Background

For several years SAR satellite data have been increasingly used worldwide to improve maritime safety and security by making it possible to locate ships and derive ship parameters. The European Maritime Safety Agency (EMSA) uses data from radar satellites like Radarsat and CosmoSkyMed to detect oil pollution as part of its CleanSeaNet services. The TerraSAR-X and TanDEM-X satellites also offer excellent prospects for deriving maritime value added data products. Additional data sources will become available with the launch of the Copernicus satellites (Sentinel 1 in April 2014). In general, spatial and temporal coverage will continue to improve as new missions are realized.

In parallel, demands on the ground segment increase. Real-time processing poses an immense challenge whenever large areas are to be mapped. In order to derive information products for ice and oil detection operational processing chains have to be developed for TerraSAR-X, TanDEM-X and Sentinel 1 data.

It is not yet possible to detect oil slicks in radar data using entirely automated procedures. Therefore, the processing systems being developed have to allow for necessary operator interactions despite stringent time requirements.
Real-time systems must be designed to exploit the enormous potential of the above-named satellites and at the same time overcome present limitations on availability and real-time capabilities. This requires both basic and applied research to develop and validate new concepts and methodologies for processing and distribution. In the ESA MARISS project it could be demonstrated that maritime information products, in this trial case ship detection products to aid anti-piracy efforts, can be provided within about 30 minutes.

Data Acquisition

Accessing new data sources

The challenge:
Expansion, adaptations and new approaches are required if data from as many different sensor types as possible are to be used. This is the key to assuring the best possible spatial and temporal coverage for real-time applications. Acquisition systems must satisfy the requirements of new transmission technologies as well as be able to cope with the increased data volume.

Tasks and goals:
- Improving the visibility circle (station horizon) of the existing antenna system
- Assembling a new antenna system with improved performance parameters
- Developing a front-end processor for the Sentinel 1 satellite
- Implementing the data acquisition chain for Sentinel 1 and Radarsat 2

Visibility circle of the Neustrelitz ground station

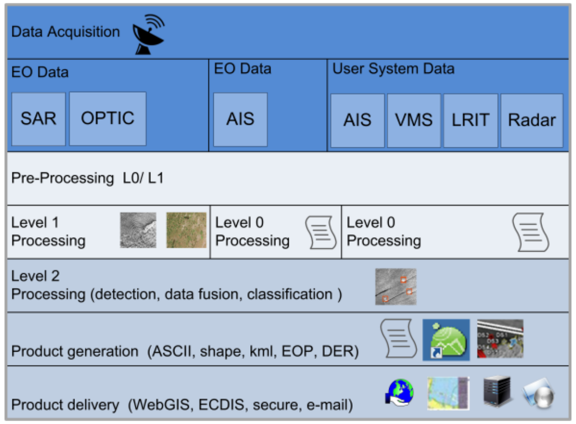
*The algorithms (thematic processors) for oil and iceberg detection and ice drift derivation come from DLR's Maritime Security Lab in Bremen.

Real-time Systems

Implementation and validation

The challenge:
The data received at the ground station must be processed in real time to yield information products about sea ice and oil pollution. This should occur automatically to the extent possible without sacrificing high precision. A system with across-the-board multimission capabilities is required for processing data from various types of sensors.

Tasks and goals:
- Specifying a new systems management procedure for real-time work flow
- Implementing preprocessing of Sentinel 1 and Radarsat 2 data
- Developing and configuring a multimission concept for the real-time processing of maritime information products
- Designing and configuring a multimission hardware concept for real-time processing
- Developing and implementing real-time processing chains to detect oil and ice from TerraSAR-X, TanDEM-X, Sentinel 1 and Radarsat 2 earth observation data*

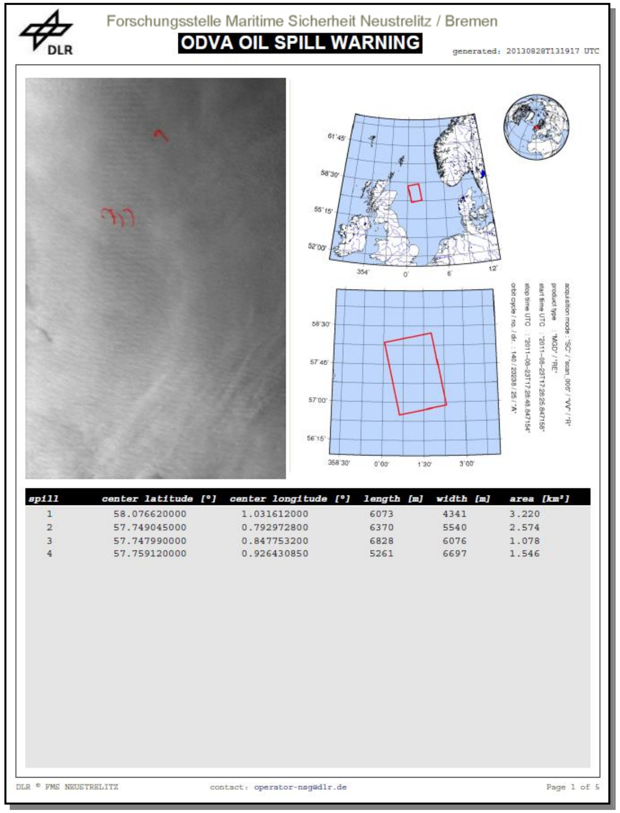


Data flow from acquisition to product delivery

Information Delivery
User-specific interfaces

The challenge:
The heterogeneity of user system infrastructures precludes the delivery of only one product type. Providing OGC-conform standard formats or customer-specified formats allows product integration and further processing in geoinformation systems.

Tasks and goals:
- Determining user requirements as to formats, delivery methods and security considerations
- Developing and implementing web-based delivery components with customer-specified interfaces


Forschungsstelle Maritime Sicherheit Neustrelitz / Bremen

ODVA OIL SPILL WARNING

generated: 20130828T131917 UTC

spill	center latitude [°]	center longitude [°]	length [m]	width [m]	area [km²]
1	58.076620000	1.031612000	6073	4341	3.220
2	57.749045000	0.792972800	6370	5540	2.574
3	57.747990000	0.847753200	6828	6076	1.078
4	57.759120000	0.926430850	5261	6697	1.546

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An example of a product (an oil pollution warning) in PDF format

EMS-DFD_03/2014

DLR at a glance

DLR is the national aeronautics and space research centre of the Federal Republic of Germany. Its extensive research and development work in aeronautics, space, energy, transport and security is integrated into national and international cooperative ventures. In addition to its own research, as Germany's space agency, DLR has been given responsibility by the federal government for the planning and implementation of the German space programme. DLR is also the umbrella organisation for the nation's largest project management agency.

DLR has approximately 7700 employees at 16 locations in Germany: Cologne (headquarters), Augsburg, Berlin, Bonn, Braunschweig, Bremen, Goettingen, Hamburg, Juelich, Lampoldshausen, Neustrelitz, Oberpfaffenhofen, Stade, Stuttgart, Trauen, and Weilheim. DLR also has offices in Brussels, Paris, Tokyo and Washington D.C.

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Real-time Systems for Maritime Safety and Security

Maritime Security Lab
Neustrelitz