Mediterranean Operational Oceanography Network (MOON) in support of oil spill emergencies management.

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The European Marine “core” service and the relationship with downstream services

From GMES MCS Implementation Group report by P.Ryder & al
The MyOcean System: uniform technology, pan-European quality standards

1. Global
2. Arctic
3. Baltic
4. NWS
5. IBI
6. Med Sea
7. Black Sea

Arctic GOOS
NOOS
GOOS/Godae
IBI-ROOS
MOON & MedGOOS
BOOS
Black Sea GOOS
Operational oceanography in the Mediterranean Sea: 1995–today

- Real Time Observing System from satellites and in situ platforms
- Numerical models of hydrodynamics and biochemistry at basin scale
- Numerical models for shelf and coastal areas
- End-User applications - Downstream services

MOON: Mediterranean Operational Oceanography Network
16 nations involved, 36 institutions. www.moon-oceanforecasting.eu
MOON Ocean Forecasting Systems

MFS-MyOcean (INGV) disseminates daily forecasts to 13 nested models every day

Shelf and sub-regional models now reach 1 - 3 km resolution
Integrated Oil Spill detection and Forecasting System

**OIL SPILL DETECTION**
- SAR SATELLITE SYSTEM
- OPTICAL SATELLITE SYSTEM
- ACCIDENT ALERT

**WIND FORCING**

**WAVE MODELS**

**HYDRODYNAMIC MODELS**

**OIL SPILL MODELS**

**ALERT TO THE USERS**
- REMPECE
- COASTGUARDS
- MINISTRY OF ENVIRONMENT
- CIVIL PROTECTION
Functional schema of the forecasting system

WIND FORCING FIELDS FORM ATMOSPHERIC FORECASTING SYSTEMS

OCEAN CIRCULATION MODELS FOR THE ANALYSIS AND FORECASTING OF THE CURRENTS

POSITION, EXTENSION, THICKNESS OF THE OIL SLICK FROM REMOTE SENSING IMAGES OR PROVIDED FROM THE ACCIDENT ON SITE AUTHORITIES

NUMERICAL MODELS OF THE DISPERSION AND TRANSFORMATION OF THE OIL SLICK

ANALYSIS OF THE EVOLUTION OF THE OIL SLIC, SENSITIVITY EXPERIMENTS FOR UNCERTAIN PARAMETERS
Oil spill forecasting model: processes
Medslick-II (Dedominicis et al., 2011)

Transport by Lagrangian advection and diffusion

Diagram showing processes including Spreading, Emulsification, Evaporation, and Dispersion.
MOON-Emergency Response Office (ERO): operational support to REMPEEC

Local Authorities

Emergency call

Local Authorities

Provision to Local Authorities of ERO bulletins

Provision to REMPEEC of ERO bulletins with oil spill forecast and images and meteo-oceanographics products

Emergency call to ERO manager and provision of info

ERO experts
The support of MOON to OSCAR-MED REMPEC operation

- Daily meteoeceanographic bulletins: Surface currents, Sea Surface Temperature (SST), Wind at 10 m, Waves height and direction;
- Oil spill drifting forecasts of the slicks detected by satellite and by aircraft;
- Provision of complementary (to CSN) optical images for oil spill detection.
MOON-ERO and GNOO support in Emergency: special cases

- Lebanon accident (July-August 2006, Lebanon)
- Gibraltar accident (05/09/2007, Spain)
- Und Adryiatik accident (06/02/2008, Croatia, Slovenia and Italy)
- Renate-Shulte Aegean Sea accident (June-July 2009, Greece and Turkey)
- FURNESS MELBOURNE case (6 January 2010, Morocco)
- Po river Emergency (February 2010, Italy)
- Porto Torres emergency (January 2011, Italy)
- Several Oil slicks detected from satellite images
Lebanon Accident (July-August 2006)

MODIS-ACQUA image, 23 July: (08:35 GMT): oil (green) is already in Tripoli.

Oil position predicted by CYCOFOS-MEDLSIK (red), 23 July 9:00 GMT (after 241 hours) compared with the slick observed by MODIS (green).

Oil position predicted by MFS-MEDSLIK (red), 23 July 9:00 GMT (after 241 hours) compared with the slick observed by MODIS (green).
Porto Torres emergency CNR-IAMC (GNOO) support to Italian Coast Guard

GNOO and Italian Coast Guard are cooperating in the field of oil spill forecasting (Memorandum of Agreement signed in 2010).

User question to GNOO: Is the oil spill found at Santa Teresa di Gallura on the 17th coming from Porto Torres?
Sea experiments: forecasting system allows to find the oil spill detected from satellite (2)

Position forecasted by the model
18.08.09 15:00 UTC

Initial position observed from satellite
18.08.09 09:03 UTC

In situ sampling
18.08.09 15:00 UTC

PRIMI project experiment
Sea experiments: forecasting system allows to find the oil spill detected from satellite (4)

Distance between model forecast and 2nd sat observation is 6 km. Distance form model forecast and in situ observation is 1 km.
MERSEA drifter experiment: forecasting system is capable to predict the drifter trajectories
Conclusions

- MOON has developed an integrated system for operational monitoring and forecasting of oil slicks in the Mediterranean Sea, built upon the use of different satellite platforms and the operational ocean forecasting systems;

- MOON and GNOO oil spill detection and forecasting system have been validated demonstrating that without an accurate forecasting system is not possible to locate oil spills after initial detection and therefore manage oil spill crises;

- MOON and GNOO supported REMPEC and several national authorities (i.e. Croatia, Cyprus, Egypt, France, Greece, Italy, Lebanon, Malta, Morocco, Slovenia and Spain) in managing oil spill emergency crises and in training exercises.