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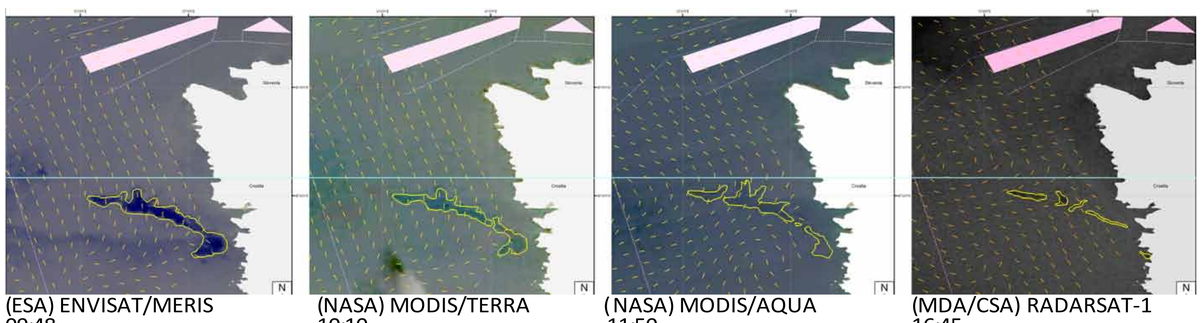
Identification of Polluters in the Adriatic Sea

Spills at sea are a common occurrence in today's shipping lanes. Oceans and seas are choked with fully laden ships, causing a tremendous impact on the fragile marine life and ecosystem. The biggest concern for life on and under the seas is oil pollution, which is becoming a big problem. This is an occurrence that usually happens on accident; however, there are deliberate polluters out there as well.

Problem overview

Ships produce oily waste in the course of their normal operations. This waste then needs to be disposed of. Discharges at sea are very strictly regulated within 'Special Areas', which also include the Adriatic Sea, the main area of our research. However, ships dump waste into the sea, because it is cheaper and quicker.

It is very difficult to cath a ship redhanded when disposing waste. Our primary goal of the project was to use modern marine simulators to produce an animation of the spill, its movement, and eventually, find the polluter responsible.

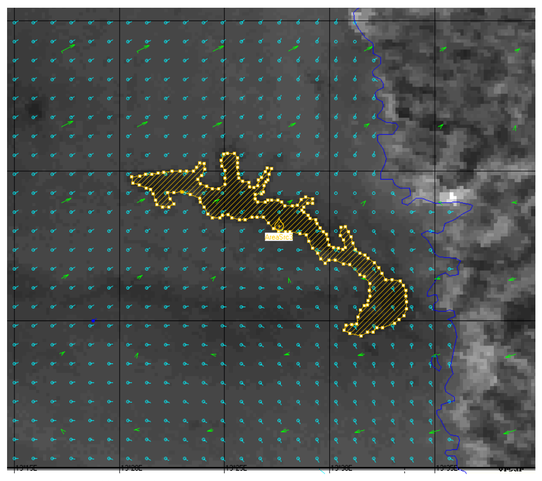


(ESA) ENVISAT/MERIS 09:48 | (NASA) MODIS/TERRA 10:10 | (NASA) MODIS/AQUA 11:50 | (MDA/CSA) RADARSAT-1 16:45

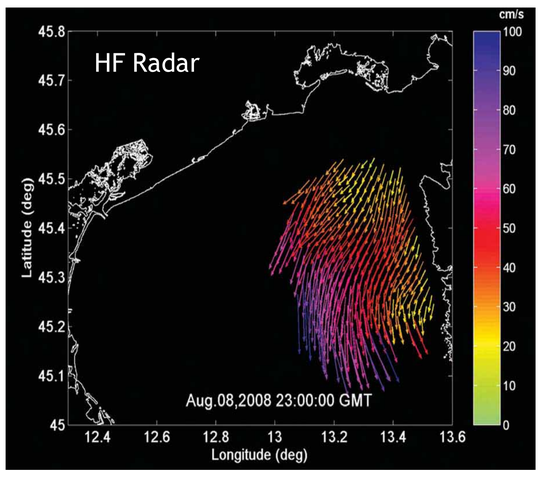
Oil spill in the Adriatic Sea, Istra region, 06.08.2008. Between 11:50 and 16:45 cleaning of oil spill took place.

Data

- Radar satellite data:
  - ENVISAT/MERIS (260 m)
  - RADARSAT 1 (30 m)
- Optical satellite data:
  - MODIS/TERRA (250 m)
  - MODIS/AQUA (250 m)
- HF radar data
- wind vectors and sea currents



Oil spill in the Adriatic Sea, Istra region, using PISCES II. The area of spill is 40 km^2.



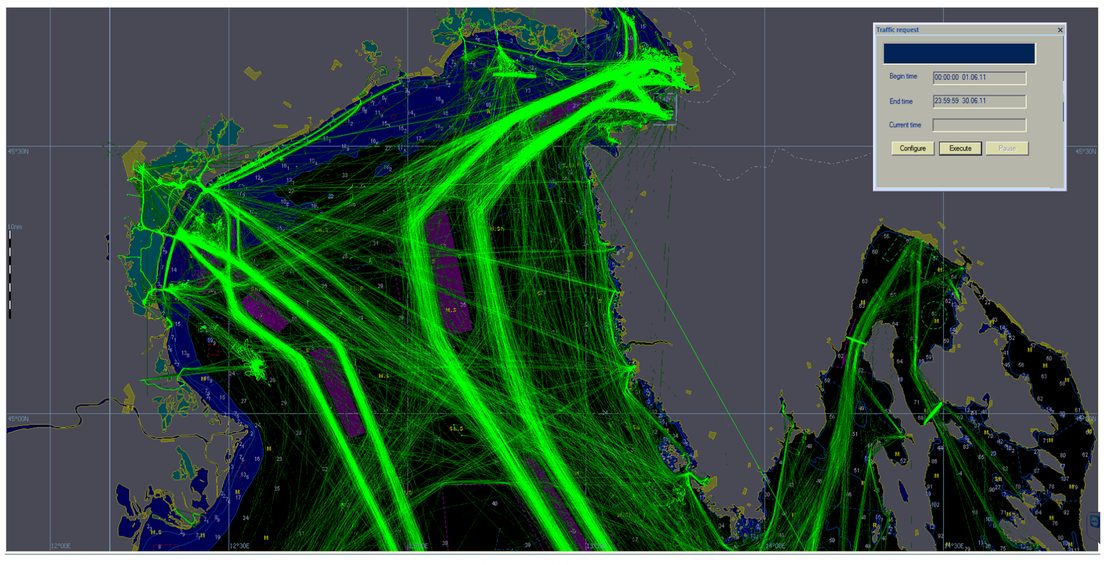
The oil spill moves on the sea surface by the action of surface currents and winds.

Methods

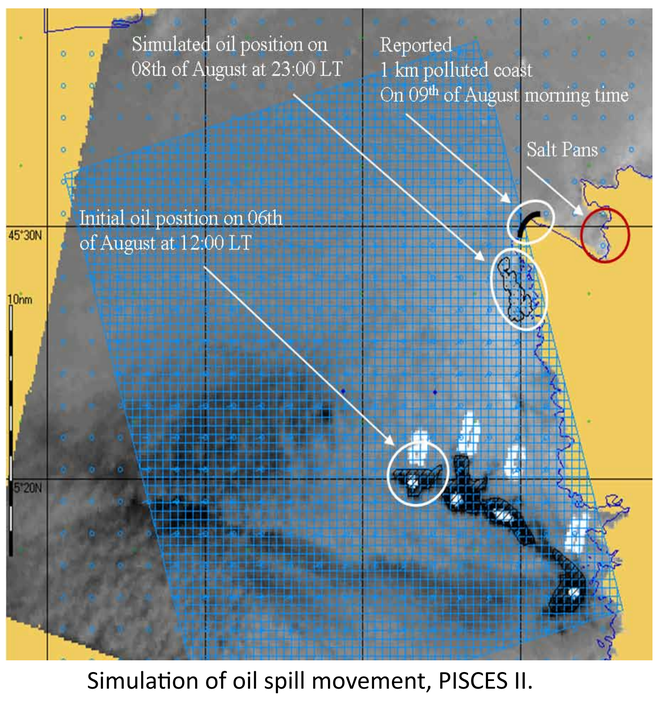
The advanced simulator PISCES II was used. PISCES II contains detailed maps and coastlines of the whole world, infrastructure on coasts, and has the ability of backtracking.

The next step involved the insertion of wind vectors and sea currents into the simulator. This data creates an environment suitable for the movement of the spill, thus enabling the spill to ˝move˝. Backtrack of the spill was then possible. Backtracking allowes the creation and the advancement of the spill in a three day period, from the day of detection to the spill's dissipation.

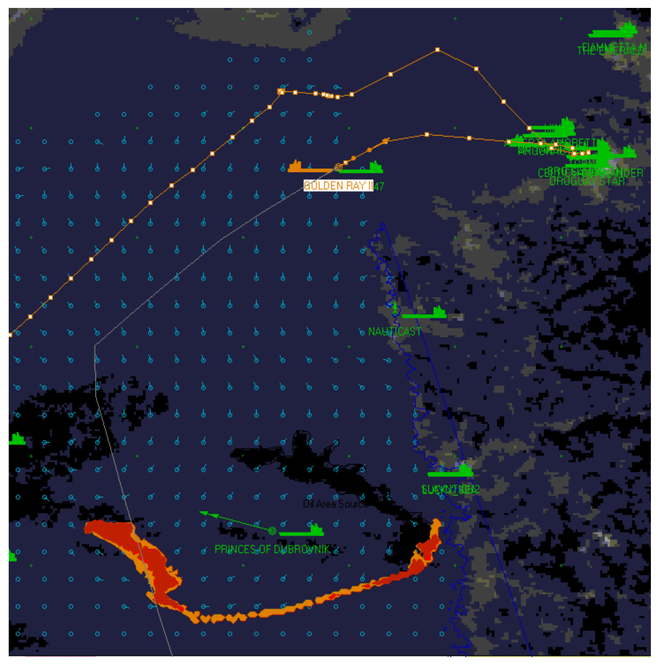
Since every ship today has its own AIS number, it is possible to track them and locate their position. AIS, or Automatic Identification System, of all ships that were in the vicinity of the spill were collected, and placed into the simulation, thus creating a list of potential polluters.



Density of marine traffic in the Istra region.



Simulation of oil spill movement, PISCES II.



Simulation of oil spill movement, PISCES II.

Results

The suspected polluters were ruled down to three potential ships; a ferry and two RORO vessels. This was concluded with the information, that these ships actually passed through the spill, a potential indicator. Assuming the size and area of the spill, and comparing that to the potential polluters, it was determined that the polluter of this spill was a RORO vessel.

Conclusions

This research clearly states the importance of integrating numerous data in order to achieve great results. As a result of our research, it is possible to conclude that no vessel is immune to not being caught in the act of disposing waste, which is good news. By implementing this type of response to any mayor spill, it is possible to determine the exact polluter, and make the sea of future tomorrow a safer and friendlier place for all.