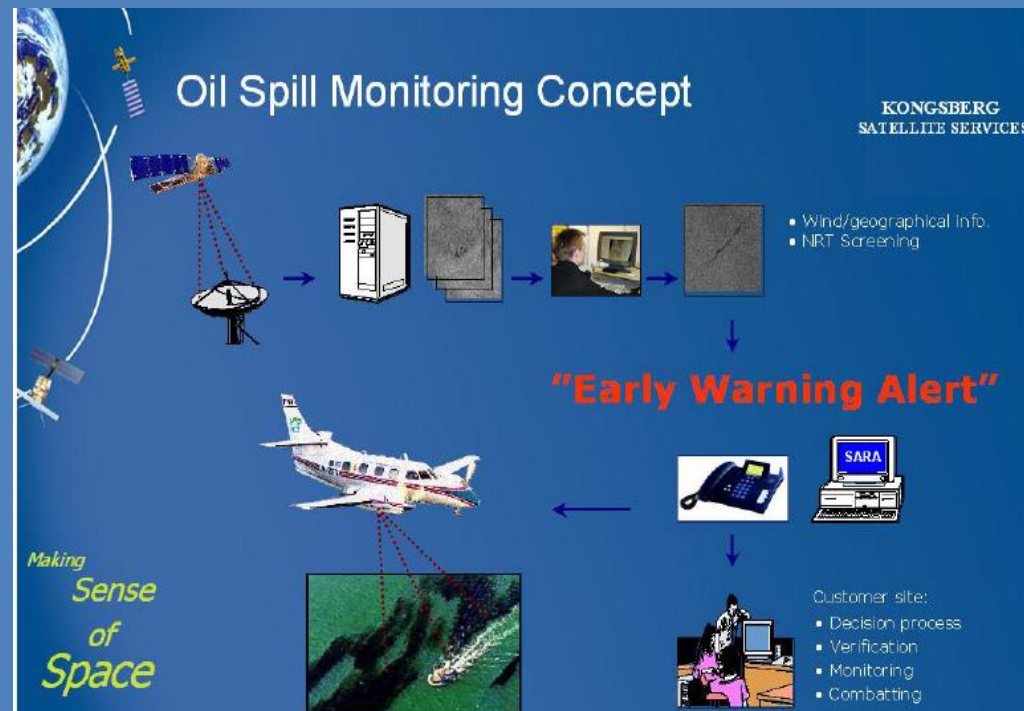
→ North Sea Pilot Project; from 2007 CleanSeaNet



→ Monitoring of both operational and accidental spills

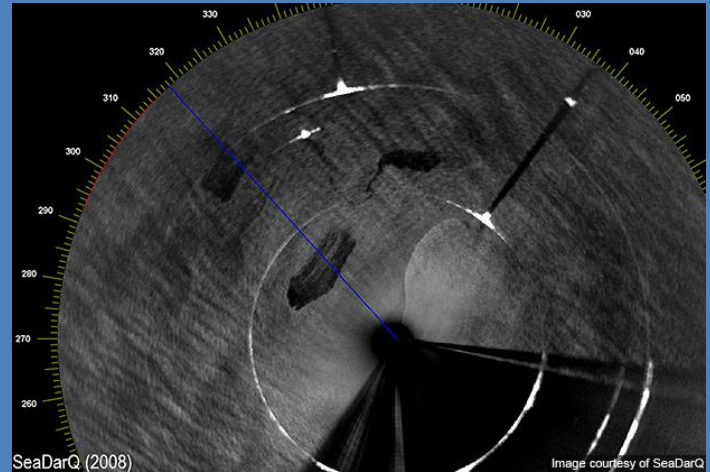


ENVISAT or RADARSAT orbit.
Detection by means of SAR
Early warning system, steered by K-SAT
Verification / validation by aircraft



- **Sensors mounted on board of response vessels**

Sensor systems (radar, IR) used on board of response vessels to detect oil spills, since 2000

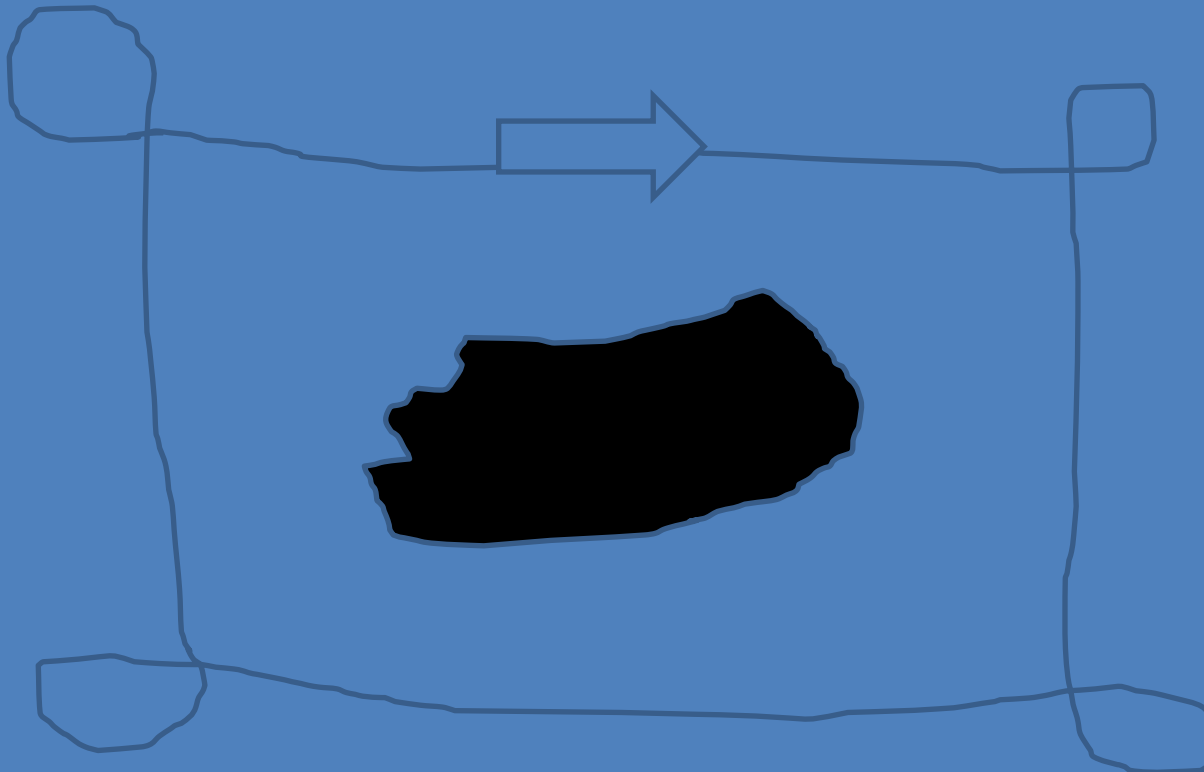


R/S Aircraft - what sensors for detection and observations (1)

- Side Looking Airborne Radar (**SLAR**)
long range detection of surface phenomena
- UltraViolet-InfraRed (**UV-IR**) scanner or cameras
close range optical data of oil slick dimensions and relative layer thickness (due to temperature differences)
- MicroWaveRadiometer (**MWR**)
measuring variation in layer-thickness

A pattern

- In higher wave conditions a pattern is flown to radiate the slick from all sides.



R/S Aircraft - what sensors for detection and observations (2)

- Forward Looking Infrared Camera (**FLIR**)
Typical SAR/CG instrument, alternative for UV-IR
- Laserfluorosensor (**LFS**)
Active laser to “sample” surface slicks compared to database of substances
- Photo- and/or video cameras
- Accurate Navigation
- Maritime radio for communication with vessels

R/S Aircraft - what sensors for observations (3)

- **MK1 Eyeball**



the human eye connected to a substantial computer (brains) to relate surface phenomena and oil appearances

→ **Bonn Agreement Oil Appearance Code (BAOAC)**

→ **NL Study on “visibility limits”**

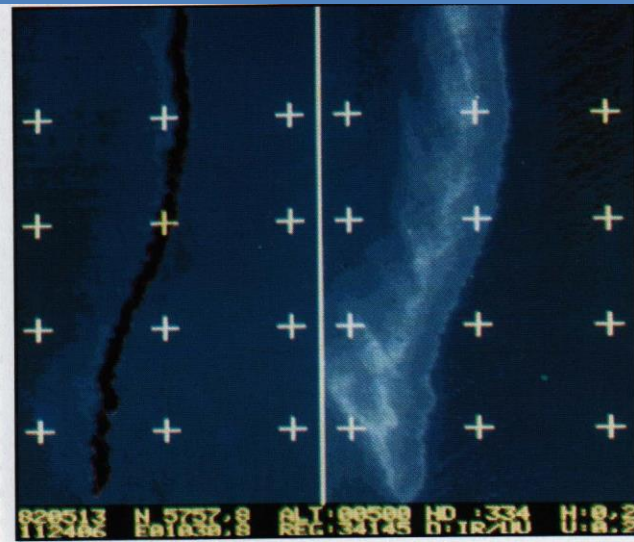
Proving that when traces of oil are observed in the wake of a vessel it is a violation of MARPOL



N52°32'58" E004°12'33"
Speed 174 kts RAlt 1498 ft Track 278° Normal pulse
H/D 148°/23.1nm Drift -5.2° Logarithmic



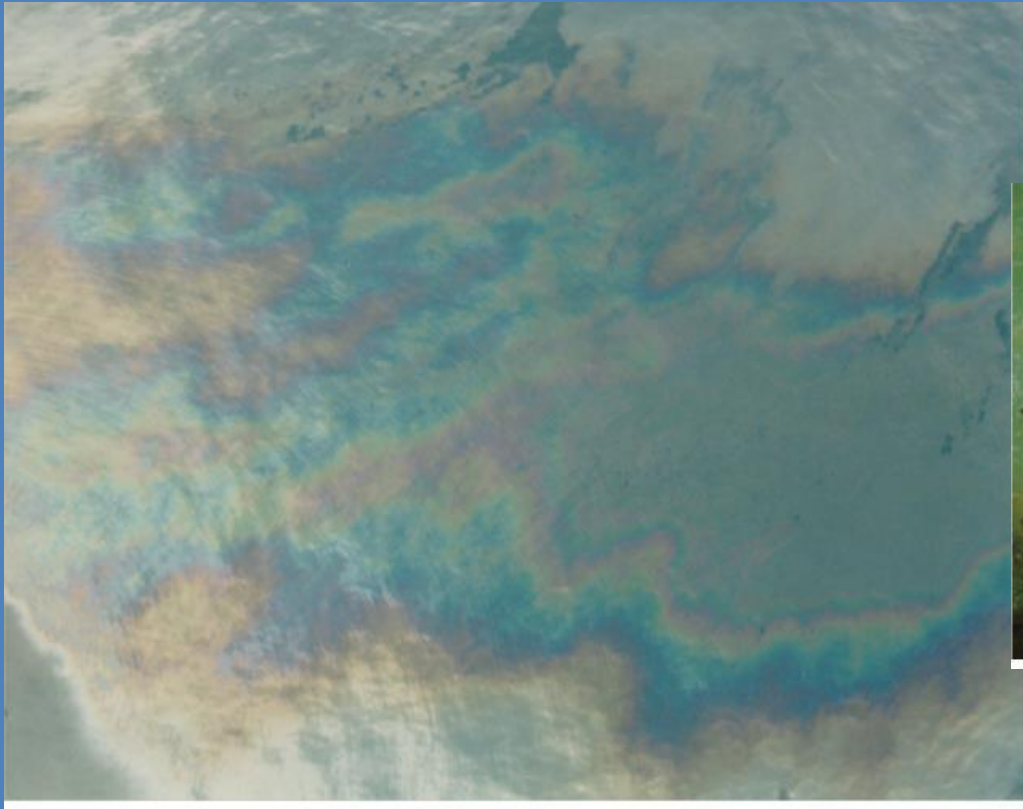
0111 090000Z POS N: 6715.0 HOB: 300 E
201 30248 HD: 219 ALT: 1000 DISP: 1R/UC



92513 N: 5737.0 ALT: 90500 HD: 334 U: 0.00



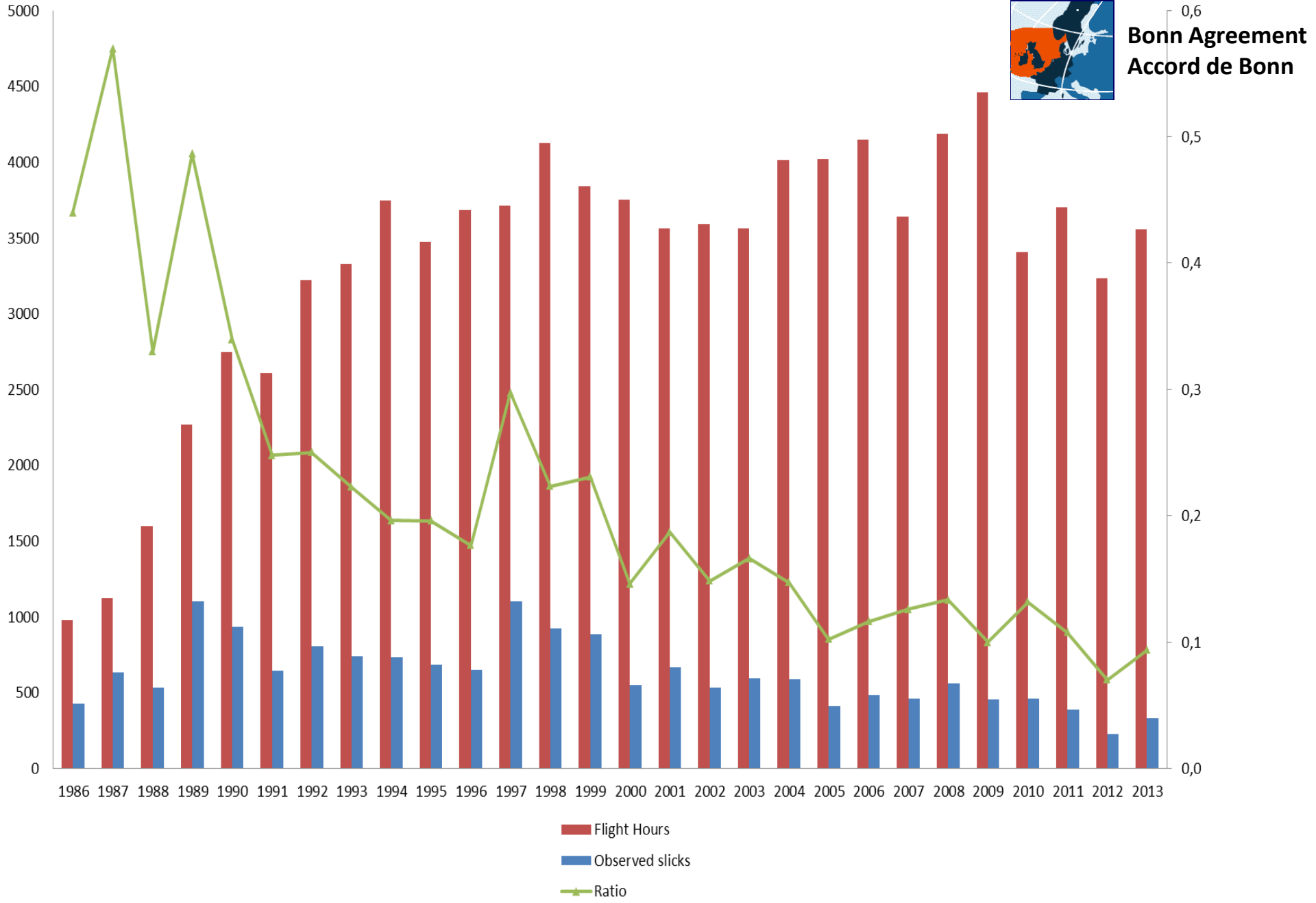
Do you know the color of oil?



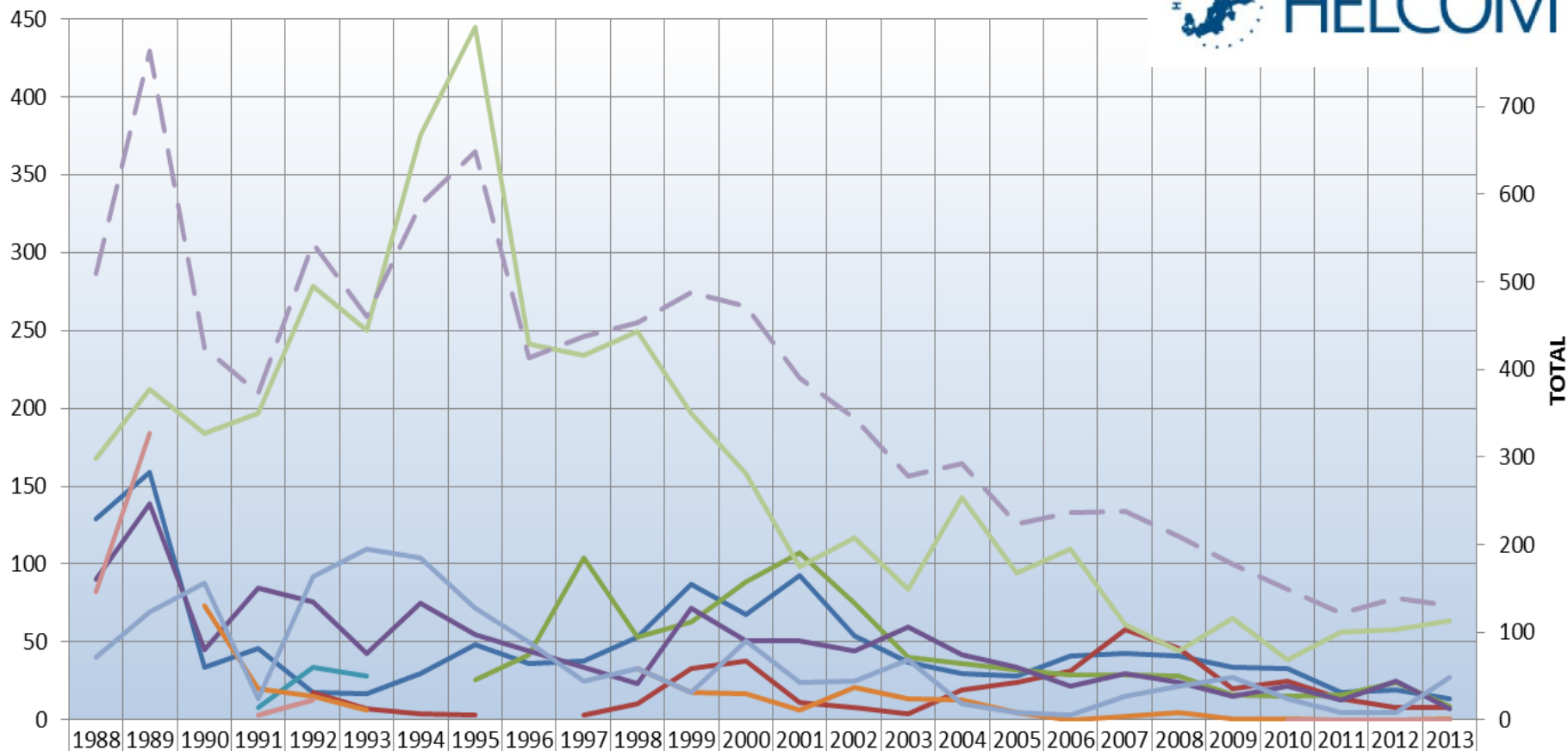
The appearance of oil at sea surface is related to the thickness of the oil layer. The operator assesses the oil slick and estimates the volume. A lower limit is to be used for initiating proceedings against the violator; the upper limit is for defining response capacity



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Number of confirmed oil spills per HELCOM country, 1988-2013

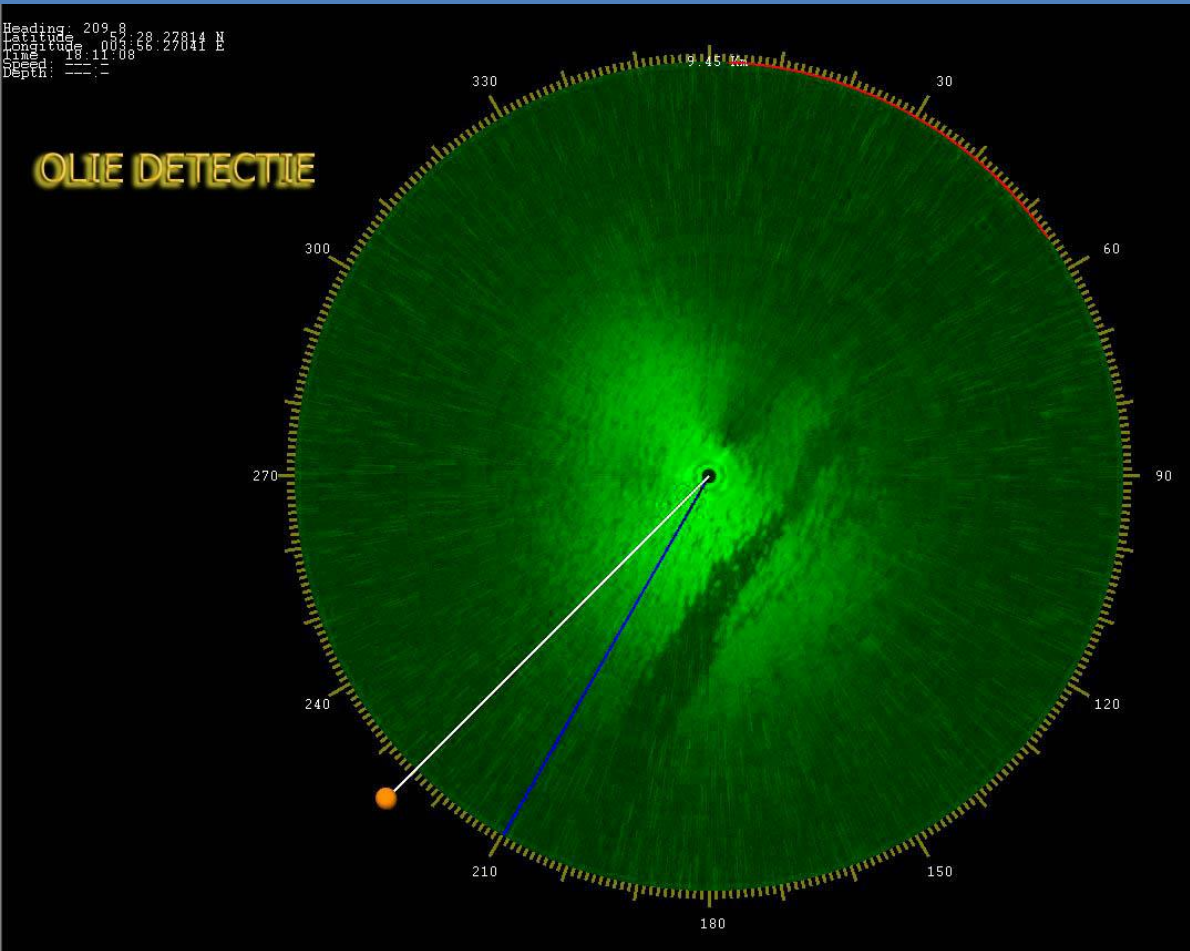


	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Denmark	129	159	34	46	18	17	30	48	36	38	53	87	68	93	54	37	30	28	41	43	41	34	33	18	19	14
Estonia					18	7	4	3		3	10	33	38	11	8	4	19	24	31	58	46	20	25	14	8	8
Finland								26	42	104	53	63	89	107	75	40	36	32	29	29	28	16	15	16	24	9
Germany	90	139	45	85	76	43	75	55	44	34	23	72	51	51	44	60	42	34	22	30	24	15	22	13	25	7
Lithuania				8	34	28																0	0	0	0	0
Latvia			73	20	15	6					33	18	17	6	21	14	13	5	0	2	5	1	1	0	0	1
Poland	40	69	88	14	92	110	104	72	50	25	33	18	51	24	25	39	10	5	3	15	22	27	14	5	5	27
Russia	82	184		3	13													2					0	0	0	0
Sweden	168	212	184	197	278	250	375	445	241	234	249	197	158	98	117	84	143	94	110	61	44	65	39	56	58	64
Total	509	763	424	373	544	461	588	649	413	438	454	488	472	390	344	278	293	224	236	238	210	178	149	122	139	130

Shipborne sensors

- Raw data taken from ship radar or
- Raw data taken from dedicated scanner
- Systems: Rutter; SeadarQ; Sens2sea; Consilium; Miros.....more?
- Pair of binoculars
- IR camera
- Aerostat (balloon) with camera system launched from a vessel.

Limited coverage

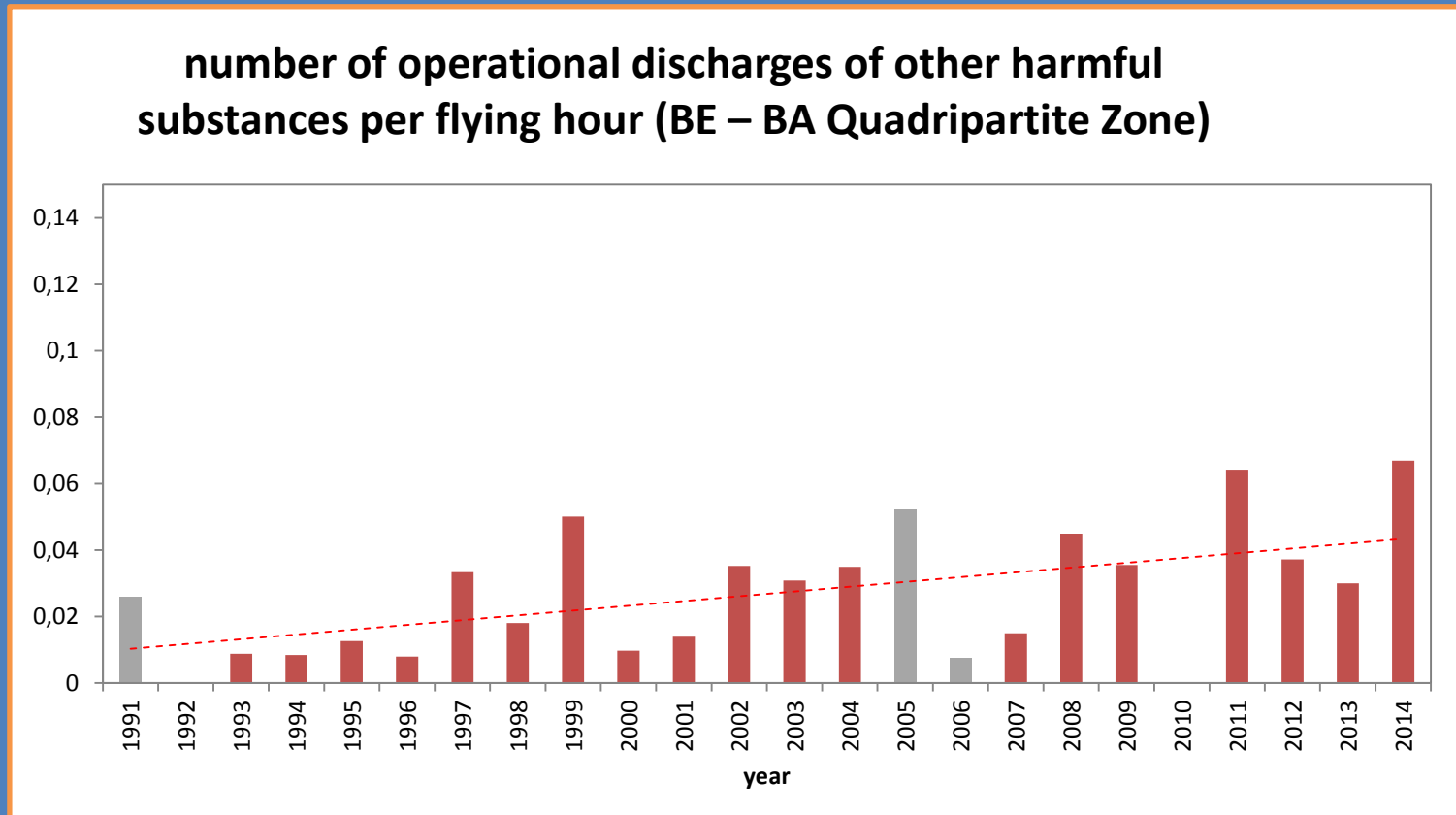


But Aerial surveillance & remote sensing are not limited to oil

- *Other harmful substances (LNS)*
- *Waste/solid cargo residues*
- *'Unknown' detections*
- *[Atmospheric emissions from ships]*

Other harmful substances

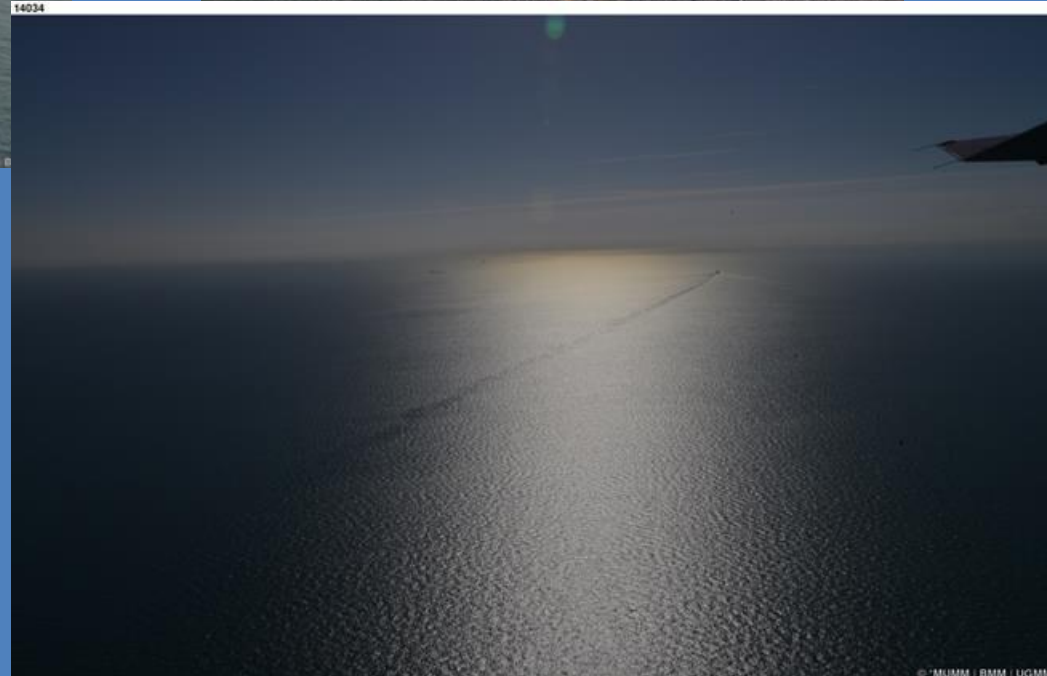
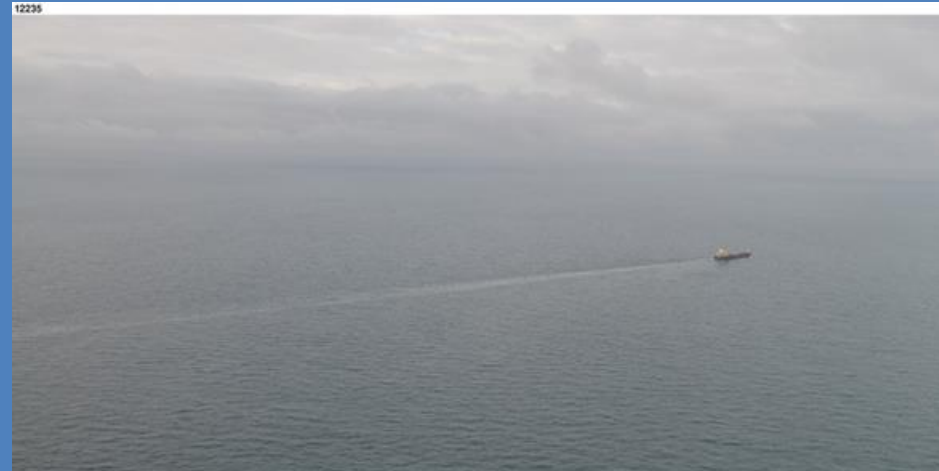
- Increase of spills of other harmful substances
MARPOL Annex II discharges (LNS)



Other harmful substances

- [satellite detection,]
- Aircraft SLAR detection,
- Visual observation from distance,
- Transparent slicks when overhead, or slicks with equal sheens, or other appearance (≠BAOAC)
 - *Sometimes vessel connected, identification substance possible*
 - *Often orphan slick without vessel, no information on substance*
- Sampling difficult if not impossible → pick up
- **Sometimes illicit discharge, but often legal (!)**
 - *Cf. (non) respect of general MARPOL Annex II discharge standards*

Other harmful substances



Waste/solid cargo residues

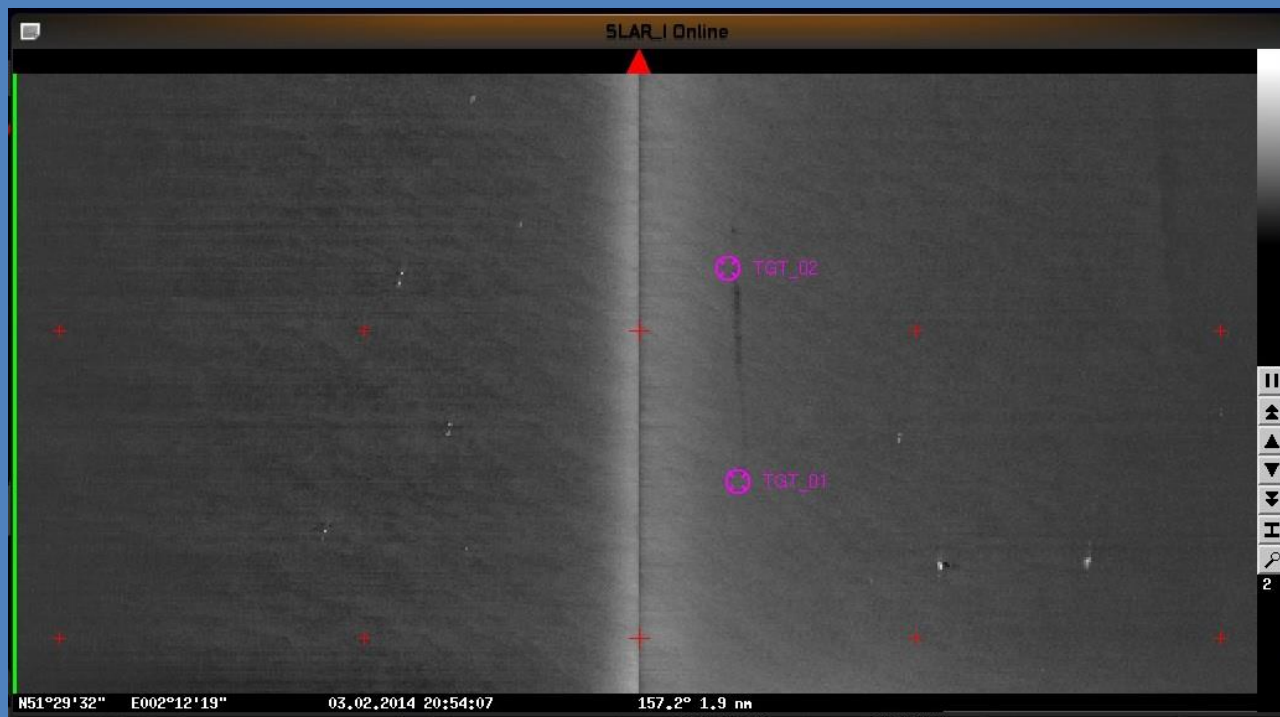
- = MARPOL Annex V discharges

North Sea = Special Area



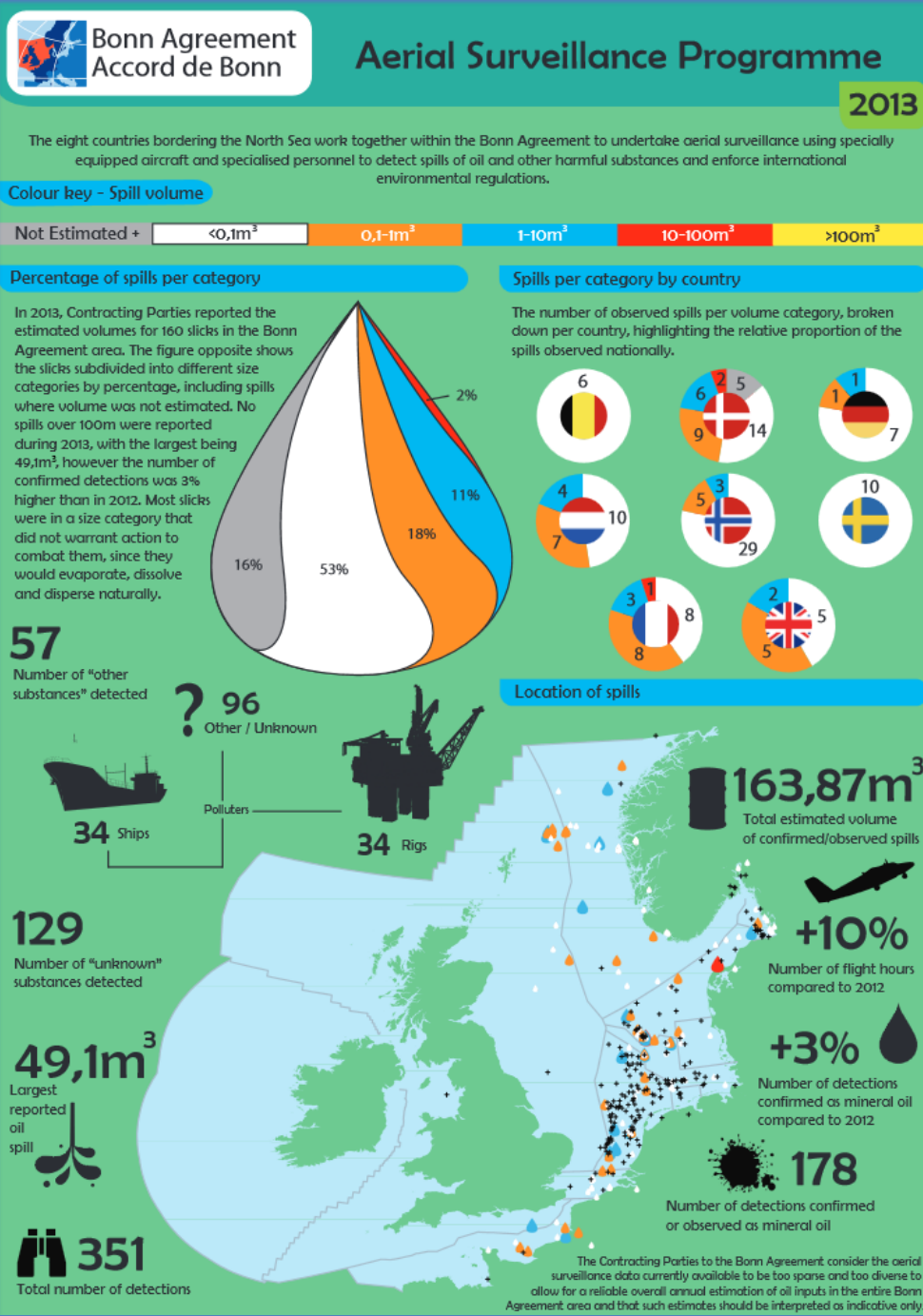
Detection of 'unknowns'

- Detections during night flight or in bad visibility
 - *No visual verification possible, only sensor image*
 - *Oil? Other harmful substance?*



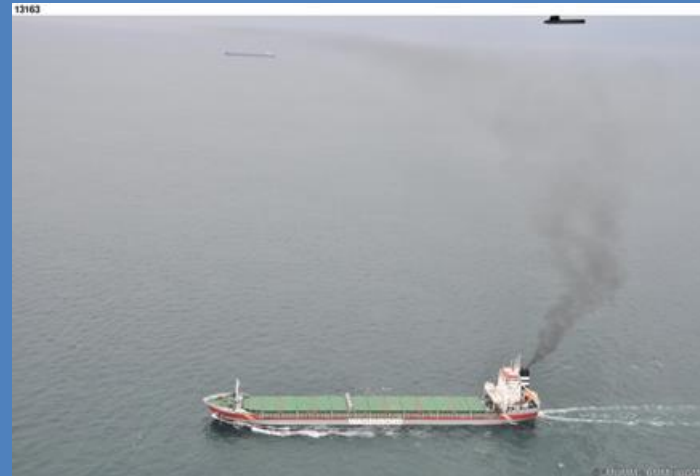
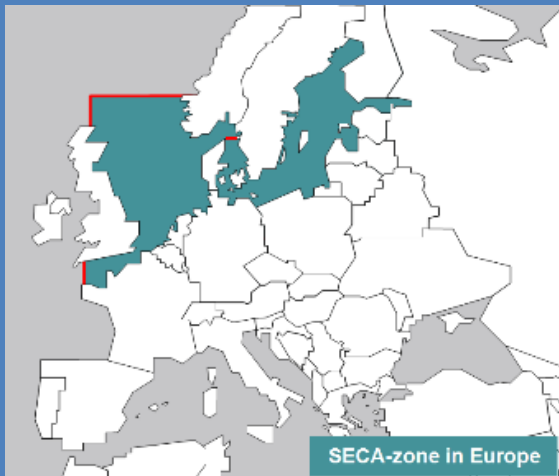
Bonn Agreement now collects statistical data on:

- Oil spills
- Other harmful substances
- 'Unknowns'



Atmospheric (SO_x) emissions from ships

- From 1/1/15, permitted S-emission in SECAs almost dropped to zero (0.1%)*
 - * *MARPOL Annex VI / Sulphur Directive*
- No BA task (yet) - but some countries start with **S-emission control flights** this year
 - *CompMon Pilot Project (TEN-T Call / DG MOVE)*



Current status BA (EU)

- Sufficient R/S aircraft
- Sufficient flight hours
- Good sensor capability for oil
- Aerial Operations Handbook (procedures)
- Extra Satellite surveillance (CSN)
- Good international cooperation
- EMSA training courses, EMPOLLEX exchange prog.
- SHARP DECLINE in operational oil spills (from ships)
- Improved response in darkness/bad visibility

What is the problem? - Issues

1. **Threat of reduction** in flight hours in some CPs
cf. budget cuts
2. Tendency of **diversification** of flight tasks
border patrol, navigation, fisheries, ...
3. Increase in **other harmful substances**
& problem of **'unknowns'**
What is substance floating at sea surface?
Can (costly) sensors reliably identify substance?
How to build a strong MARPOL-file in such cases?

What is the problem? - Issues (2)

4. What about **SOx emission** enforcement needs?
EU ship owners strongly urge for at-sea controls
5. What kind of enforcement do MARPOL Annexes request? **Where can R/S assets best contribute?**
- costs vs. benefits?
6. How to further improve **response in darkness & bad visibility?**

OTHER ?

BA Remote Sensing Workshop

- Bring together operational & legal experts, industry & researchers
- With the aim to exchange info & discuss:
 - Current **challenges in marine pollution**
 - State of the Art & developments in **remote sensing**
 - Use/utility of sensors from **legal point of view**
 - Useful **further actions**

...Keeping the problems/issues in mind

Wishing you a fruitful Workshop !

