



Background to *Cedre's* involvement in different detection techniques

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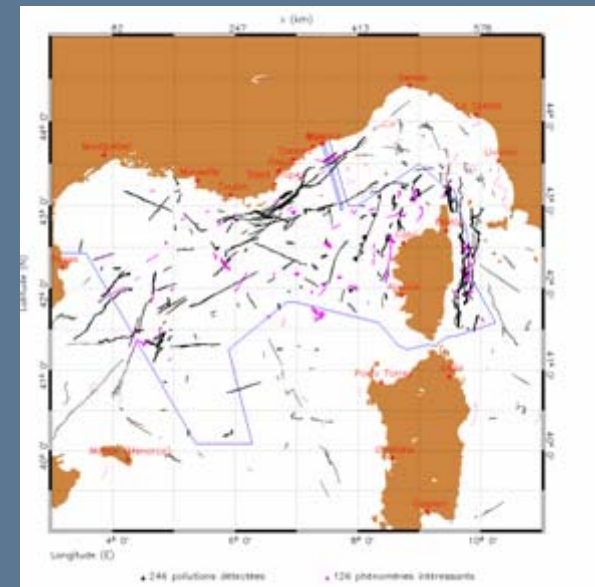
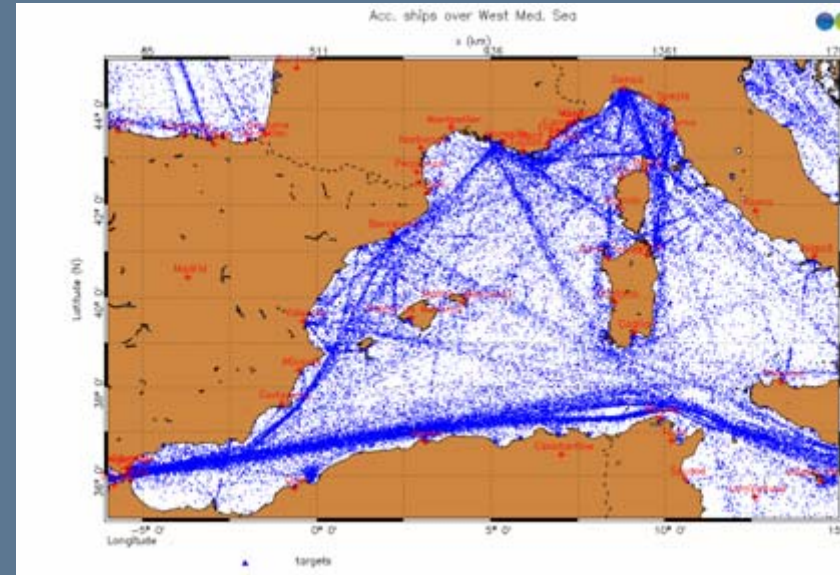
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Research and development

- Satellite imagery (radar)
- Aerial detection and remote sensing
- Detection of sunken oil
- Fixed devices
- Oil detection at the surface by shipborne sensors
- Drifting buoys / dye release
- Container detection / tagging
- Gas detection
- Wrecks
- Inland waters

Satellite imagery (radar)

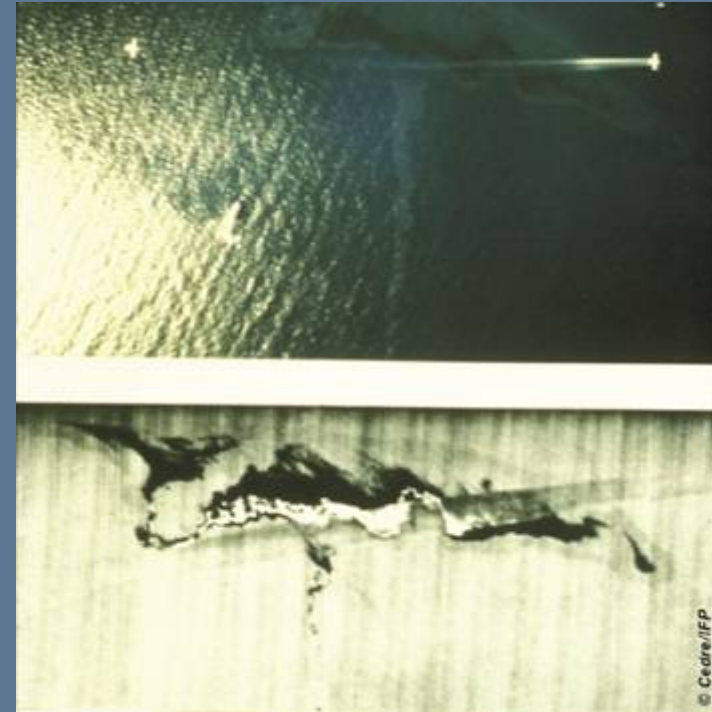
- Mediterranean delegate in charge of this topic
- Started in 1997 (OILWATCH)
- Many European projects (RAMSES, GAIANET, CLEOPATRA, DECLIMS, VASCO...)
- Treatment of satellite (radar) images
- Analysis of SAR images and exploitation with the aim of reducing illegal discharges
- A few interesting images (but quite late) during the *Prestige* spill
- Pictures: ship traffic in the Mediterranean Sea, spill detections, produced by CLS-BOOST for *Cedre*



Courtesy of CLS-Boost

The 1980s: the Protecmar trials

- Actually began in 1979
- Research campaigns on the use of dispersants
- With aerial guidance
- Spraying effectiveness monitored by observation / photos
- Detection/dye tracking techniques are included in the trials



Dispersant spraying: visible and IR images – Protecmar 3, 30/09/81, source IGN, © Cedre/IFP

The 2000s: DEPOL, Protecmar's heirs

- Depol 04, 05 and 07
- 04: intercalibration of remote sensing means: Bonn Agreement + Japan (LIDAR) + Actimar
- 07: French customs + tests of other devices
- And since, involvement in other projects (POLHSAR)

...



DEPOL 04 – Some of the aircraft involved - Source Cedre

Vegetable oils and chemicals

- Same idea: study products' behaviour and possibilities of detection / dyeing
- Pollutmar, since 1989: HNS
- PALMOR, end of the '90s (VO)
- Rapsodi I and II (2001-2002), EC projects (HNS and VO)
- Clara 2, ANR (HNS)
- Tests of dyes (several experiments)



Palmor 2: palm oil slick, October 1998 – source *Cedre*



Clara 2: spill of product from BSAD *Ailette*, September 2008 – Source *Cedre*

Detection of sunken oil

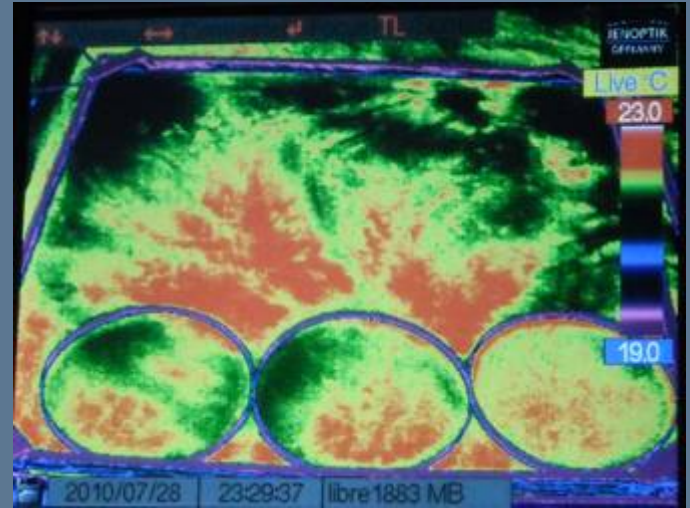
- Aftermath of the *Erika* spill
- Started in 2002:
 - RITMER project EXCAPI
- Test of acoustic sensors in a dry dock
- European project DENIM
 - (with ICRAM and IFREMER)
- European project ASMA (with DHI, GRAS, NOC)
- Goes on with VASQUE



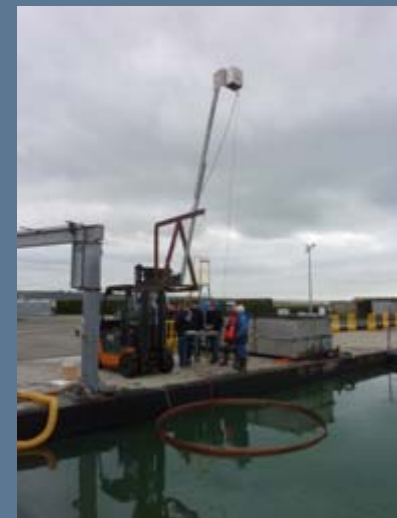
EXCAPI trials – March 2002- GESMA's basin –
Source *Cedre*

Detection with fixed devices

- Study for the Civil Protection Directorate in 1994 (4 sensors on several types of oil)
- State of the art on sensors / devices for detection of oil on water surface carried out for Total (2009-11), with tests on some systems (SlickSleuth - UV, VarioCam Infratec – IR...)



Trials at Cedre: INFRATEC's VarioCAM® HR Inspect IR camera



Trials at Cedre: InterOcean SlickSleuth SS 300

Oil detection by shipborne sensors

- Since 2006, participation in ANR project RAPACE (captive drone for guiding oil spill response vessels)
- Assessment of SeaDarq system (on ship's radar) during DEPOL 07
- ANR project DETHERPOLMAR (infrared detection with a camera set up on a ship's mast)



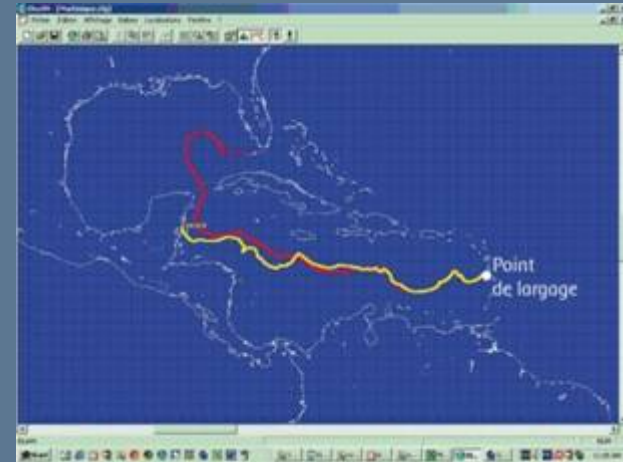
DEPOL 07: RAPACE balloon set on the *Alcyon's* deck – source *Cedre*



DEPOL 07: the thermal infrared camera of project DETHERPOLMAR – Source *Cedre*

Drifting buoys / dye release

- Trials started in 1989 (VIGIMAR and NORDA) for oil and HNS
- Pollutmar trials
- Kidour trials 1994-96 (French Navy and industry), PTR and NORDA buoys
- Exercises Carribean (2003-2004) and Mediterranean Sea (2005)
- IN 2007 EC project Mersea in the Mediterranean Sea
- 2009, AMPERA DRIFTER project, tracking devices (dyes and buoys)



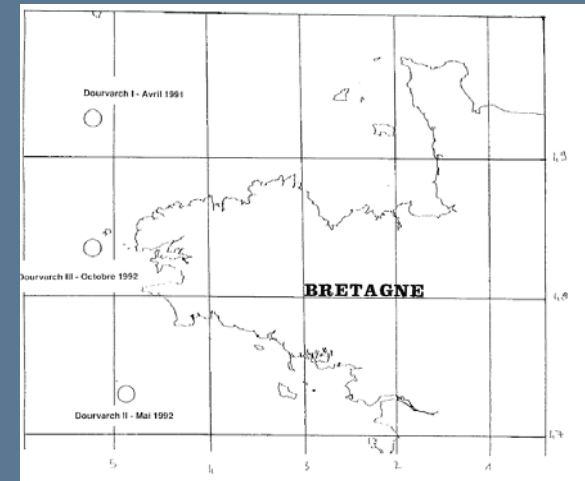
Monitoring of drifting buoys in the Caribbean – Source *Cedre*, ARGOS data



Buoys used during AMPERA DRIFTER trials at sea, Spain, 2009, source *Cedre*

Container detection / tagging

- Studies started in 1990 (aftermath of accidents): surface and underwater localisation, tagging
- EC, Defence and Research ministries, industry
- Dourvarc'h experiments (1991-92)
- Start in 2007 of project FEDER/Interreg LOSTCONT: lessons learnt from accidents, workshop, trial at sea



Location of Dourvarc'h trials (1991-92) – Source *Cedre*



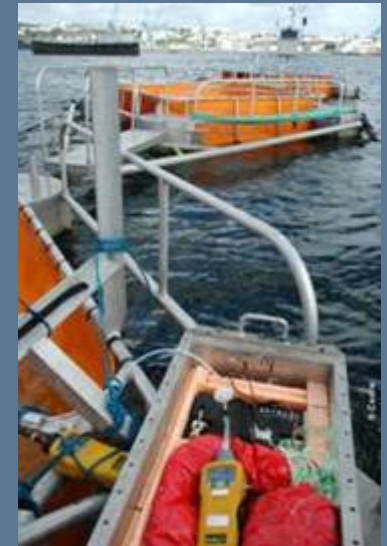
Container tagging system –Lostcont trials, 2008 – Source *Cedre*

Gas detection

- In 1987, studies on protection and detection means for response teams (for French Navy)
- Pollutmar trials
- GALERNE project (ANR), with the aim of drafting response sheets for emergency response teams: trials of detector and hyperspectral IR camera
- NUAGES project (ANR) currently under preparation



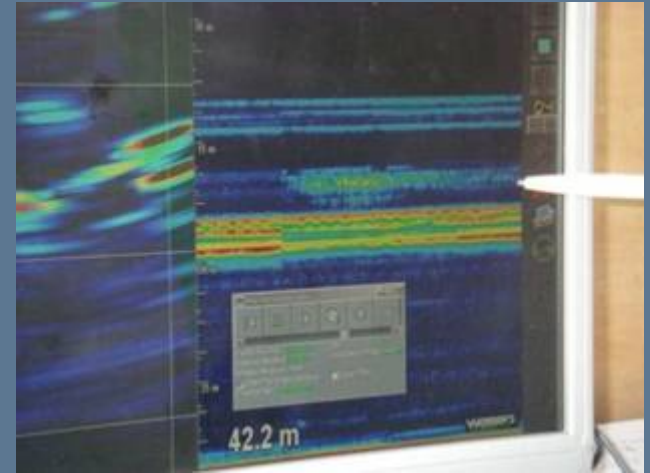
Trials of D2RC detector– June 2008 –GALERNE project– Source *Cedre*



Floating cells and detectors –GALERNE trials - June 2008 – source *Cedre*

Wrecks

- First state of the art on “Intervention on wrecks” in 1994, for the French Navy, following actual operations: inventory of detection and observation means (sonars, ROV...)
- Updated in 2000
- In 2006, participation in ROSE project (led by IFREMER)
- Test of multibeam sonar in Cedre’s basin, 2010, within a study on detection of leaks from wrecks
- Technology intelligence on a regular basis



Test of multibeam sonar – Cedre 2010



Wreck of the *Peter Sif* – Source Fanch Cabioch

Inland waters

- 2000 – 2001, for ministry of Environment, study “detection and measurement equipment”
- Inventory of methods and equipment for surface, bottom and water column monitoring
- In 2001, “pollution marking” study and trials for Water Agencies



Tests on dyes – 2000 – Source *Cedre*

And also...

- Other kinds of "experiments", which made significant improvement possible
- R&D still progresses a lot during spills
- And all the more since it is increasingly difficult to carry out trials at sea involving real pollutants



levoli Sun (styrene) and *Allegra* (palm kernel oil), sources French customs and *Cedre*



Prestige: aerial picture (French customs) and monitoring of drifting buoys (*Cedre*)



levoli Sun: olfactory detection test - source *Cedre*

Training: from spills...to illegal discharges

- First training course in 1993, for the French Navy, based on the first manual
- Lecturers from *Cedre*, French Navy, French Customs
- Focused on “accidental spills”
- Change in trend in the 2000s (*Erika* aftermath)
- Currently, 1/3 of lectures on legislation
- Sometimes, need to remind observers of the paramount importance of aerial observation during spills
- 2 sessions / year
- Trainees: French Navy, French Customs, MRCC, Canadian CG (NASP)

Other courses / workshops

- 2 courses for Moroccan authorities in the 2000s (one involving the French Customs expert)
- China, Japan in the 2000s
- EMSA 2011 (preparation of training documents)
- Several workshops at European / Mediterranean levels in the 1990s and 2000s
- Airborne detection, satellite imagery, buoys...
- Legislation



International seminar, Qingdao, China 2009

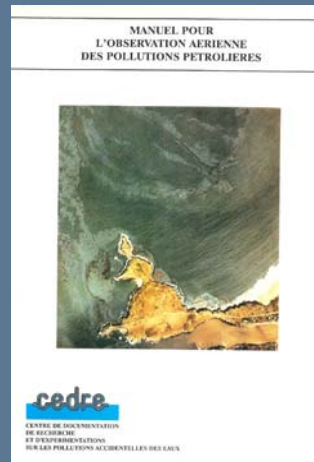


European workshop "Satellite imagery in the Mediterranean", Toulon, 2003 – Source *Cedre*

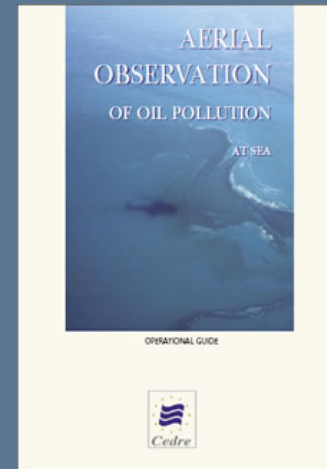
"Aerial observation" manual



1980



1993



2004-2009, FR and EN



Currently being drafted