

PML

Plymouth Marine
Laboratory

Listen to the ocean

An integrated marine oil spill monitoring and modelling system

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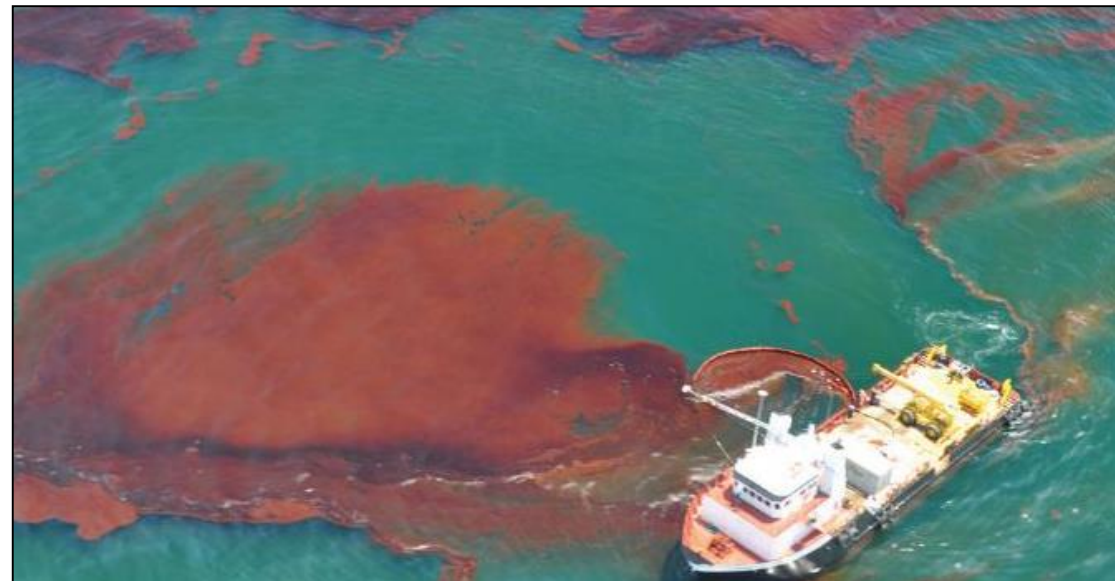
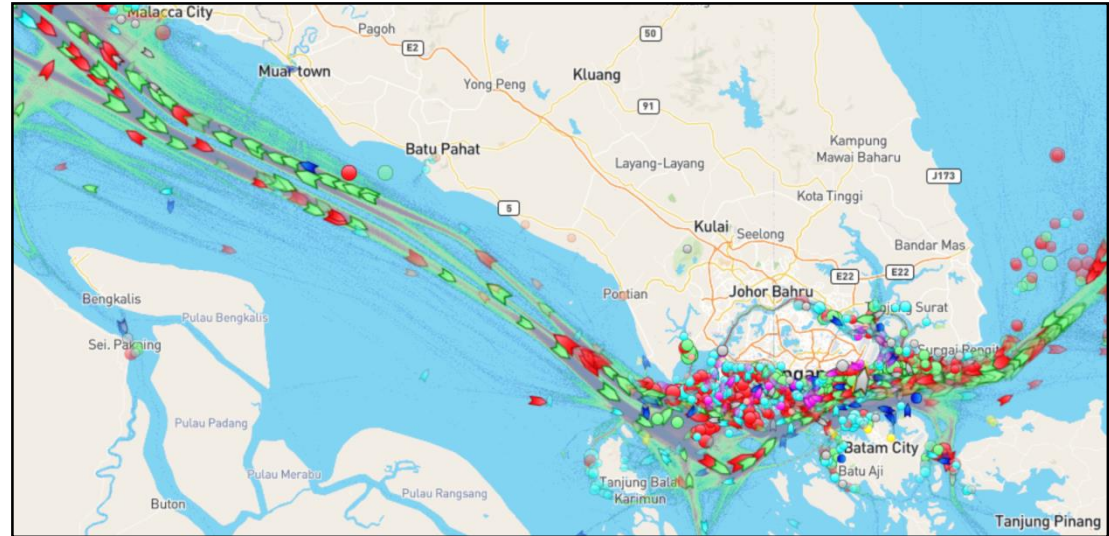
¹Plymouth Marine Laboratory, ²Riskaware, ³AutoNaut

Earth and Sea Observation System (EASOS)

- Funded through UK Space Agency's International Partnership Program (IPP) and led by Space Applications Catapult
- Addressing problems with marine pollution, flooding and illegal deforestation within Malaysia
 - Aim to create an integrated system
 - PML leading marine pollution domain
- Working with the National Defence University of Malaysia and other government agencies in the country
 - DOE, MMEA, Marine Department

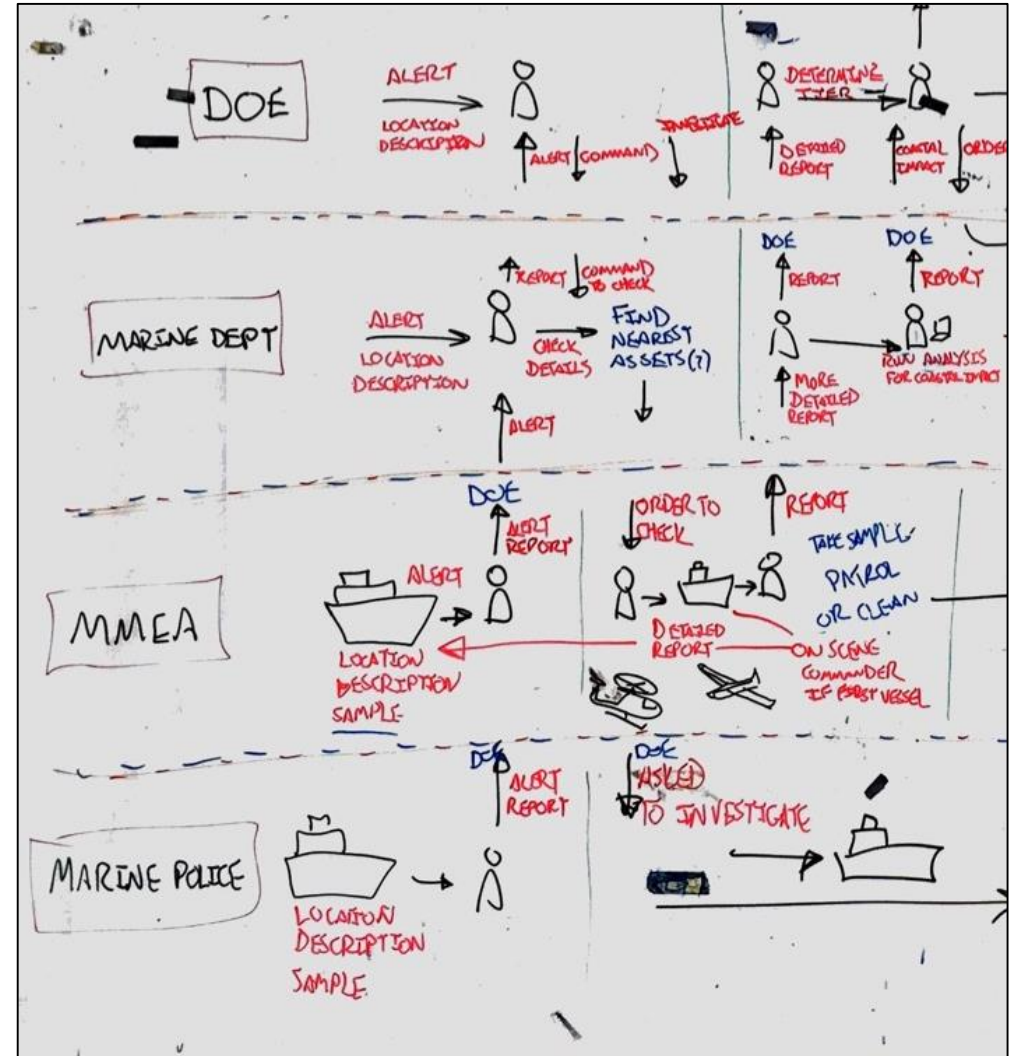
Shipping in the Malacca straits

- Shipping generated oil pollution impacts negatively on
 - Coastal communities
 - Fisheries
 - Tourism



Requirements

- Augment existing 'help line' system with systematic monitoring
- Predict path of oil slick and likely impact on coast
- Provide information to multiple partners



System overview



Satellite oil detection

- Automated Satellite data delivery
- Oil detection algorithms

» **Spill location and extent**



In-situ monitoring

- On-site oil extent validation
- Verification of satellite data

» **Ground-truthing and surveillance**



Ship detection

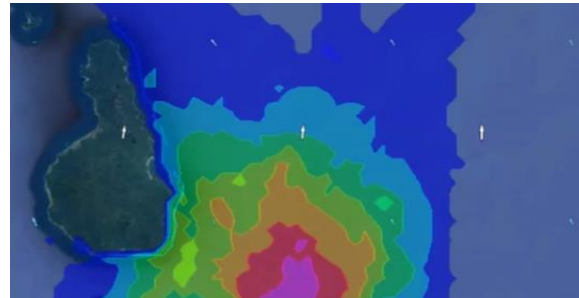
- Ship detection algorithms

» **Vessel ID and characteristics**



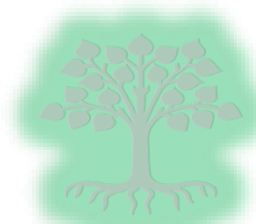
Forwards modelling

Impact, time, location, concentration & probability



Source estimation modelling
release time and location

Visualisation dashboard

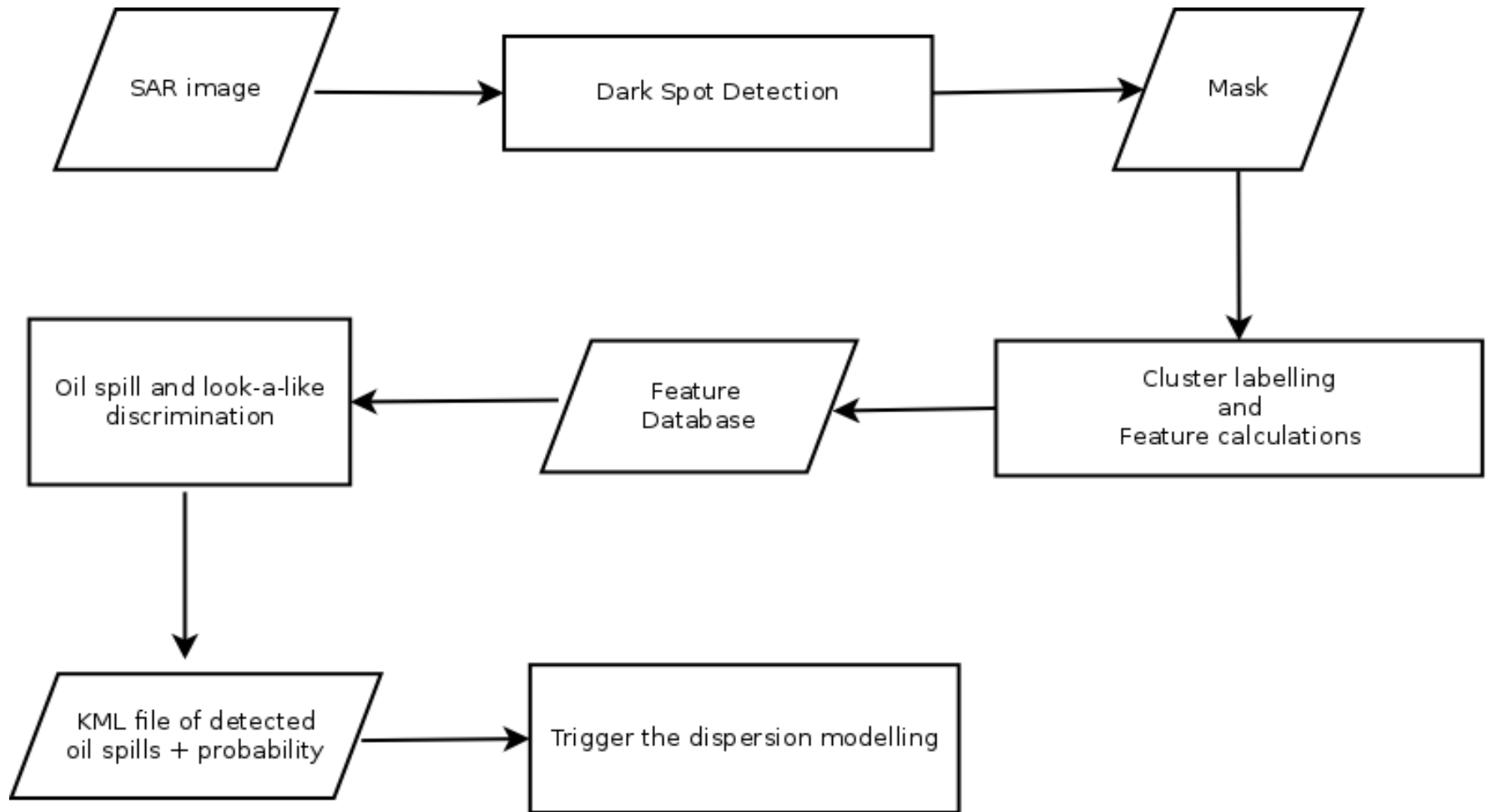


Satellite monitoring capabilities

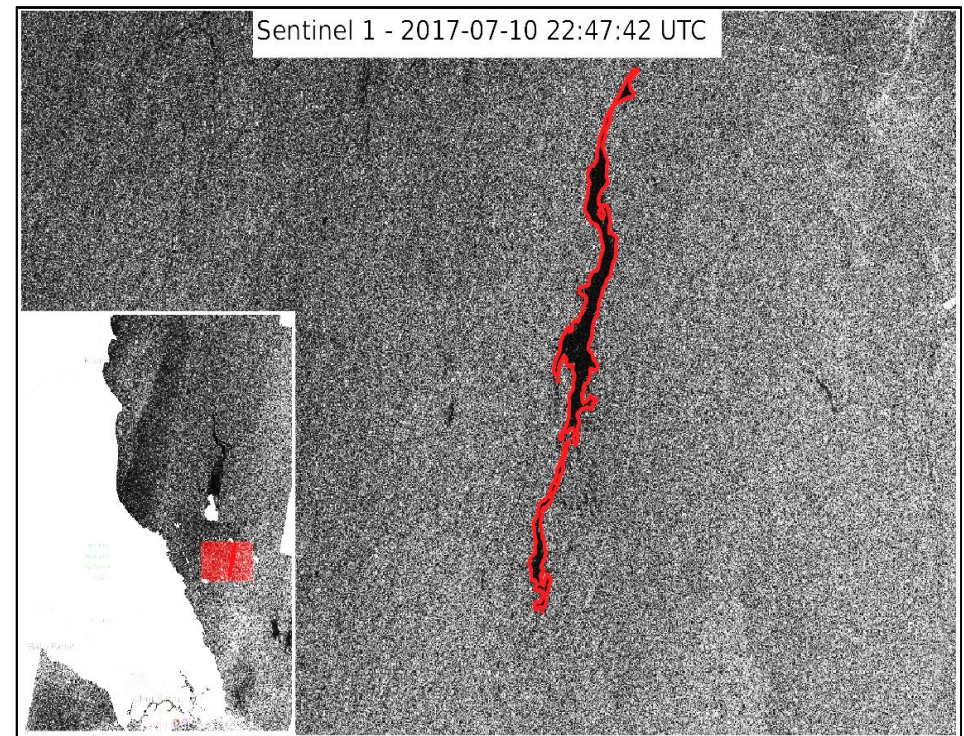
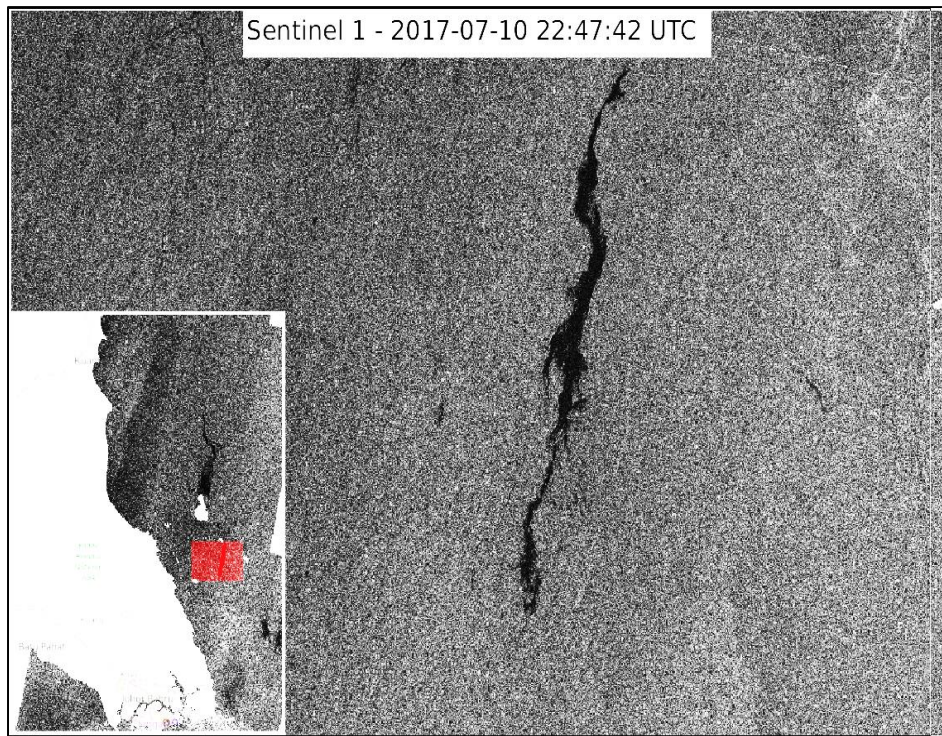
- Synthetic Aperture Radar (SAR)
- Active sensor, works day and night
- Can penetrate through clouds
- Public and private sources



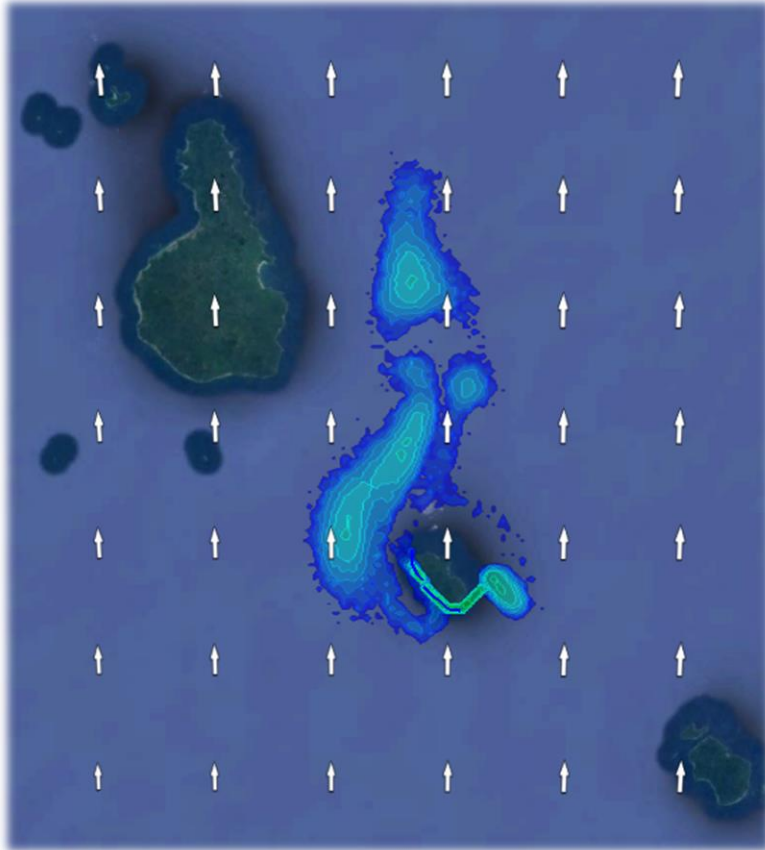
Oil spill detection process



Satellite oil detection

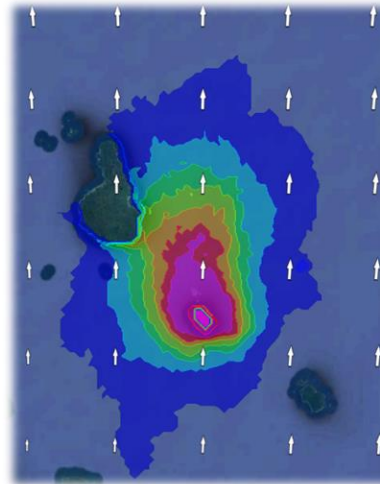


Oil spill dispersion modelling



Concentration

- Most likely path
- Shows thickness
- Includes evaporation and sinking
- Coastal deposition contours



Probabilistic

- Ensemble uncertainty estimates
- Likely extent of the spill
- Coastal deposition likelihood

<http://www.riskaware.co.uk/>

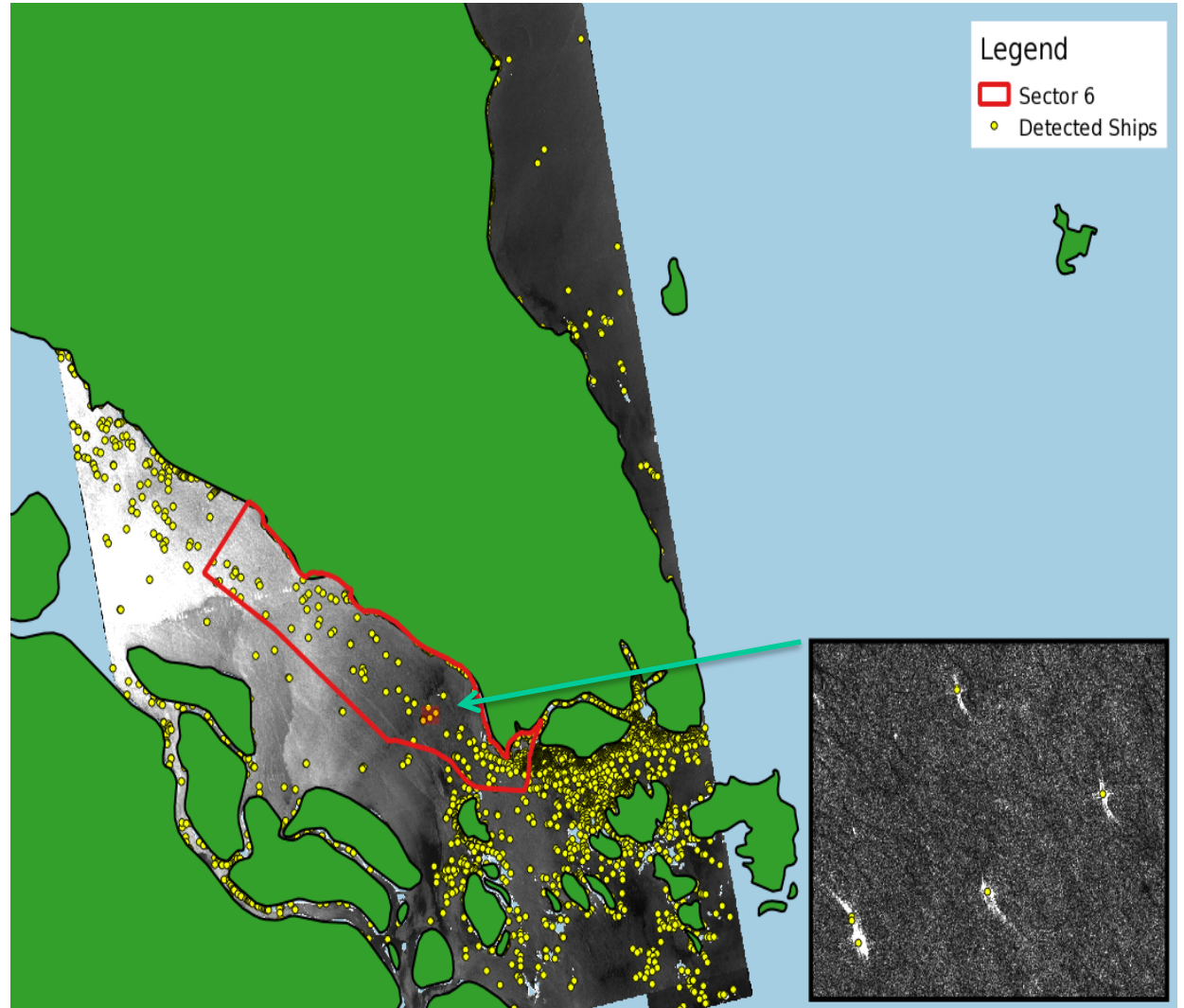
Oil spill dispersion modelling – oil concentration



<http://www.riskaware.co.uk/>

Satellite ship detection

- Source estimation
- Ensemble of possible sources
- Validation of AIS

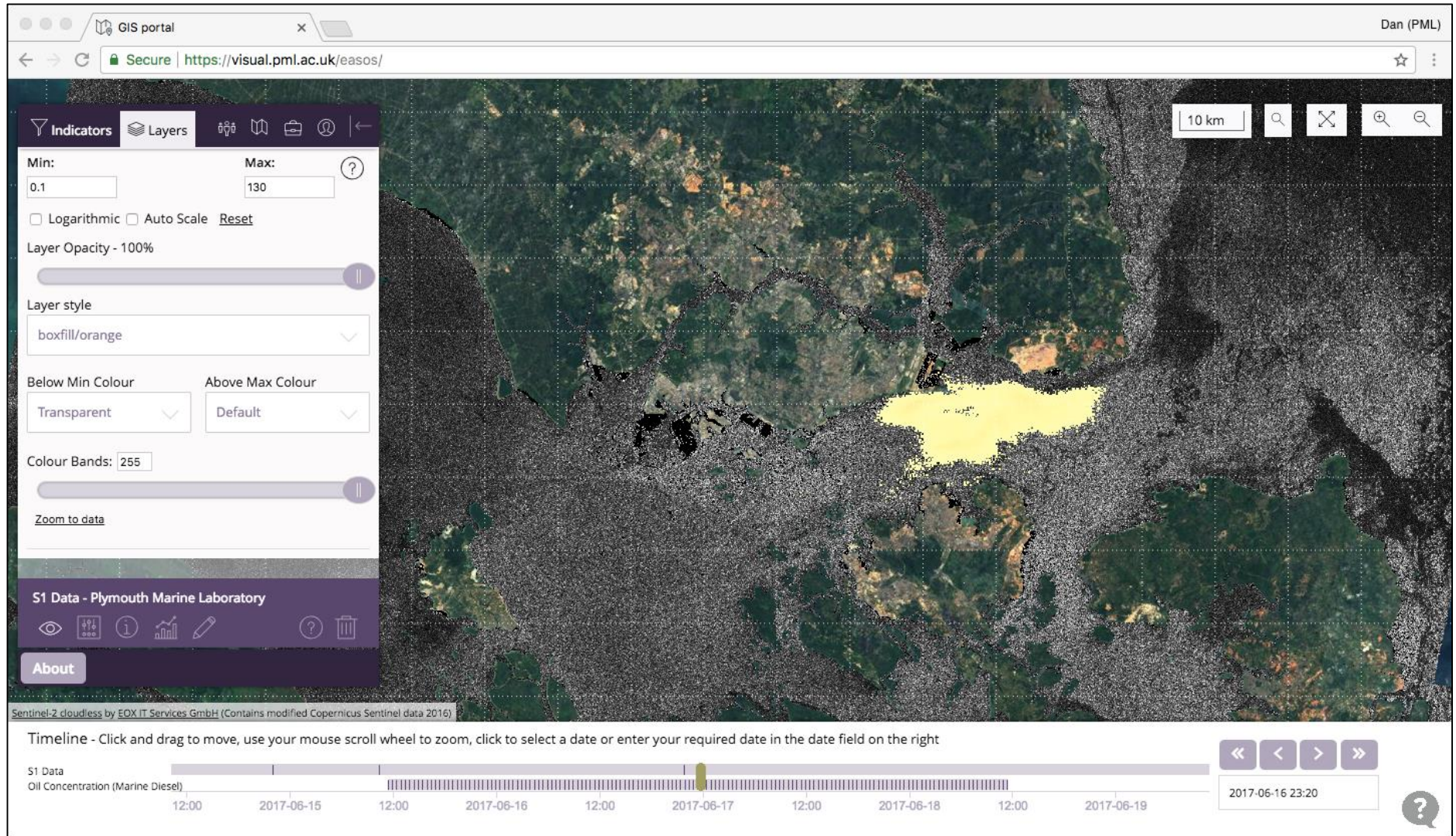


In-situ monitoring – AutoNaut USV



<http://www.autonautusv.com/>

Data Visualisation



<https://visual.pml.ac.uk/easos/>

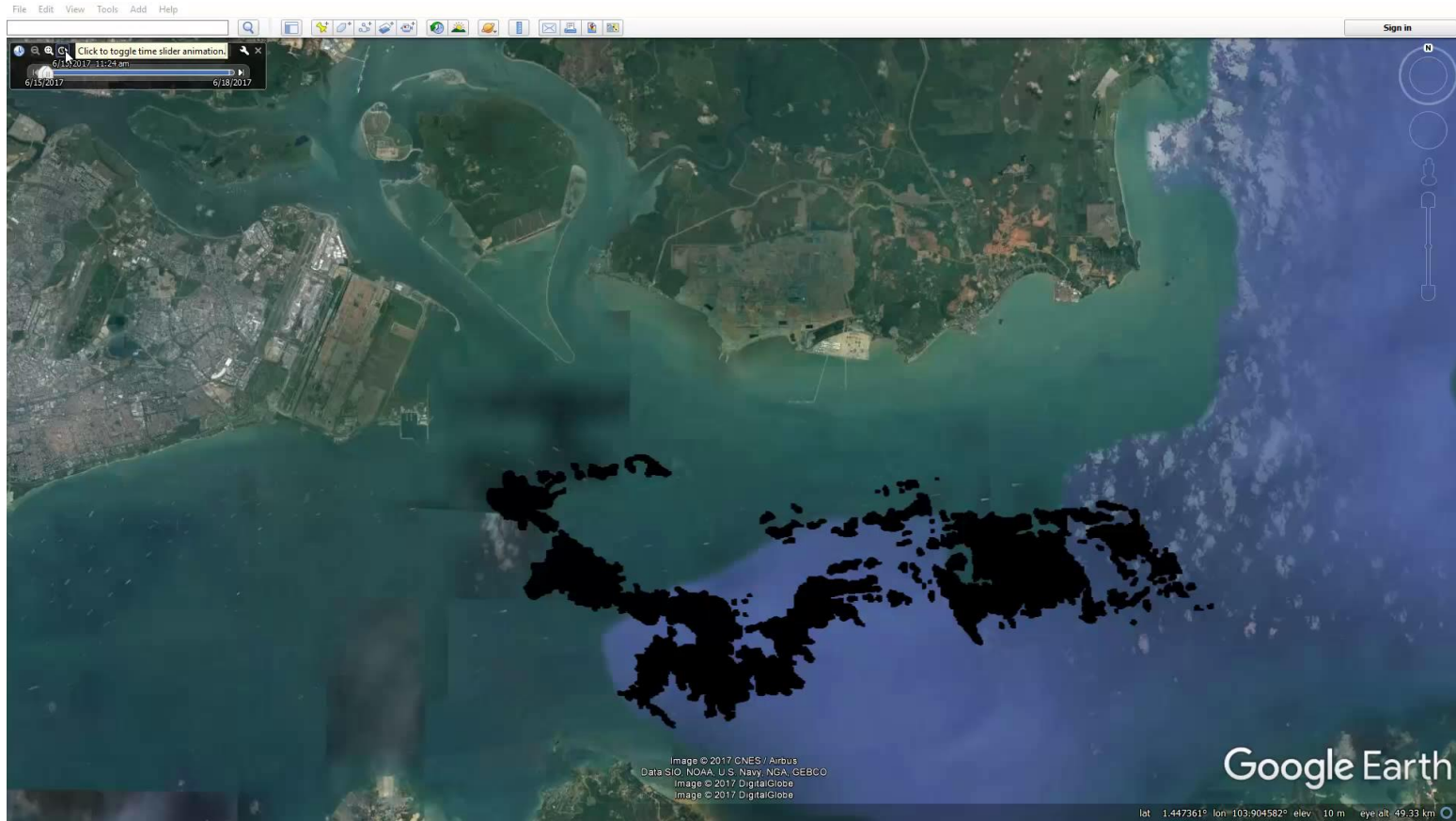
Case study – Putri Sea Tanker

- On 14th June, 2017 20:42 UTC, IFC received information from POCC that an Equatorial Guinea registered Tanker, Putri Sea, reported that her engine room had exploded and the vessel was going to sink.
- Malaysian Marine Department (MMD), requested input from EASOS on the incident



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PHANTOM 4

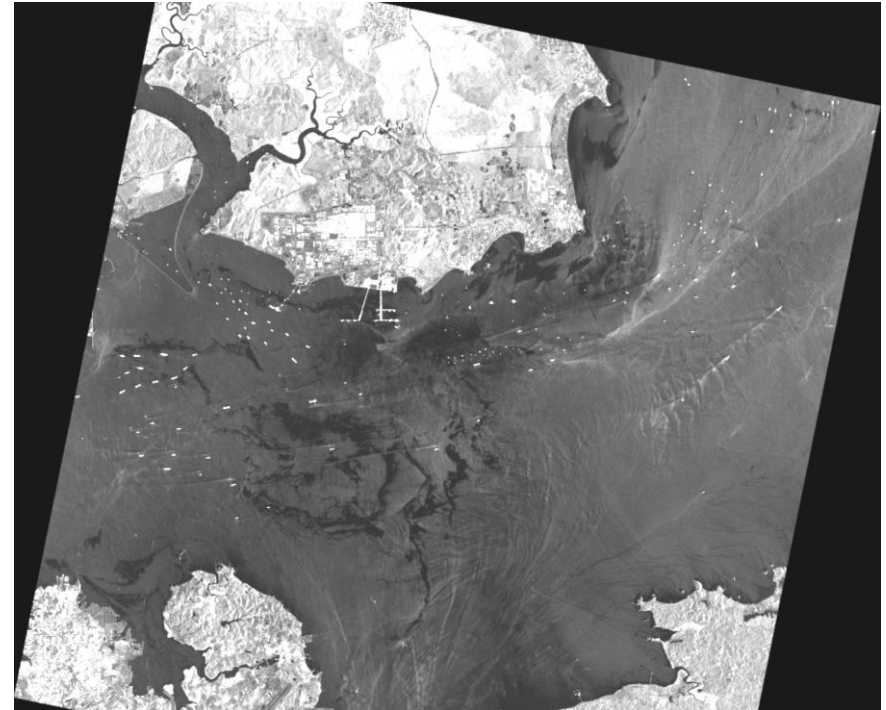
Case study – Putri Sea Tanker



<https://visual.pml.ac.uk/easos/?state=b552f7>

Case study – Putri Sea Tanker

Comparison between modelled results 24 hours from first scene and subsequent SAR acquisition



Conclusions

- An integrated system for monitoring oil spills and predicting path is being developed by PML and partners as part of the EASOS project
 - Focusing on Malacca Straits
- Fully automated satellite processing, oil slick detection and dispersion modelling
 - Starting to provide data from 1st
 - Improving algorithms – need more training data
- A web-based portal used to display and interact with data

Thank you

