



Premiam 2018

An Integrated Approach to Post Spill Monitoring –
Space to Seabed

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Introduction

- CGG & BP collaboration in a pollution monitoring service trial
- Conducted during September/October 2016
- Using satellite data to identify slicks of interest and use the information to direct autonomous systems
- Outlined the value of satellite systems
- Initial trials of autonomous system
- Integration of technologies
- Future direction



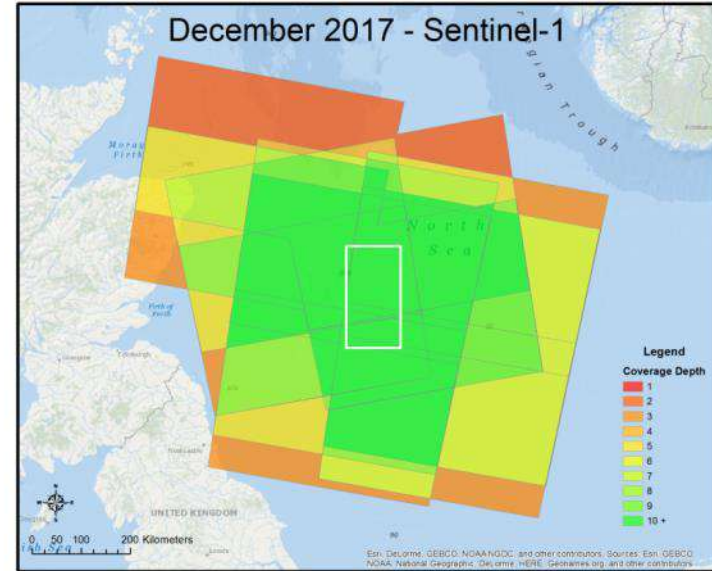
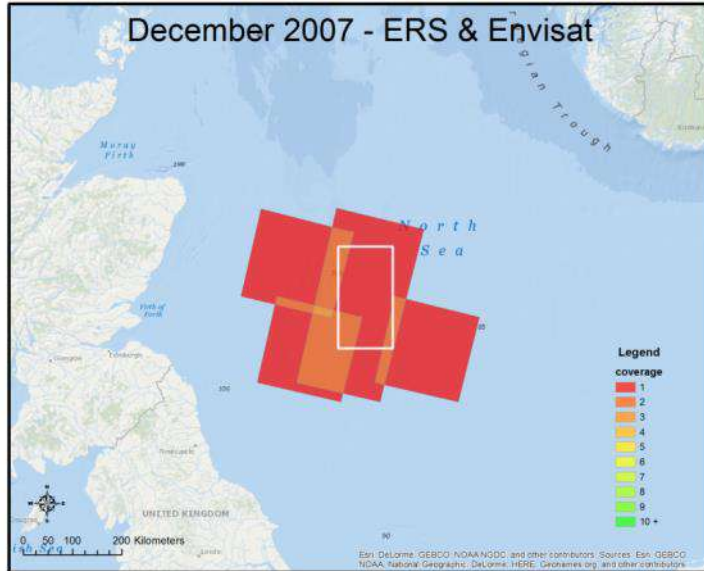
Typical coverage frequencies

Satellite	Revisit Period (days)	No. of satellites in constellation
Sentinel-1 (a & b)	12 (6)	2
COSMO SkyMed	16	4
Radarsat-2	24	1
TerraSAR-X	11 (4-7)	1 (2)
Etc.	Etc.	Etc.

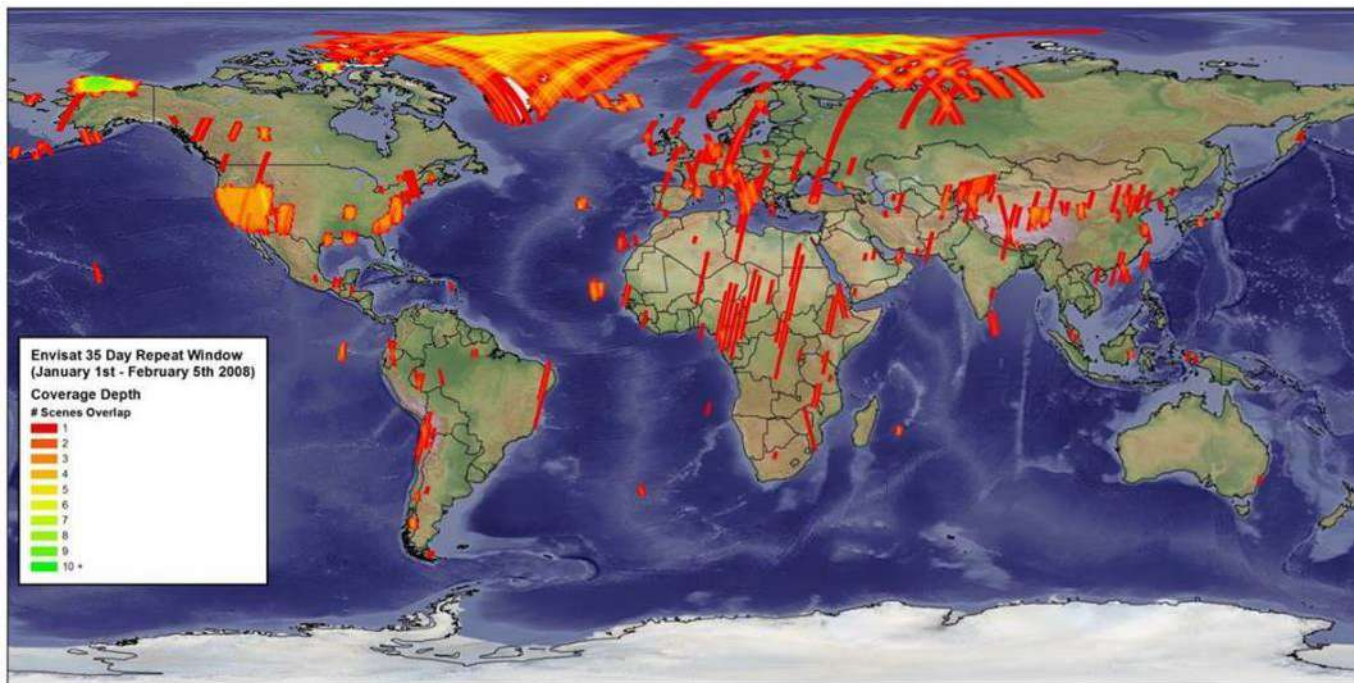
Higher coverage frequency where scenes overlap



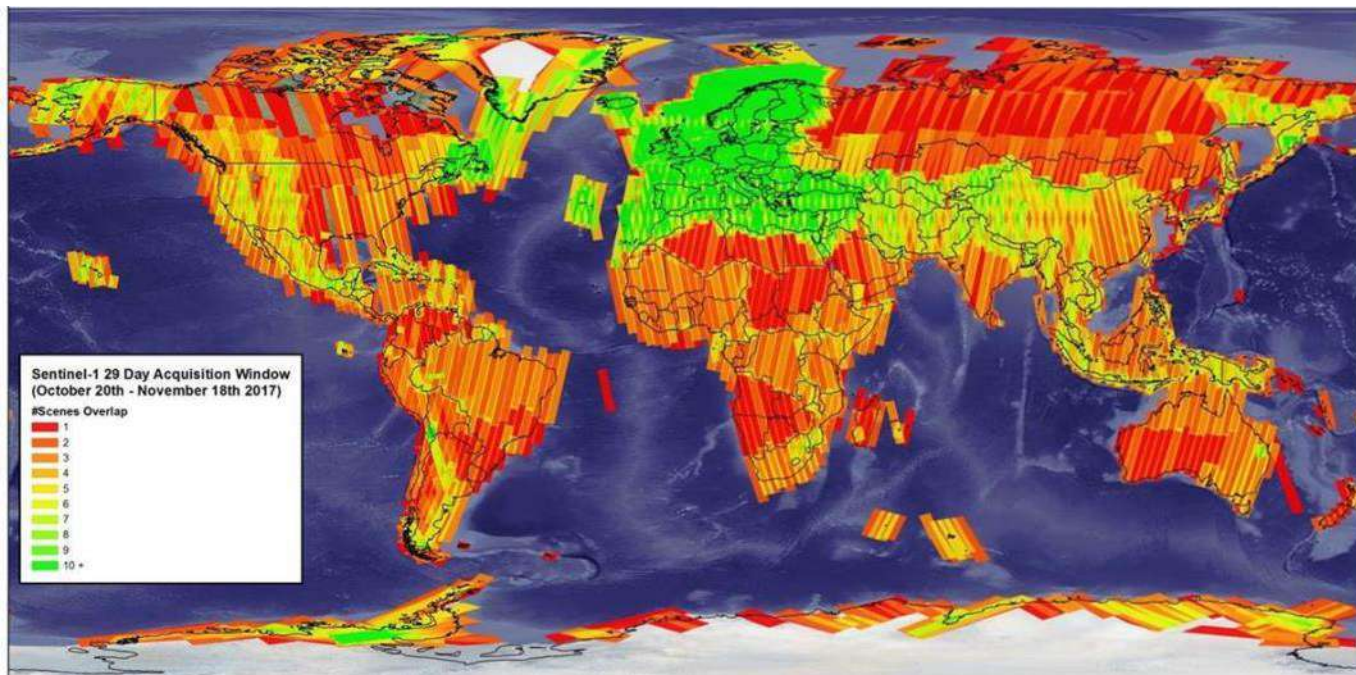
What a difference a decade makes



What's the picture globally?



.....and now for Sentinel-1



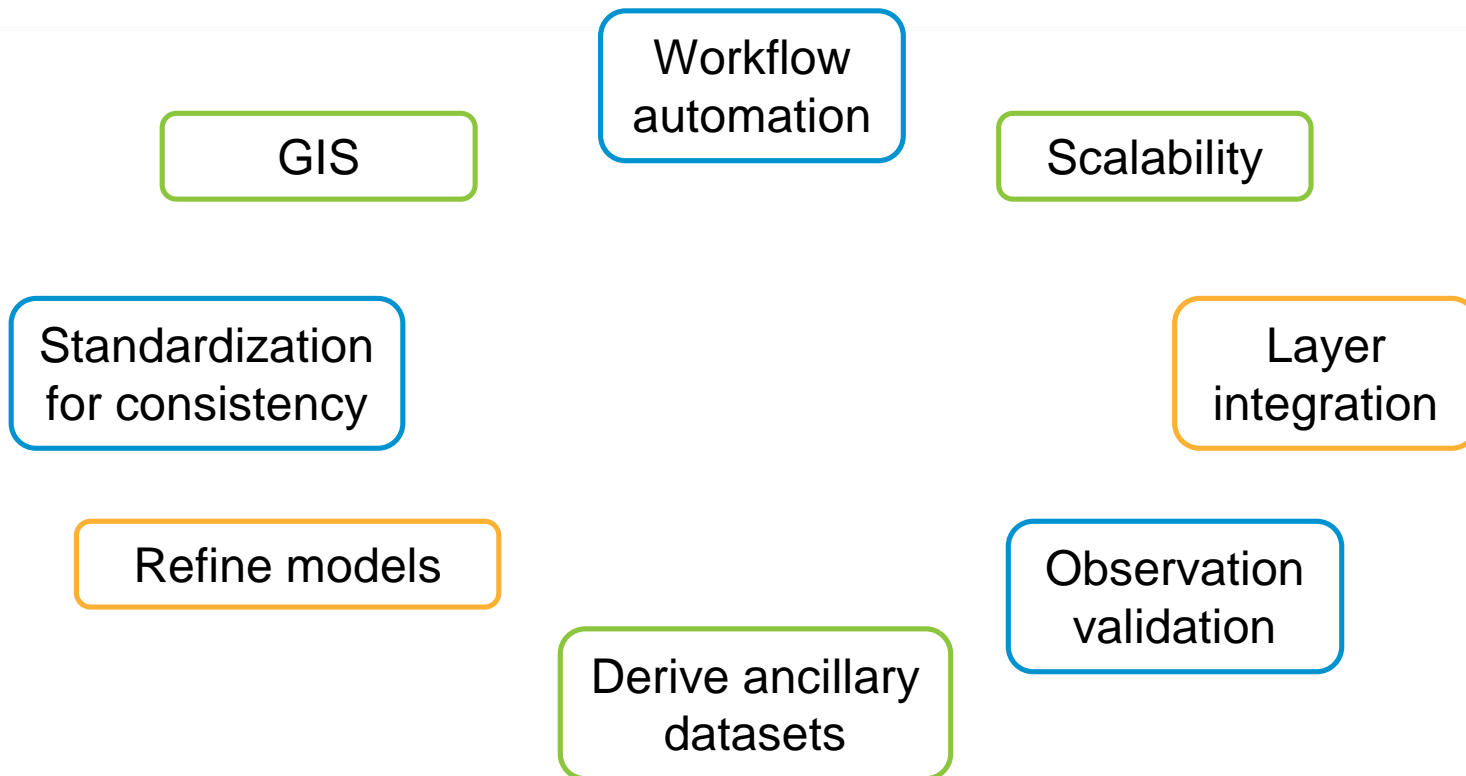
FREQUENCY ↑

COVERAGE ↑

RESOLUTION ↑



Satellite imagery for offshore pollution



An enhanced approachroutine monitoring

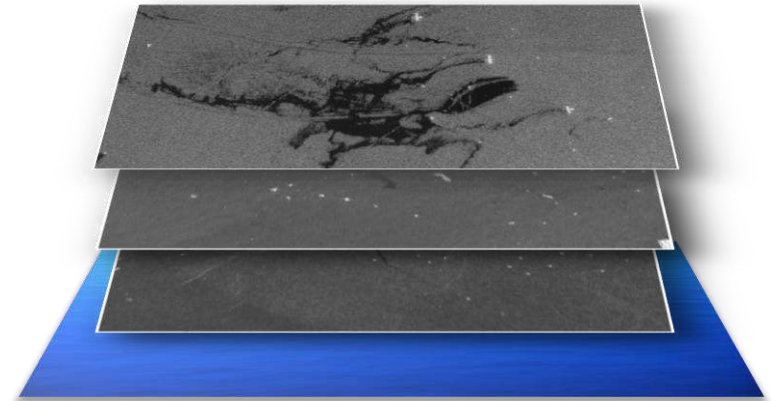
Exploit open access data

Plan ahead

Enhance situational awareness

Support emergency response

Put knowledge in operators' hands



Offshore Asset Pollution Monitoring Service Trial



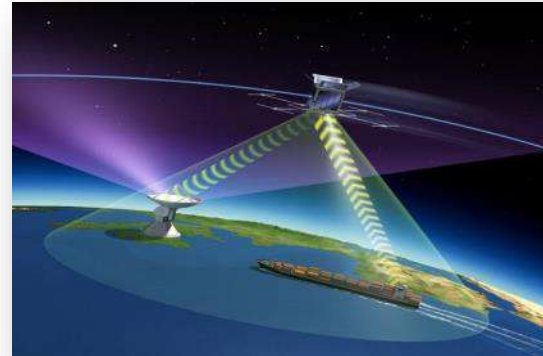
Objectives

1. To demonstrate the **improved situational awareness** provided by satellite data under NPA's Offshore Asset Pollution Monitoring service
2. To maintain **regular observations** of offshore around BP's production facilities at the Clair field
3. To demonstrate the advantages of **combining data** from satellite and autonomous surface vehicles



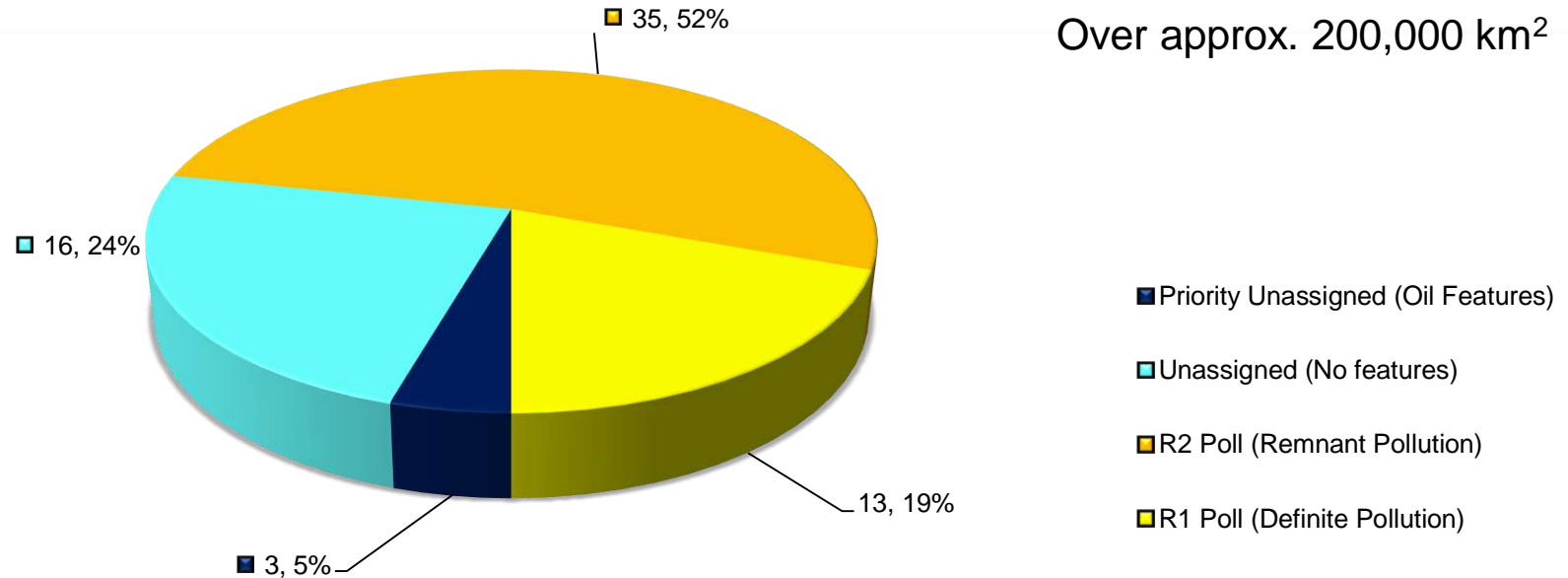
Satellite data

- Imagery
 - Satellite radar missions
 - ERS
 - Envisat
 - Sentinel
 - COSMO-SkyMed
- AIS vessel tracking
 - AIS (Automatic Identification System)
 - Provided by ExactEarth
 - Daily data





Slicks mapped during the service trial



- 30 COSMO-SkyMed satellite image acquired
- 15 Sentinel-1a satellite images acquired



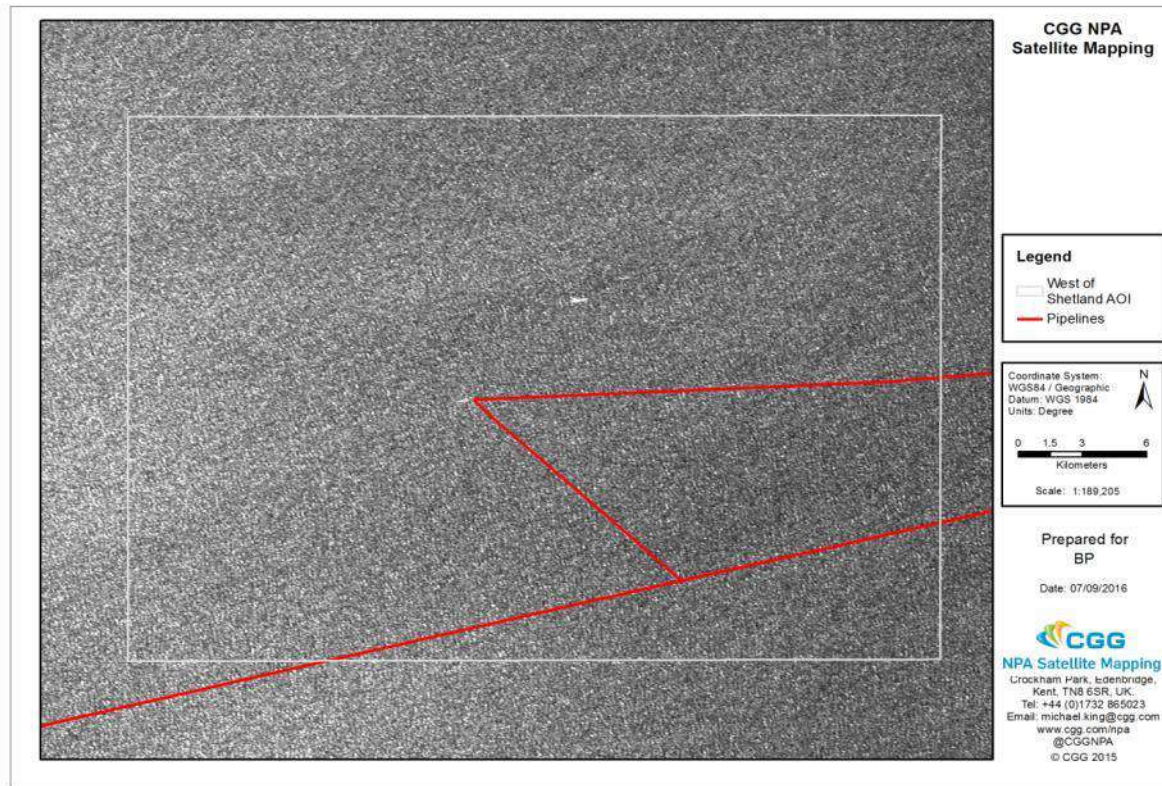


Service trial results

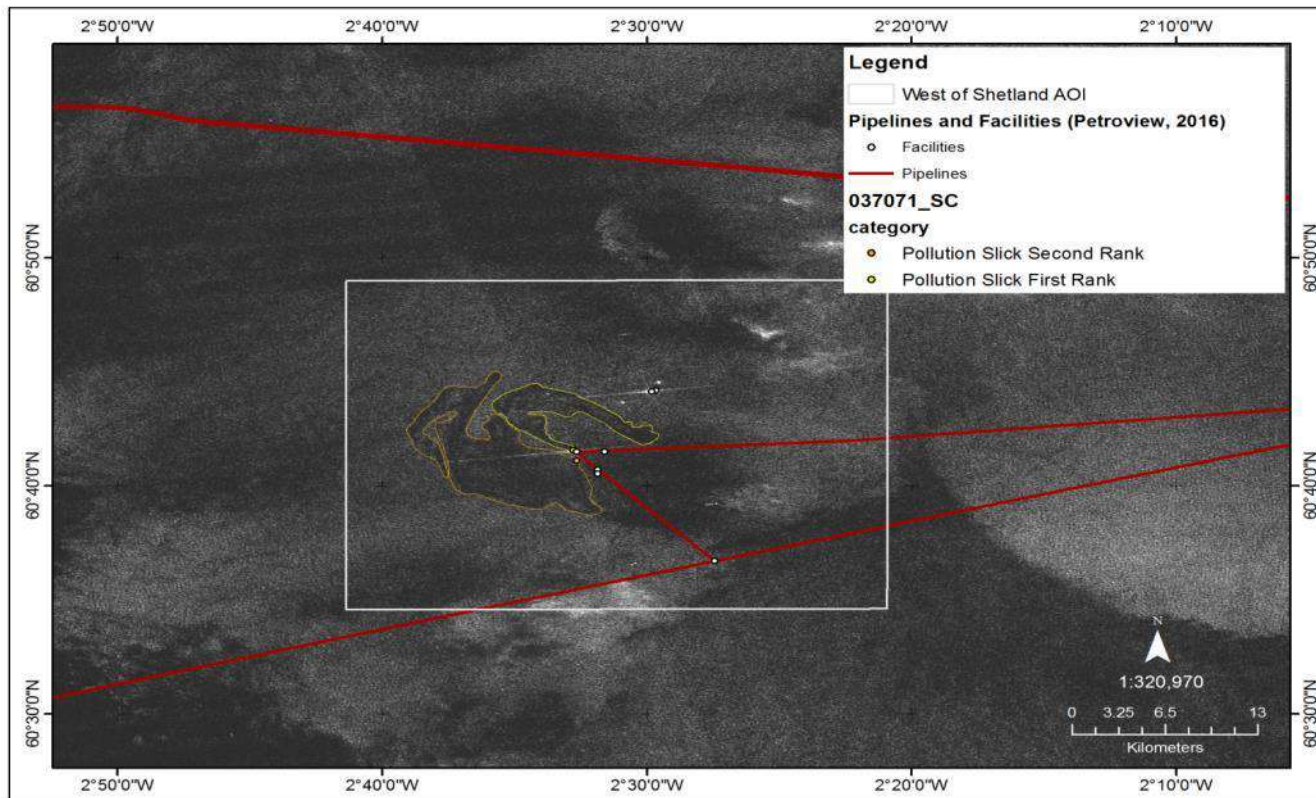




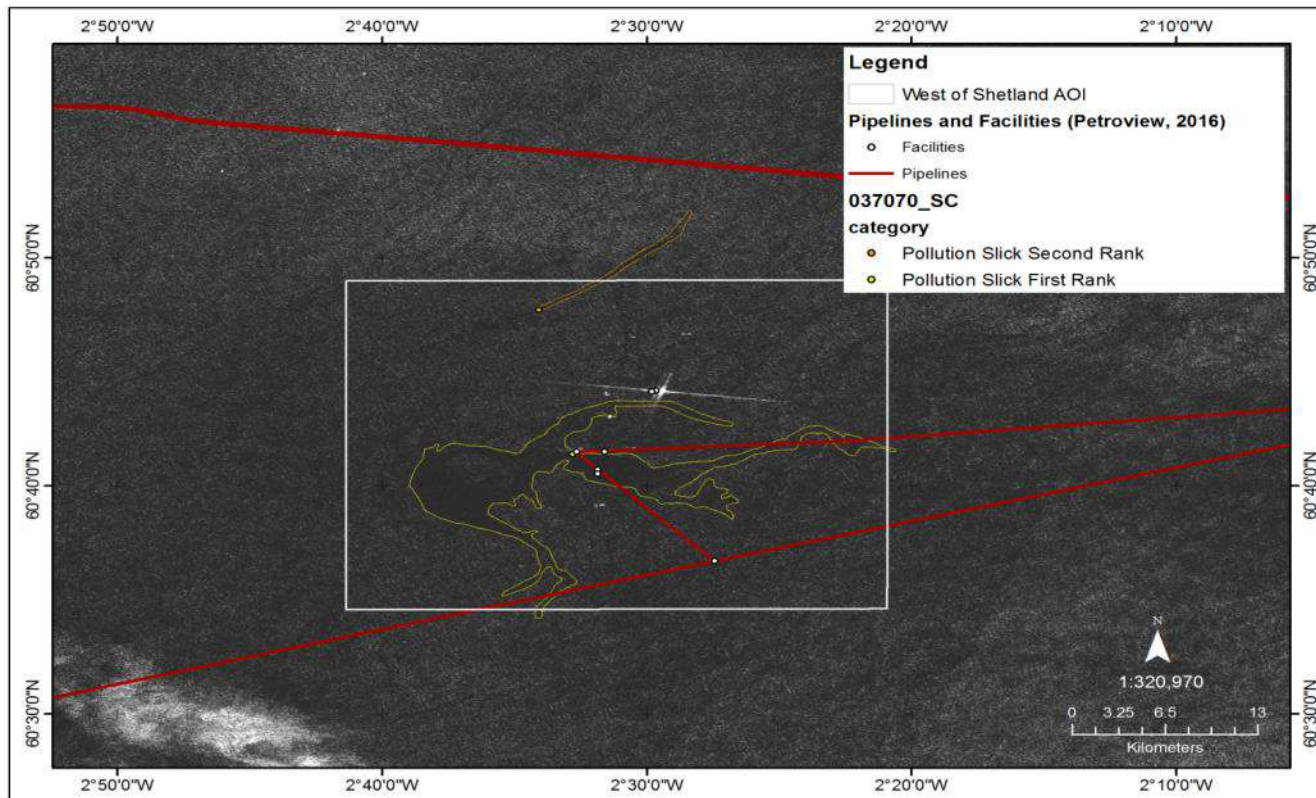
Long periods with no observed slicks



Clair incident – 01/10/2016

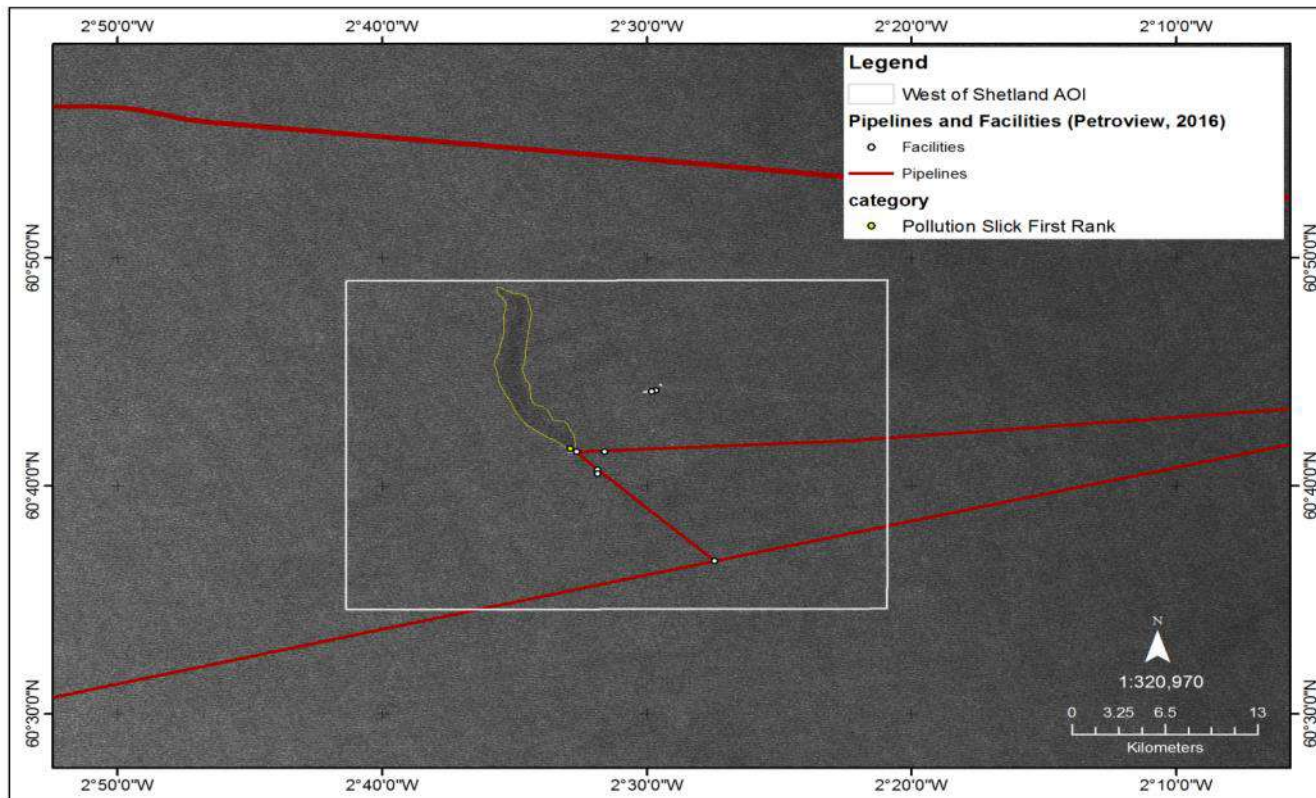


Clair incident – 02/10/2016





Clair incident – 03/10/2016



Marine Autonomous Systems (MAS)

- MAS provide the opportunity of low cost, persistent and quality data gathering platforms.
- Autonaut, an Autonomous Surface Vessel (ASV) demonstrated the potential for system integration
- Multiple deployment trials in 2017-18 in the North Sea
- Satellite augmented mission planning
- Shallow water bathymetric service and AOI's to improve situation and feature targeting.





Other issues

- AUV systems could provide data for modelling and defining the ‘envelope of interest’
 - Rapid strike
 - Small
 - Profuse
 - Capable
- Benthic sampling still a challenge for automated systems
- Subsea visual feature recognition i.e., detecting change is an area of interest – feature recognition already well established in the satellite realm.
- A.I. = predict with models and generate new information from data to guide and ultimately automate certain decisions





Conclusions

- Satellite earth observation can be seen as an important tool for post spill monitoring, and regular proactive information gathering.
- The use of newly emerging technology regarding maritime autonomous systems (MAS) offers a step change for impact monitoring.
- Data flow is crucial - and ‘enabling technologies’ such as A.I., offer the promise of ‘near real time’ results, potentially allowing a more adaptable approach to post spill monitoring.





Thank you

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