



DHI GRAS SOLUTION

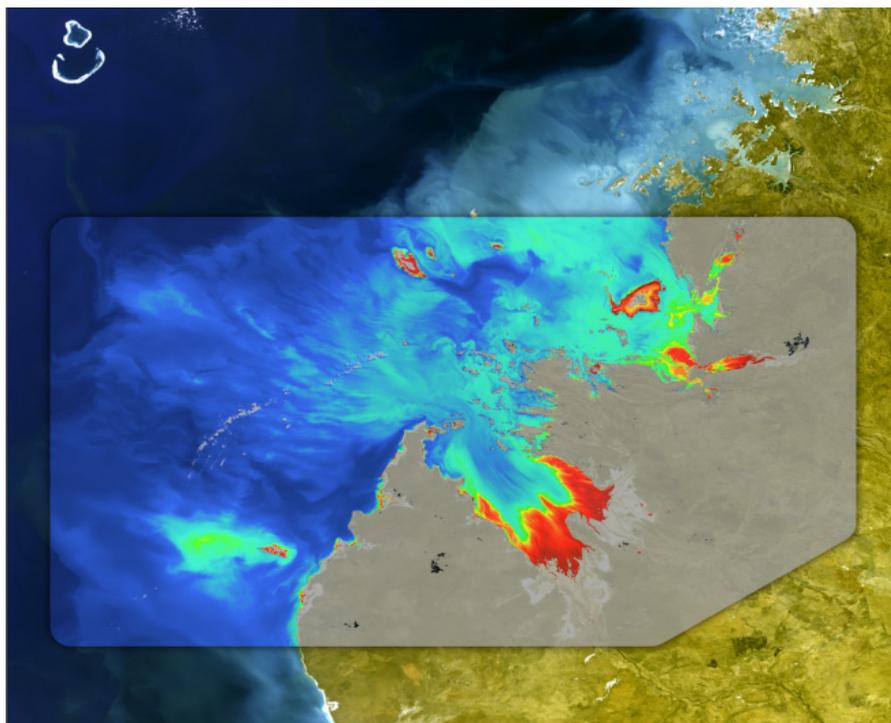
SEDIMENT MAPPING FROM SPACE

Baselines and up-to-date information

SATELLITE-BASED SEDIMENT MONITORING

Dredging and material handling in the aquatic environment always result in a certain sediment spill that must be managed. The sediment released during excavation, dredging, transport or disposal of sediment is visible as plumes or clouds of sediment in the water column.

Since the suspended matter affects the color of the water, it is possible to map these plumes based on satellite data. This allows for a quantification of both the spatial extend and the levels of the suspended matter. Using satellite data archives dating back to 2000, it is possible to establish the long-term baseline conditions for any region of the World in a 250m spatial resolution. Using near real-time satellite data in the operational mode, it is equally possible to derive the current environmental situation on both the local and regional scale. With a web-based solution, up-to-date information can be made available with only a few hours delay.



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SUMMARY

CLIENT

Infrastructure companies, ports, marine contractors, environmental authorities, oil & gas industry, consultants and contractors

CHALLENGE

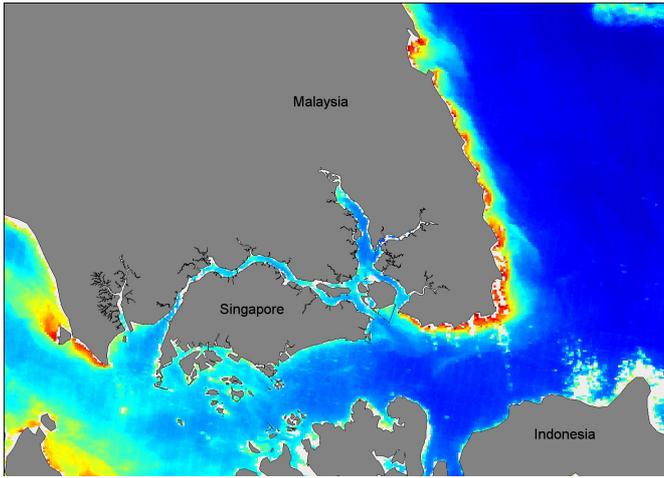
- Unavailability of historical sediment baseline of an area
- Need to monitor the environmental impact of sediment spill during marine construction works
- Need to define sediment spill levels and determine the actual impact levels
- Need to separate the effect of marine construction work from natural occurrence
- High cost of monitoring approaches at uncertain safety levels

SOLUTION

- Frequently updated maps of baseline conditions based on historic satellite data
- Operational data in near real-time made available through a web portal

VALUE

- Accurate delineation of impact zone
- Daily information of the regional distribution allowing identification of sediment levels and sources
- Very cost-efficient approach compared to traditional in-situ monitoring and with no associated safety issues
- Quick access to data from anywhere through a web browser, smart phone and other devices
- Reliable source of information – the method is well-proven and has been successfully applied globally
- Reduced risk of dredging bans due to exceeded tolerance limits
- Reduced time required to process environmental approvals



Example of a regional sediment map derived from satellite data in a 250m resolution © DHI GRAS / NASA

ABSOLUTE OR RELATIVE VALUES

Absolute values can be derived through calibration of the satellite signal against in-situ data. This type of information can be delivered almost in real-time for regional studies (250m resolution) and within a few days for detailed studies in high resolution (0.6-30m resolution).

Where there is no or only limited available calibration data, the information can either be derived using a DHI GRAS-derived regional algorithm or the data can be presented as relative values (low-high suspended sediment level). Relative values are often sufficient to identify the areas prone to heavy sediment loads or to monitor the general patterns of sediment movements in an area.

INCREASING THE VALUE OF FIELD CAMPAIGNS

By incorporating in-situ measurements into a monitoring system, the measured sediment values can be used to ensure a continuous calibration of the satellite-derived sediment maps. This extends the information from the in-situ point measurement to the entire area covered by the satellite data. This may further reduce the need for expensive in-situ stations.

With a near real-time system, the information can also be used to plan and adjust ongoing field campaigns. From the satellite derived sediment maps it is possible to identify specific factors (for example, the location of optimal measurement sites or specific areas of interest). With a time series of historical data used to establish the baseline, it is possible to optimise the timing of field campaigns to ensure that any and all seasonal variations are included in the sampling.

TYPICAL USAGE

Coastal policy and management: identification of potential sedimentation problems, environmental impact assessment, monitoring conditions during coastal constructions

Coastal construction: documentation of environmental impact, optimal site identification, identifying baseline conditions, compliance monitoring

Dredging activities: Estimate sediment levels and movements, document environmental impact of activities, calibrate sediment movement models.

MODELLING SPILL AND DISTRIBUTION

The satellite-based regional overview and mapping of the sediment distribution in an area, in conjunction with the numerical modeling simulations of DHI's software packages (MIKE 21 or MIKE 3) has proven to be a strong combination. The satellite data provide valuable input for the model as calibration data and as validation data for the model performance in the setup phase. The model environment enables the possibility of forecasting the dispersion of the sediment plumes some days ahead in time. This can be crucial to minimizing the impact of construction activity in sensitive areas.

AVAILABILITY

- Worldwide coverage
- Daily data available since 2000
- Available in spatial resolutions from 0.5-250m resolution allowing local and regional analysis
- Data available in near real-time
- Password-protected, web-based broadcast system provides access from a standard browser or a smart phone

KEY BENEFITS

- Near real-time mapping with data delivery within hours after the satellite overpass
- Enables construction of baseline conditions prior to construction activities
- Possible to identify origin of extreme events and determine if they are natural or man-made phenomena. This optimises construction/production activities and reduces costs
- Cost-effective compared to traditional monitoring methods (in-situ collection, buoy measurements and so on)
- Provides information on spatial variation – not just a point measurement

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