UNISPACE III - ISPRS/EARSeL Workshop on
"Remote Sensing for the Detection, Monitoring and Mitigation of Natural Disasters"
2:30-5:30 pm, 22 July 1999, VIC Room B
Vienna, Austria

MONITORING OIL SPILLS FROM SPACE: STATE OF THE ART AND PERSPECTIVES

Dr. François Cauneau
Centre d'Energétique, Ecole des Mines de Paris
B.P. 207, F-06904 Sophia Antipolis, France
Fax: +33 (0)4 93 95 7535 E-mail: cauneau@cenerg.cma.fr

ABSTRACT

In the context of the constantly increasing pressure of human activities on the environment, oil spilling has been pointed out as one of the most representative pollution mechanisms. In the past, since attention was often focused on the most spectacular aspects, *i.e.* accidental oil pollution, oil spilling has been long associated with the petroleum industry. Advanced monitoring techniques have brought evidence that for the most part marine oil pollution is not accidental, but chronic, due in fact to the whole domain of shipping activity.

During the past ten years improvements in oil spill monitoring techniques using airborne and spaceborne remote sensing have considerably changed this perception, showing to national and international authorities the exact extent of the phenomenon, the variety of its sources, and the means thus supplied to assess the possible impacts on the global environment.

The first studies to assess the extent of oil spilling activity on the scale of a whole basin were developed for the EC, over the Mediterranean (see *e.g.* Wald *et al.*, 1984). Based on the systematic processing of optical data, provided by low resolution radiometers such as Landsat-MSS, such studies brought into evidence the order of magnitude of the activity, which revealed to be far beyond the most pessimistic estimates based on aerial surveys. They confirmed also what had been suspected for a long time by customs and coast-guards: most oil spills occur off-shore, *i.e.* in international waters.

The 1990's have seen the increasing use of spaceborne Synthetic Aperture Radars (SARs, such as ERS, Radarsat, JERS, and the former Almaz systems). Such sensors offer mainly the possibility to acquire day and night images regardless of cloud coverage, and Space Agencies expected oil spill monitoring to be one of the most important civil applications of the SARs. Thus, SARs have been extensively used for this purpose, and a strong policy of project funding has been developed, in particular by the EC. From methodology to the design of end-users' operational tools, large studies such as Clean Seas, Oil Watch or DESIMA have significantly contributed to define the tools that will be in use for oil spill monitoring in the near future. Such actions have also resulted in new knowledge in this domain. Among the results achieved, it has been shown that (1) anthropogenic oil spills at sea may be easily identified, at least on a statistical basis, firstly since global mapping brings to evidence the correlation between slicks locations and the main shipping lanes; (2) a conclusion of the previous point is that spilling appears to be less the fact of oil tanker than classic ship transport; (3) there is a strong need for advanced tools to discriminate natural and anthropogenic slicks, especially in areas where the natural production of surfactants is significant.

The next steps may now be foreseen in three directions: future SARs will allow multi-scale mapping for global coverage and focused studies. A first axis of development should be that such capacities will be used, in the context of international co-operation, to generalise to the global ocean the results already obtained in European seas. A second axis is given with the need to develop tools for the integration of remote sensing data into decision making systems, such as those developed by UNEP in the CAMPS program for the Mediterranean. Lastly, the results obtained already show a very good synergy between airborne and spaceborne remote sensing. The latter is already used by civil authorities for prosecuting illegal spilling, but the diagnostic described in this paper shows that all these efforts would remain meaningless without the development of proper judicial tools, that will allow the prosecution of any polluter in international maritime waters.