ENVISAT (right) and RADARSAT 1 (left) satellites

Information Centre (MIC). This information will help in assessing the clean-up requirements. EMSA also has the resources and capability to assist in this area by making its fleet of contracted oil pollution response available for clean-up duties.

It can clearly be seen that CleanSeaNet is part of an extensive network of national and international organisations. For example, EMSA has signed Memoranda of Understanding with the European Union Satellite Centre (EUSC) and with the Joint Research Centre of the European Commission (JRC) for the development of satellite based technology to support marine pollution monitoring and detection operations.

EMSA also has an agreement with ESA concerning the use of space based earth observation for enhancing maritime safety. EMSA and ESA are working together on the strengthening of earth observation applications for oil spill monitoring and surveillance, as well as on issues affecting longer term service sustainability such as identification of requirements for future satellite systems. GMES (Global Monitoring for Environment and Security) is the joint programme of the European Commission and ESA to provide future earth observation products needed for public use. EMSA will look towards GMES for the provision of cross-cutting, multi purpose data products to support future CleanSeaNet service developments.

Finally, EMSA consults with Member States through the CleanSeaNet User Group, which is made up of representatives from national pollution control authorities, and this meets back to back with the European Group of Experts on Satellite Monitoring of Marine Pollution (EGEMP).

Looking ahead

The most significant future development envisaged at the present time will be the integration of satellite images from CleanSeaNet with vessel traffic information, including regional automatic identification system (AIS) information. This will be done via the EMSA managed SafeSeaNet system, which looks more generally at the monitoring of vessels and their cargoes. This will provide an EU wide picture of vessel traffic using geographical information systems (GIS) which, in this case, will substantially improve the system for detecting illegal oil discharges and identifying those responsible.

Possible spills identified on a satellite radar image from CleanSeaNet are of limited value without verification by surveillance aircraft or vessels. Also, once a spill is verified, it is important to have positive identification of the polluter, and this is made much easier by taking the relevant vessel traffic information and superimposing it on the appropriate satellite radar image(s).

Another important future development will be the expansion in the number of satellites over the next decade. At the moment, in addition to ENVISAT and RADARSAT 1 and 2, ESA will also be launching SENTINEL 1 around 2010-2012. At the same time, several other satellites which are due to be launched are being considered for their suitability. Consequently, although the CleanSeaNet system, together with its partners, has improved response to illegal discharges significantly, it will continue to work towards having an even greater impact on the detection and identification of polluters in the future.

Further Information

The EMSA website contains further information on this and all the other activities of the Agency, and it can be accessed at: **http://www.emsa.europa.eu**

EMSA

CleanSeaNet

EUROPEAN MARITIME SAFETY AGENCY

THE **GLOBAL** ISSUE

The discharge of oil from ships, oil platforms and other sources causes significant damage to our coasts and to the marine environment in general. Due to the large sea areas involved, deliberate, illegal discharges are more difficult to detect, and that is the main reason for the development of the CleanSeaNet system.

Ships discharge pollutants on a regular basis

Although the shipping industry has a substantial number of very responsible ship owners and operators, some are motivated to deliberately pollute the sea for several reasons. Firstly, it is a lot cheaper to dump waste at sea than to collect it in the approved way and then to deposit it in onshore facilities. Secondly, it is a lot easier and quicker to dump than to expend the time and effort needed for disposal at approved processing sites. Thirdly, owners and operators often argue that shore based waste reception facilities are not readily available. Consequently, if unscrupulous operators believe that they are unlikely to be spotted, or if they believe that the consequences of being caught are not significant enough to deter them, they will continue with their illegal discharges. However, should the likelihood of being spotted increase, this could substantially reduce such illegal activities.

The monitoring of European waters is particularly challenging as the EU is an inundated peninsula with an extensive external coastline and several significant semi-enclosed seas. At present, monitoring is being undertaken by a number of Member States, but the coverage is by no means uniform across the EU. Consequently, CleanSeaNet is being developed to support improvements in terms of greater consistency, efficiency and effectiveness.

While manned aircraft are regularly used for surveillance purposes, it would be extremely expensive to use them for comprehensive coverage. By far the most cost-effective way of monitoring the seas and oceans on a global or regional scale is to use remote sensing satellites.

Against this background, the EU is now beginning to put even greater emphasis on the use of satellite information for surface monitoring and the CleanSeaNet initiative will contribute significantly to more effective detection and tracking of ship sourced pollution in the future.

THE **EMSA** ROLE

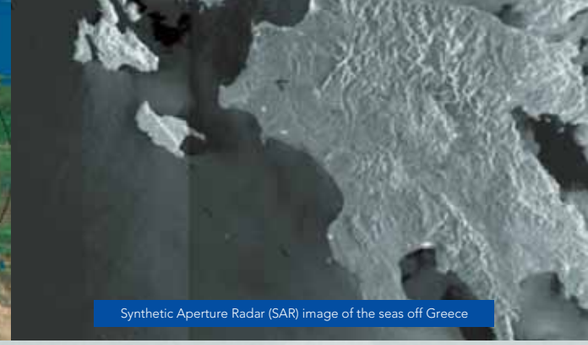
The Requirement

Directive 2005/35/EC on ship sourced pollution, and on the introduction of penalties for infringements, tasks EMSA with working with Member States to develop technical solutions and to provide technical assistance in relation to the implementation of the Directive. In line with this, the Agency provides a European operational system for oil slick detection based on satellite sourced synthetic aperture radar (SAR) images. The service is aimed at supporting the response chain of Member States for locating polluters, and is offered to authorities in all EU and EFTA states. It became operational in April 2007 and is under continuous development.

Once possible oil pollution has been spotted by satellite, it is necessary to verify the situation

In the recent past, a total of around 1400 satellite images per year were used and ordered individually by twelve EU countries. These are purchased from satellite operators or service providers under national contracts or are provided by the European Space Agency led MarCoast project. However, some countries have stated that the current number of images used is not enough to satisfy their real needs and that they wish to monitor their sea areas more extensively. The EMSA task is to provide a baseline service throughout EU waters which Member States can 'top up' according to their requirements. The intention is that, once they have received information on potential polluters, Member States send out aircraft or vessels, when appropriate, to verify the existence of pollution and provide an appropriate follow-up, including the tracking of the polluter. EMSA should then be informed of the results.

Data is received in Norway, Italy and the Azores to provide comprehensive EU coverage



Synthetic Aperture Radar (SAR) image of the seas off Greece

The Service

CleanSeaNet will supply analysed images from data provided by the European Space Agency's ENVISAT and Canada's RADARSAT satellites. The downloading, processing and analysis of the data and the supply of the resultant images is carried out by a consortium including KSAT, Telespazio and Edisoft. EMSA also has a contract with Eurimage, which is the authorised commercial licence distributor for ASAR (Advanced Synthetic Aperture Radar) images from ENVISAT. For access to RADARSAT data, a contract has been signed with MDA, which is the holder of the distribution rights.

The intention is that CleanSeaNet provides images which either address sea areas not already covered, or which provide enhanced coverage for sea areas already under surveillance. At the present time, one ENVISAT and two RADARSAT satellites (latest launched in 2007) are in low earth orbit and each of these orbits on the polar axis fourteen times per day. Thus, there is coverage of EU waters several times per day and selected images can be ordered depending on the needs of each individual Member State. These may range from comprehensive coverage of a nation's offshore waters to the provision of selected images in perceived high risk areas.

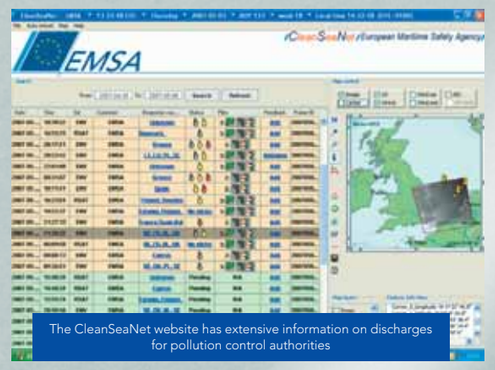
Having requested specific images, a network of receiving stations in Norway, Italy and the Azores (the latter as of 2008) downloads the data from the satellites, following which it is relayed to control centres for rapid processing and analysis by trained operators. The operators assess the images, together with supporting meteorological information, to determine the likelihood of the presence of oil on the sea surface and to assist in identifying the source of the pollution. One of the main indications of the presence of pollutants is a lessening in the surface roughness of the sea, although this can also be triggered by weather conditions and other effects, so it takes significant expertise and experience to do an accurate analysis. The processed and analysed information is then sent simultaneously to the national authorities in the affected Member States and to EMSA. The time from data acquisition by the satellite to the receipt of processed information by pollution control authorities should not exceed 30 minutes.

This means that, nowadays, it is possible to organise a timely response to both accidental and deliberate discharges. EMSA's aims are to:

- provide regular information to Member States on possible illegal discharges.
- provide information to Member States on accidental spills.
- monitor hot spots.

Should the presence of pollution be suspected, coastal authorities can decide whether they wish to deploy aircraft or surface vessels to assess the situation in greater detail before deciding if there is a need for further action. If significant pollution is confirmed, the national operational response mechanism kicks into action. This includes identifying and dealing with the polluter and organising any necessary clean-up activities.

CleanSeaNet also has an important role to play in the case of a major accidental oil spill in EU or adjacent waters, at which time it will rapidly respond by providing analysed satellite radar images of the affected area. The International Charter for Space and Major Disasters provides a unified system of space data acquisition and delivery to those affected by disasters, and CleanSeaNet operates within the framework of the Charter. At such times, ESA will coordinate the supply of images from the different international space agencies within the Charter which cover the affected areas. EMSA then acts as the focal point for collating the information, performing data analysis and delivering products to the affected Member State(s) with the involvement of the European Commission's Monitoring and



The CleanSeaNet website has extensive information on discharges for pollution control authorities