

# The Use Of Earth Observing Satellites For Hazard Support

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*Abstract:* Weather satellites have long been used to support forecasting of intensive weather hazards such as tropical cyclones, severe storms and flash flooding. Although there have been numerous research and operational demonstrations that illustrate the potential usefulness of EO satellite data for a broader range of hazards, the operational application of these data to other hazards is rare. Recognizing the benefits that could be gained from better application of EO satellite data to natural and technological hazards, the Committee of Earth Observation Satellites (CEOS) initiated a project for disaster management support. The project has published two annual reports. Since the last report was published, the project has become an ad hoc working group. This paper summarizes the work of the ad hoc working group. A full report of the work of the group is in the group's first annual report which is available from the author of this paper.

The ad hoc Disaster Management Support Group (DMSG) supports natural and technological disaster management on a worldwide basis by fostering improved utilization of existing and planned Earth Observation (EO) satellite data. The DMSG focuses on developing and refining recommendations for the application of satellite data to selected hazard areas. Hazard teams for these selected areas have been formed to document findings, recommendations, and specific user requirements. An information tools team has also been formed to develop a server intended to demonstrate timely access to satellite-derived data and information products (i.e., "one stop shopping") to support various facets of disaster management.

## I. REPORT OF THE CEOS DMSG

CEOS was formed in 1984, in response to recommendations from the Economic Summit of Industrialized Nations Working Group on Growth, Technology, and Employment's Panel of Experts on Satellite Remote Sensing. This group recognized the multidisciplinary nature of satellite-based Earth Observations (EO) and the value of coordination across all proposed missions. In CEOS, providers and users of EO satellite data work together to promote the effective use of data from such satellites. **Recognizing the benefits that could be gained from better application of EO satellite data to natural and technological hazards, CEOS initiated an activity on disaster management support.**

**The DMSG began as a short term project in late 1997 with an objective to support natural and technological disaster management on a worldwide basis by fostering improved utilization of existing and planned EO satellite data. Meetings have been held two to three times per**

**year. With over 300 participants from more than 140 organizations, the DMSG has found strong support among CEOS members and associates, as well as an enthusiastic reception from numerous international, regional, and national emergency managers, and distinct interest from the commercial sector.**

A resolution to form an *ad hoc* working group was presented at the 13<sup>th</sup> CEOS Plenary in November 1999. It was agreed that the group will continue the essential functions of the former project as well as address improved space agency coordination and other issues. DMSG would serve as a forum to identify, and interact with, current and potential users of space-derived data as one of the tools to deal with disasters. The group will address policy and technical issues including a focus on a comparison of requirements against capacity and will recommend steps to correct any mismatches between the two. With strong support among the representatives, the DMSG was formally established and the Terms of Reference (TOR) approved by the 13<sup>th</sup> CEOS Plenary. NOAA agreed to provide the initial chair of the *ad hoc* CEOS DMSG.

The DMSG currently has eight hazard teams whose members include representatives from satellite agencies and emergency management users' organizations. There are hazard teams for drought, earthquake, fire, flood, ice, landslide, oil spill, and volcanic hazards. Teams are charged with compiling user requirements; identifying shortcomings and gaps in the provision of required satellite data; and developing recommendations for alleviating them. **Particular emphasis is placed on working closely with space agencies, international and regional organizations, and commercial organizations on the implementation of these recommendations.**

In general, timely information on the development of hazards as well as general information on risks, hazards, and opportunities remains fragmented and difficult to locate. To begin to address these and other gaps, prototype tools are being developed. NOAA is sponsoring a prototype information server to demonstrate timely access to satellite-derived data and information products (i.e., "one stop shopping") to support various facets of disaster management. A number of agencies are participating in the development of the server, providing links to their data and information services, and developing additional support

tools under the auspices of the Group. An Information Tools Team oversees the development of the server.

Since its formation the DMSG held three meetings, the first a planning meeting in Tokyo, Japan, on February 14-15, 2000. At that meeting, hosted by Japan's National Space Development Agency, the DMSG focused on plans for 2000 for its hazard teams and information server team. The participants also agreed on a new strategy for demonstrating coordinated space agency responses to specific disasters by using guidelines to be drafted by representatives from the European (ESA) and French (CNES) space agencies. Representatives from two regional institutions – Asia Pacific Advanced Network and Asian Disaster Reduction Center – explained their roles in facilitating access to and better utilization of Earth observation satellite data products to local end users for disaster management in the Asia Pacific region. The ESA representative showed examples of space technologies that his organization has applied for disaster management and for developing partnerships with emergency management users in Europe.

At its second meeting a workshop hosted by the Canada Centre for Remote Sensing (CCRS) in Ottawa, the DMSG welcomed participation by four representatives from the remote sensing industry: Spot Image, RADARSAT International, Orbimage and Space Imaging. This industry panel described examples of disaster support that can be provided by private satellite operators and participants explored ways to cooperate on providing better information on all options available to those who need to obtain remotely sensed data. The Canadian Space Agency (CSA) provided updates on how it is using RADARSAT data for national and global disaster management support. Three participants spoke on behalf of other international entities – the International Strategy for Disaster Reduction (ISDR), the Global Disaster Information Network (GDIN) and the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS). They explained the disaster support activities underway in those institutions and welcomed DMSG collaboration with them. ESA and CNES provided initial guidelines for demonstrating coordinated space agency responses to requests for satellite remote sensing data and imagery. These guidelines are based on the ESA-CNES charter that was signed on June 22, 2000. Demonstration activities to be pursued by DMSG imply no formal commitment to the charter and will reflect only the "best effort" of agencies that are willing to participate. The newly formed Ice Hazards Team reported at the workshop.

The DMSG met on January 9-10 to lay out its work plan for the year ahead, especially in response to CEOS Plenary direction to shift DMSG's primary focus to investigate and demonstrate technical coordination of civil satellite systems in support of disaster management, and specifically to support "The Charter." Participating were leaders of its

Hazard Teams, lead representatives of space agencies, and a few representatives of commercial remote sensing firms. Participants developed templates for scenarios that would demonstrate the use of civil satellite systems in support of disaster management. Several Hazard Teams will develop scenarios that will be finalized at a two-day workshop in June in Brussels, Belgium.

## II. ACCOMPLISHMENTS

The DMSG has developed a number of findings and recommendations. There are currently twelve overarching recommendations derived from nine findings. The findings note that disaster managers often recognize the value of and are willing to use new satellite technology, but may be reluctant because the technology is unfamiliar and unproven in an operational environment. The recommendations suggest ways the space community might respond, e.g. by promoting mutual dialogue, creating user friendly tools, performing compelling demonstrations, and using integrated approaches to create more user friendly products and services. The full set of findings and overarching recommendations are in the annual report.

As a part of their assessment and identification of requirements, each hazard team has also developed hazard specific recommendations. Hazard team recommendations and other accomplishments are available as a part of each hazard team's report. Hazard team reports are in the annual report, available from the author of this paper. The overarching recommendations are in part a consolidation of recommendations common to several hazard teams.

**The Information Tools team is currently developing two tools. One is a hot events page of links to web sites with data and products for recent significant hazard events. The other is a contacts page to point potential users to providers of data and products that can support disaster management. The Information tools team report will expand on these and other team activities.**

Hazard Team reports and the Information Tools Team report are included in the 2000 annual report, available via the DMSG information server web site at <http://disaster.ceos.org> and in hardcopy.

## III. DMSG WORK PLAN

In recent meetings, the DMSG has focused on developing a work plan. The work plan calls for hazard teams and the information tools team to continue their respective activities, as well as to address new elements. These include fostering more aggressive cooperation amongst space agencies, with the commercial sector, and with international disaster organizations. Also, DMSG is

working with the CEOS Working Group on Information Systems and Services (WGISS) to find ways that DMSG can leverage tools and capabilities developed by WGISS.

#### *A. Cooperation with Space Agencies*

One aspect of this work plan is to demonstrate coordination among space agencies in responding to specific disasters. The French Space Agency, Centre National d'Etudes Spatiales, (CNES) and the European Space Agency (ESA) have initiated a Charter under which space agencies could conduct multi-mission tasking of existing satellites, on a best efforts basis, as demonstrations of joint support for specific hazards.

The DMSG can both support and learn from the experiences of agencies that participate in the Charter. **DMSG will promote the demonstration of coordination of space agency responses to specific disasters using guidelines based on the Charter.** Each hazard team is considering projects that will demonstrate coordination of space agency assets. The flood team has included demonstration project plans in their report in this publication.

#### *B. Cooperation with the Commercial Sector*

The Group's work plan calls for a closer relationship with the commercial sector. At its last meeting, the DMSG invited representatives from four commercial remote sensing operators (Spot Image, RADARSAT International, Orbimage and Space Imaging) to convene a panel that would provide perspectives on using satellite data for disaster management support. The panel was tasked to introduce the capabilities of each of their respective companies, to identify barriers to improving the use of satellite data for disaster management, and to identify potential areas for collaboration to mitigate such barriers.

Perceived barriers were identified and some possible remedies identified. It was recognized that requirements must be sufficiently identified; they often are not. Funding and contracts must be in place and available when disaster strikes; they often are not. Realistic training is essential and experience is needed, e.g. through pilot projects. It was also recognized that there are no robust stand-alone solutions. Information must often be gleaned from multiple data sources and integrated into a usable format.

#### *C. International Cooperation*

The DMSG is also working closely with key international organizations such as the United Nations International Strategy for Disaster Reduction (ISDR) and Committee on Peaceful Use of Outer Space (COPUOS) **that have roles in coordinating aspects of disaster man-**

**agement.** The ISDR is the successor to the UN International Decade for Disaster Reduction that ended in 1999. The ISDR will focus on creating a culture for disaster prevention. COPUOS has launched a three-year work plan to develop an integrated, global disaster management support system through its Scientific and Technical Subcommittee (STSC). ISDR and COPUOS have both agreed to maintain a close liaison with DMSG regarding coordination of disaster management related to remote sensing. **Cross briefings and joint activities will be pursued.** Helen Wood represent DMSG at the February 2001 meeting of the STSC where the use of civil space assets to support disaster management will be addressed.

#### *D. Using WGISS Information tools*

WGISS has developed several information tools that can eventually be useful for DMSG activities. WGISS is currently supporting the Information Tools team in developing a contacts list for providers of data and products that can support disaster management. DMSG will use the CEOS International Directory Network (IDN) database of contact information for providers of Earth observation data and World Wide Web based tools developed by the Canadian Centre for Remote Sensing (CCRS) to search the IDN.

## **IV. CONTACTS**

Team reports are included in the 2000 annual report, available via the DMSG information server web site at <http://disaster.ceos.org>. For a hardcopy of the annual report or further information, please contact:

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## **VI. ACKNOWLEDGEMENTS**

The group acknowledges the contributions of its many members, most notably the hazard teams. The success of the group depends on the active participation of group members and the presentation, discussion, and summarization of their programs and projects related to supporting disaster management.