

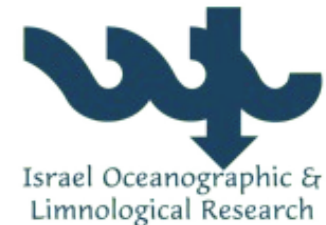


**ENPI  
CBCMED**  
CROSS-BORDER COOPERATION  
IN THE MEDITERRANEAN



# High Risk Areas for Oil Spills in The Eastern Mediterranean

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# Motivation

- Determination of areas which are at high risk for oil spill may assist in:
  - oil combat resource allocation,
  - preparing oil spill scenarios for contingency planning,
  - planning marine protected area, offshore structures, etc`.

# Scope

- Region: East Mediterranean
- Time domain: 2013



# Data

- Ship traffic information
- Oil transport information
- Offshore platform information



# Ship Traffic Information

- Data obtained from Shipcon
  - Data contained global data on ship calling
    - calling records: 4,475,514 non tanker , 4316 tanker
    - 19,911 ships (including 3854 tankers)
    - 9190 waypoints (328 in the East Med.)
  - Calling record - ship, waypoint, date of calling, time of calling, date of departure, time of departure
- 
- A world map with a light blue background and a grid of red dots representing ship traffic data points. The dots are most densely clustered in the North Atlantic, the Mediterranean Sea, the Indian Ocean, and the South Pacific, indicating high levels of ship traffic in these regions. The map also shows the outlines of continents in a light tan color.

# Oil Transport Information

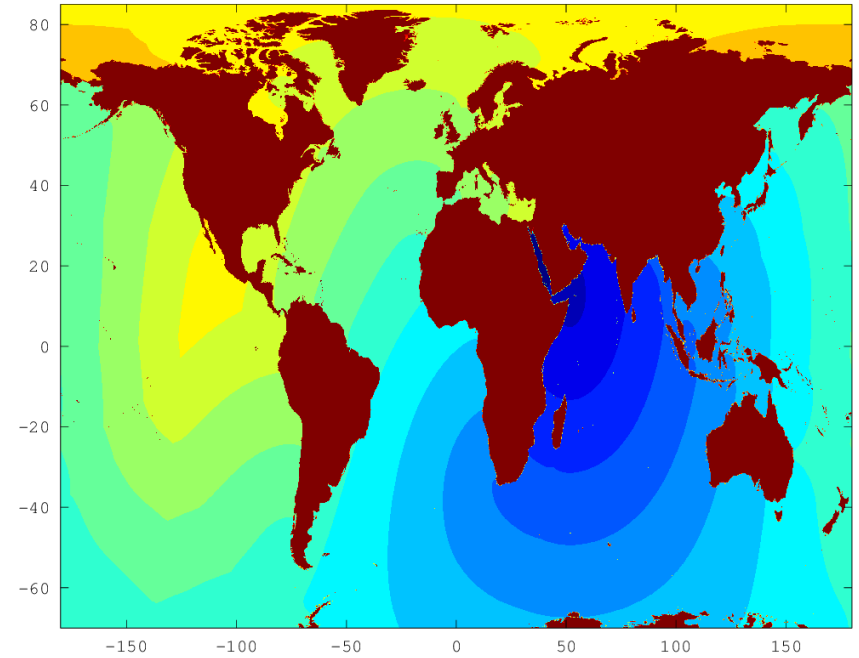
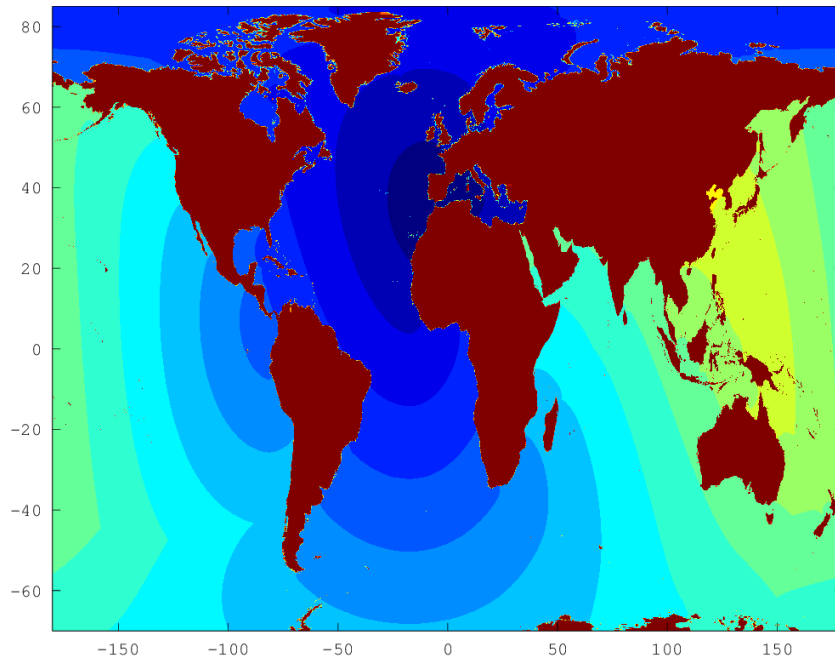
- Data obtained from Shipcon
- 4316 Records
  - ship
  - departure waypoint and date
  - amount loaded
  - arrival waypoint and date
- Oil type is not specified
- Unloaded amount not specified

# Data Processing

- Quality control per ship:
  - Sort records by date
  - Remove records contradicting more than one record (i.e. overlapping time interval, reverse time interval, duplicate record)
  - Remove waypoints with NaN coordinates
- Assume ship routes are the shortest possible, while trying to keep distant from land.
- Assume ship travels at constant speed.

# Data Processing

- Distances from Gibraltar and Suez allow to determine if a ship going between two waypoints outside the Mediterranean, passes through the Mediterranean or not



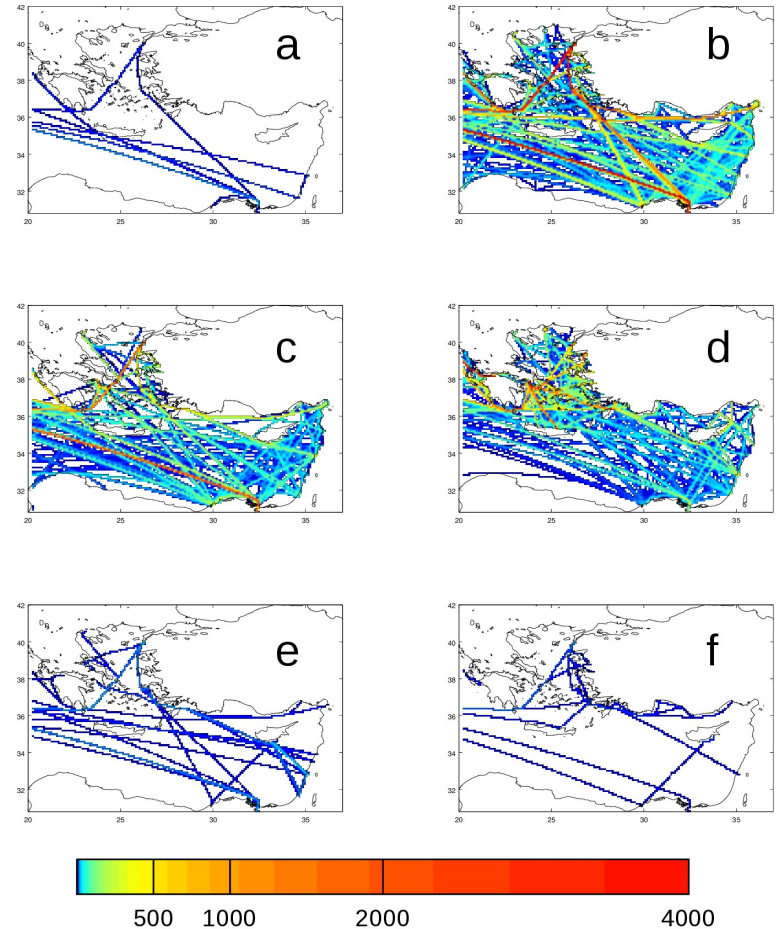


# Data Processing

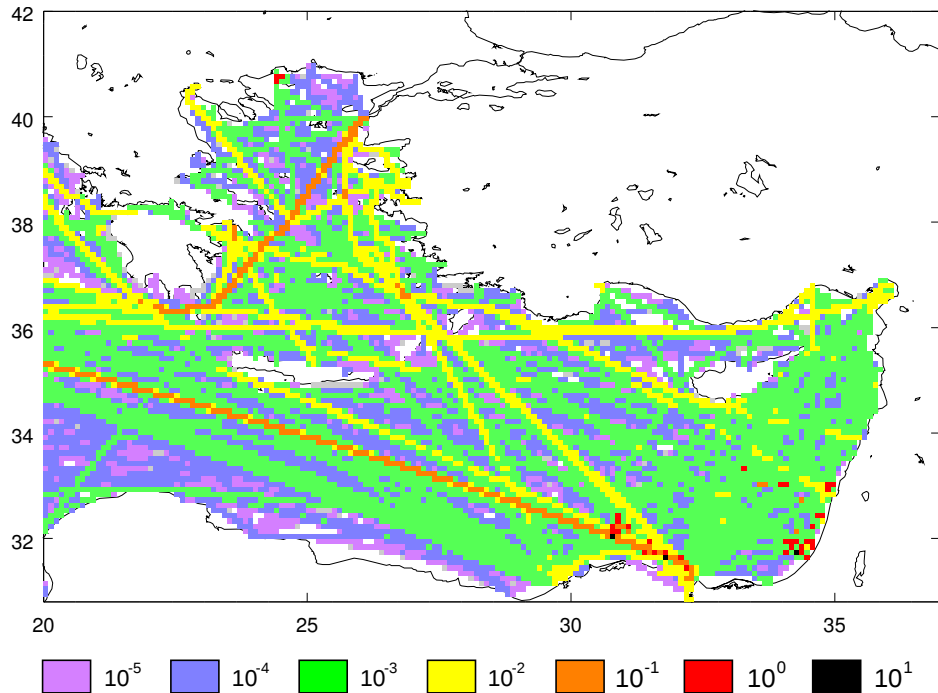
- Compute routes between waypoints inside the East Mediterranean.
- Count the number of times a route is repeated in a year per ship class:
  - 21 ship types, 3 tanker types and 17 nontanker types.
  - Oil tankers are subdivided to 8 categories according to the amount of oil being carried :  
0 – 10kt, 10 – 25kt, 25 – 45kt, 45 – 80kt, 80 – 120kt, 120 – 160kt, 160 – 320kt

# Data Processing

- The computed Routes are gridded on a  $0.1^\circ \times 0.1^\circ$  grid
- The average velocity is computed for each ship type



# Total Probability



- The leading cause is spill from ship-rig and ship-ship collision
- High risk define as at least once in a century ( $p > 0.01$ )
- Highest probability at rigs and on routes away from Suez and Dardanelles

# Information Required to Improve the Estimates

- AIS density maps instead of virtual paths - will solve the following problems:
  - Erroneous paths due to missing or bad waypoints
  - Routes do not consider navigational warning
  - Partial information on STS, no information on bunkering
- Additional information on maritime connectors (i.e. location, type, pipe size, annual use)
- Information on location and type of rigs
- Information on oil types

# GIS Tool

- Calculate probability estimates
- Users can
  - update datasets
  - use higher resolution
- ESRI and qGIS versions