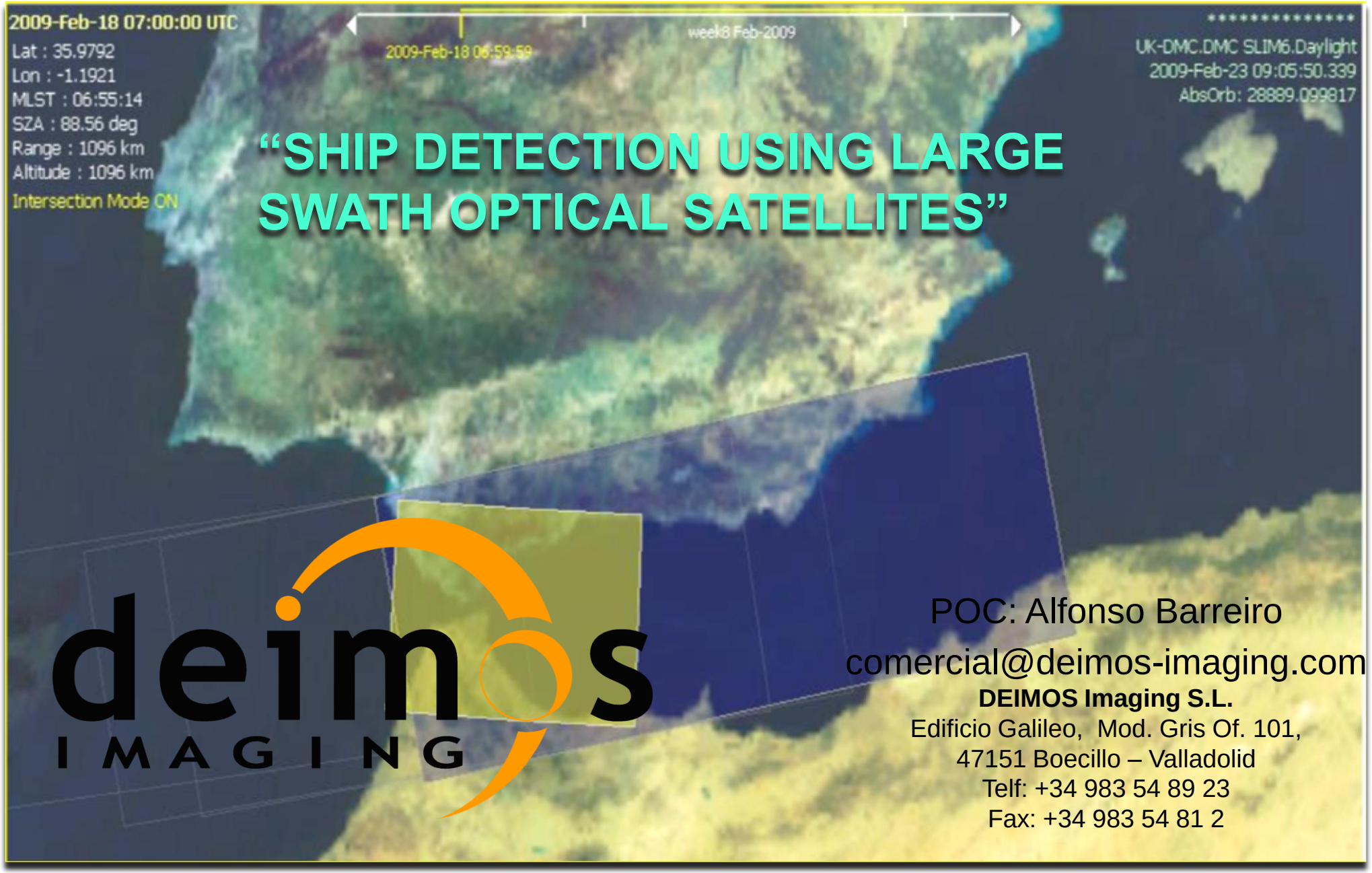



# "SHIP DETECTION USING LARGE SWATH OPTICAL SATELLITES"

POC: Alfonso Barreiro

comercial@deimos-imaging.com

**DEIMOS Imaging S.L.**

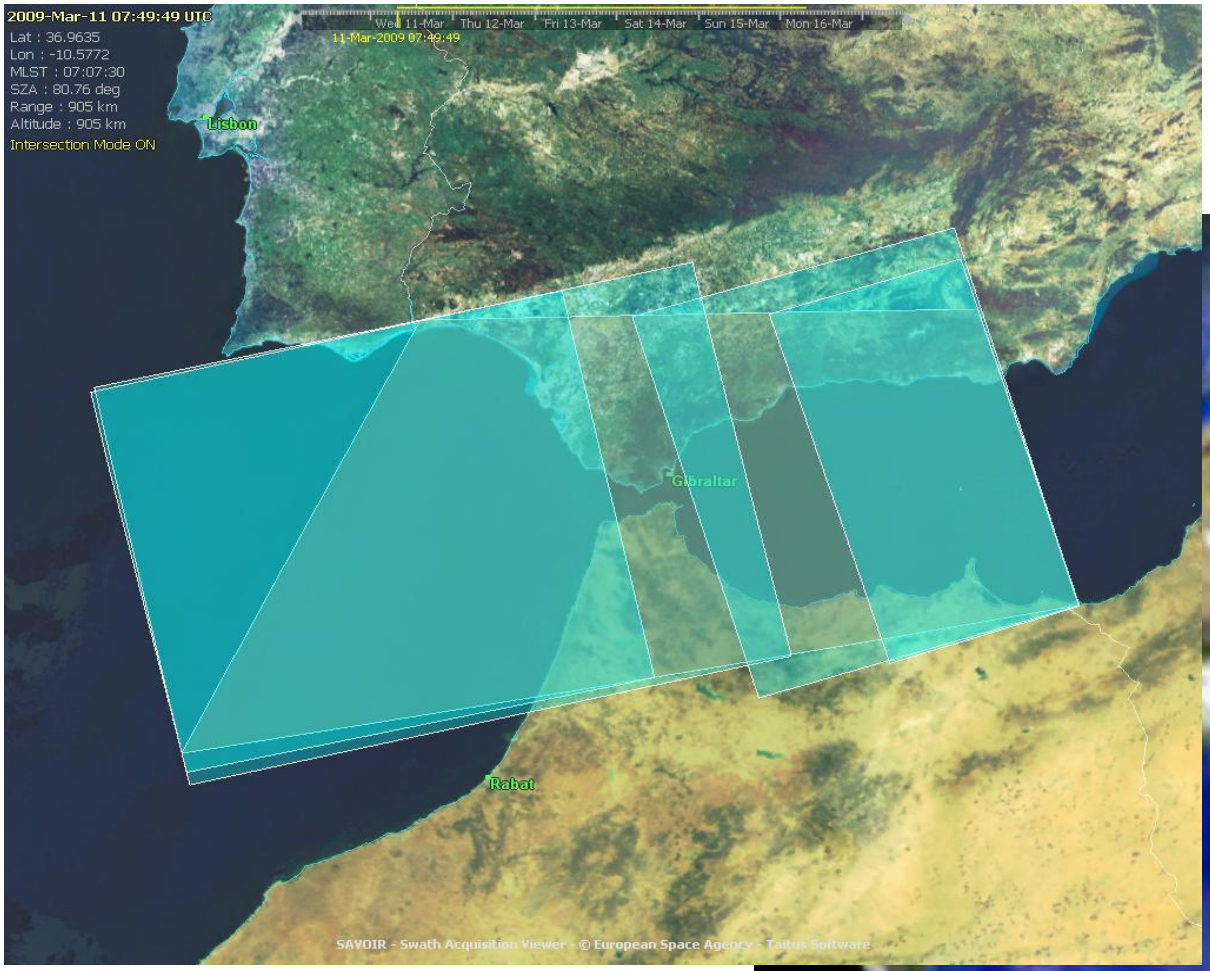
Edificio Galileo, Mod. Gris Of. 101,

47151 Boecillo – Valladolid

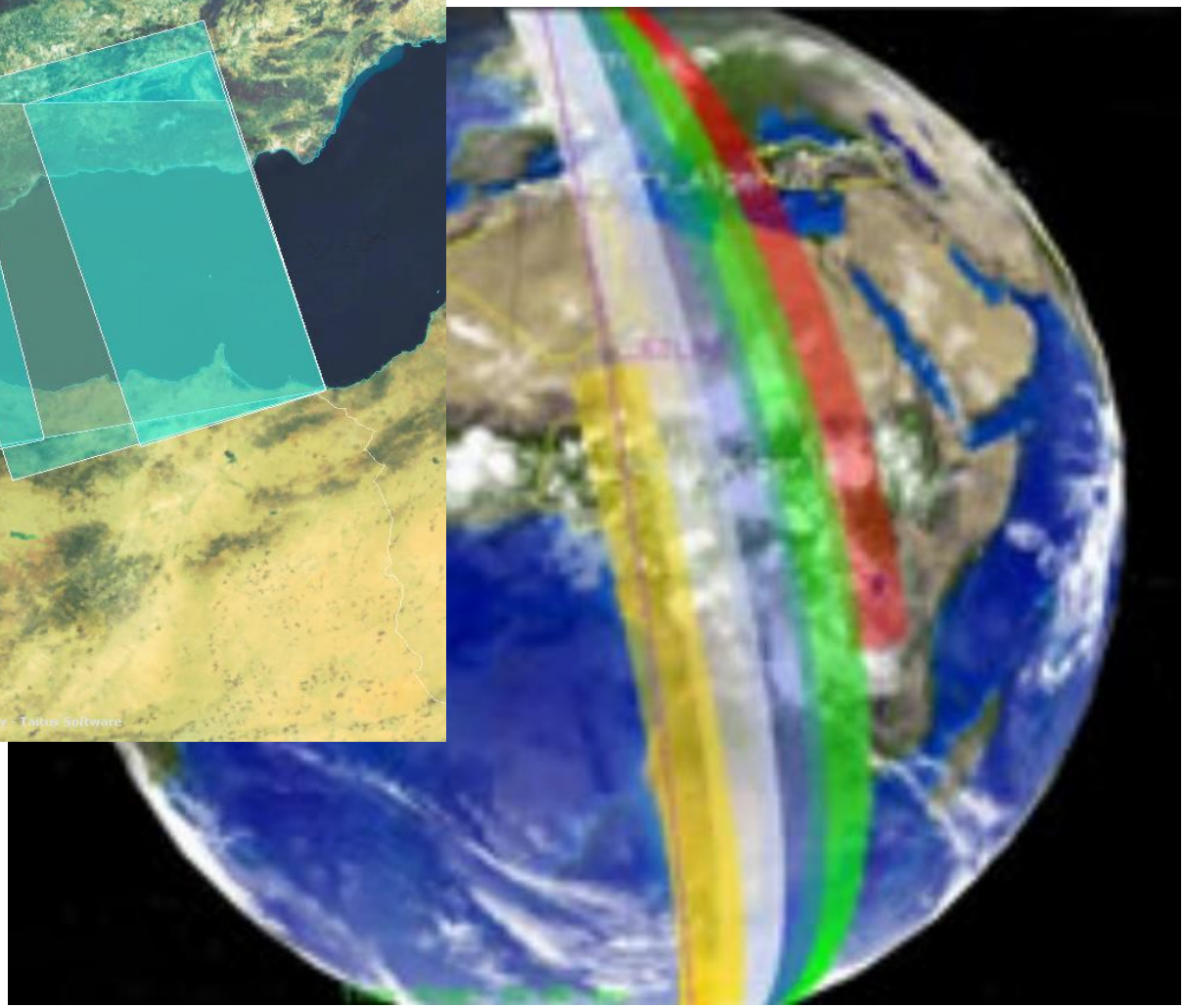
Telf: +34 983 54 89 23

Fax: +34 983 54 81 2

# Coverage capabilities




Possible captures in Southern Spain-Morocco area

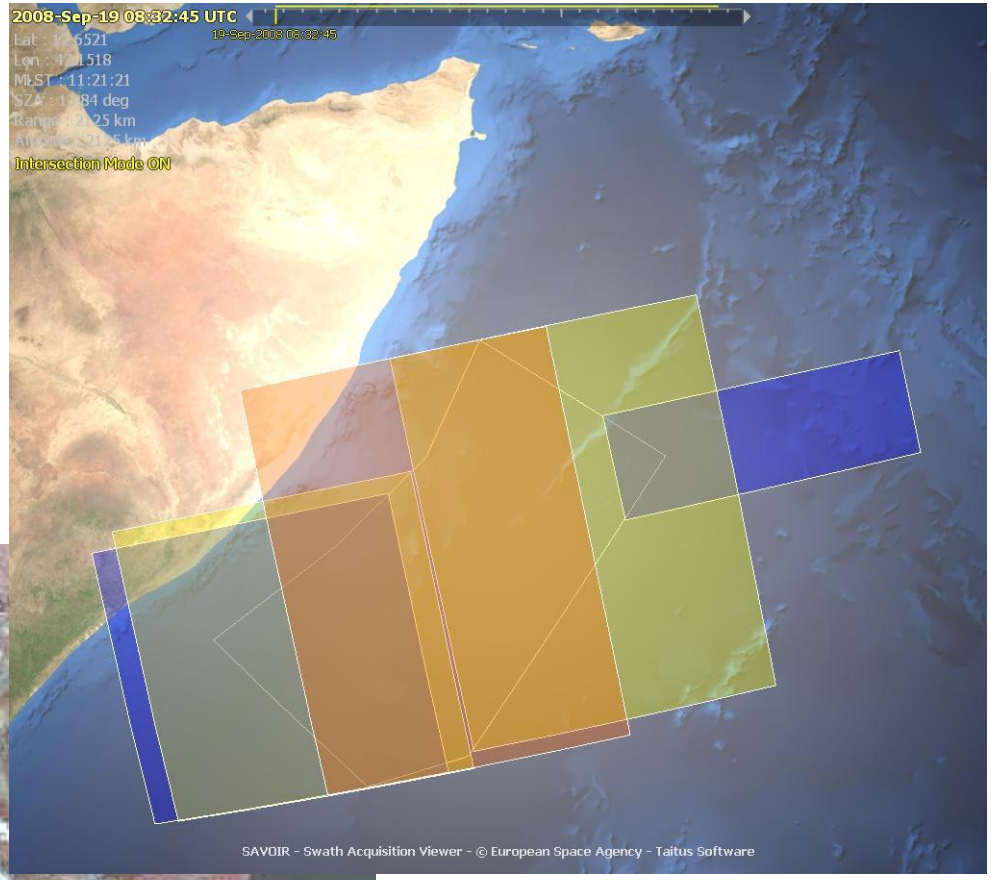


Constellation passes to cover very large areas daily

# Basic sensor capabilities

SSTL SLIM-6 sensor capabilities:

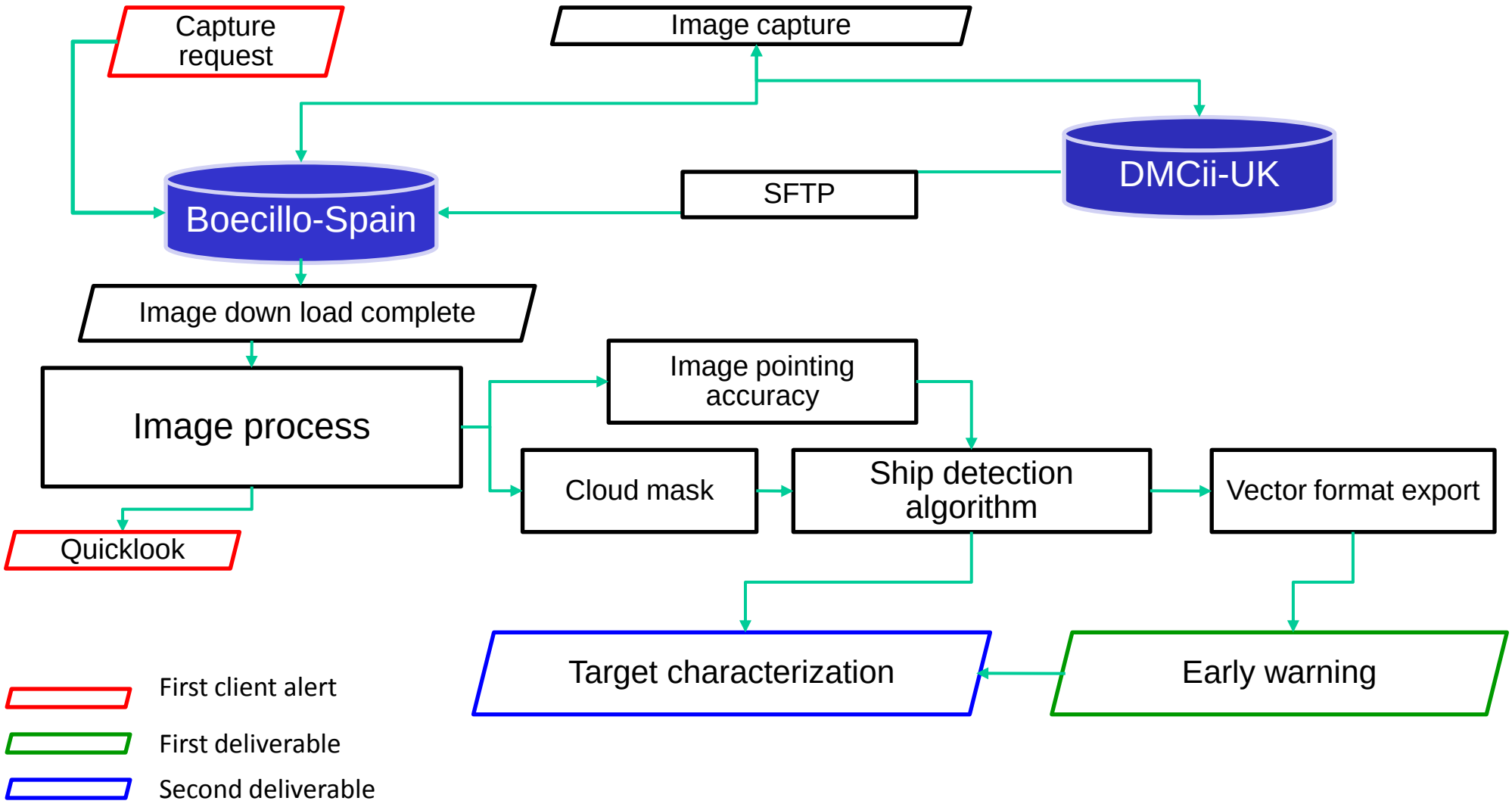
- Very large swath, 670 Km planned for Deimos-1 satellite:
  - 20 m GSD at nadir
  - 3 Basic bands: Green, Red, Near IR
  - Over 28 thousand pixels across



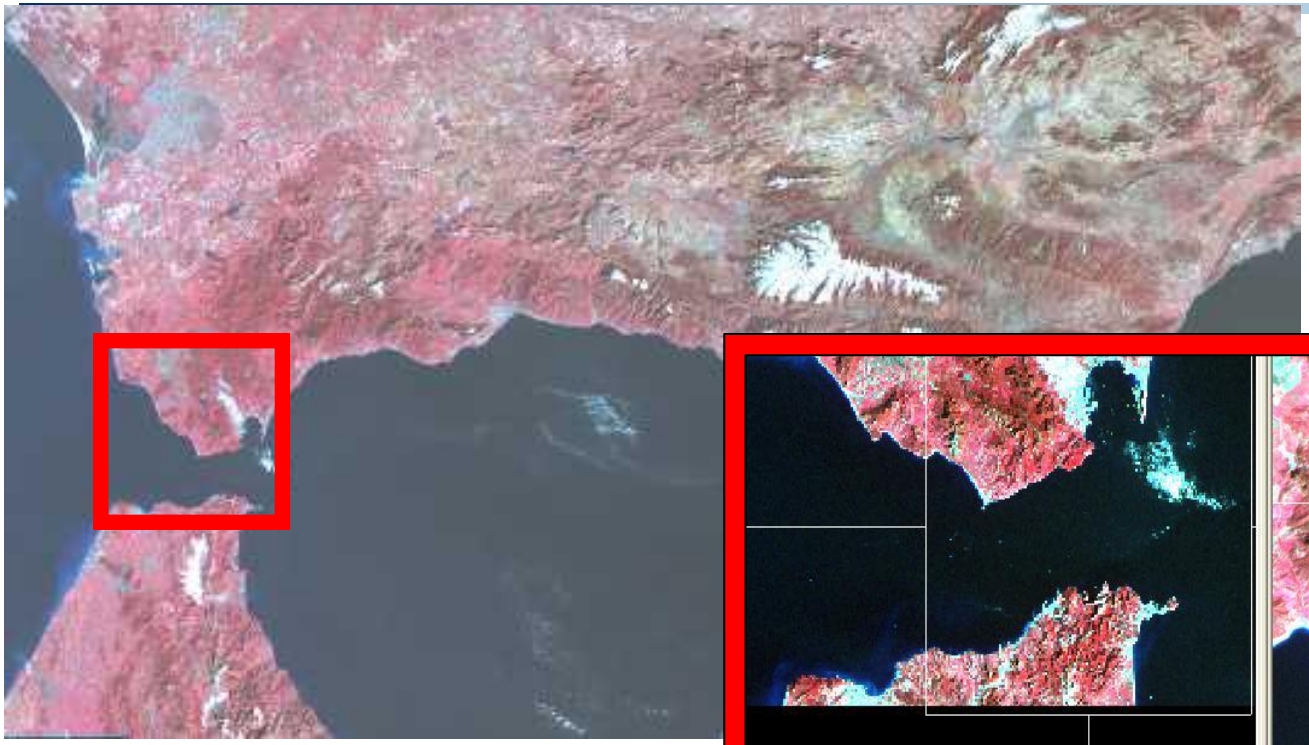

Mission planning tool, possible image capture to cover Somali AoI.

Actual image captured on Feb. 23rd, 2009.

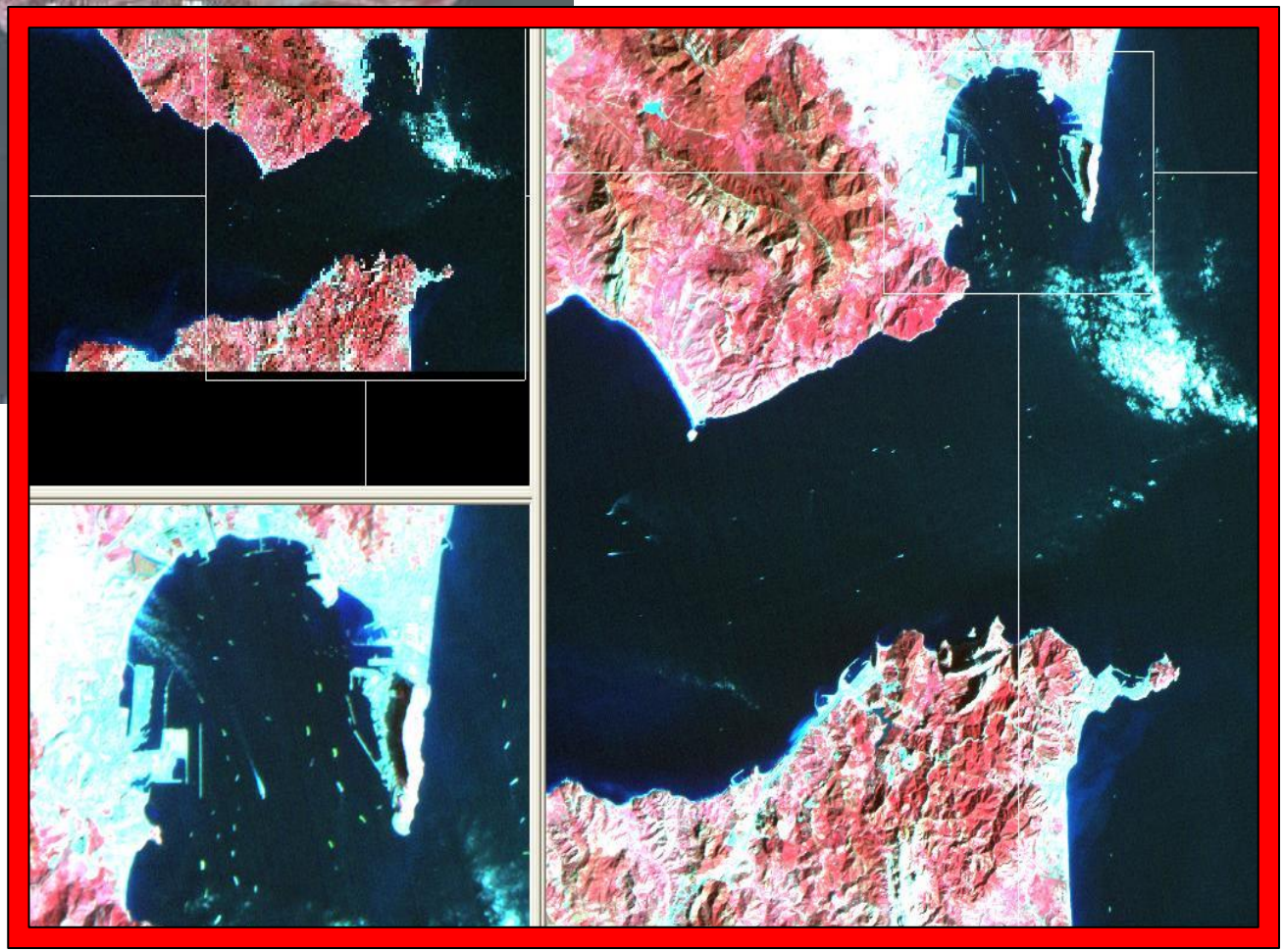
# BASIC FLOWCHART



# February 2009 demo scenario



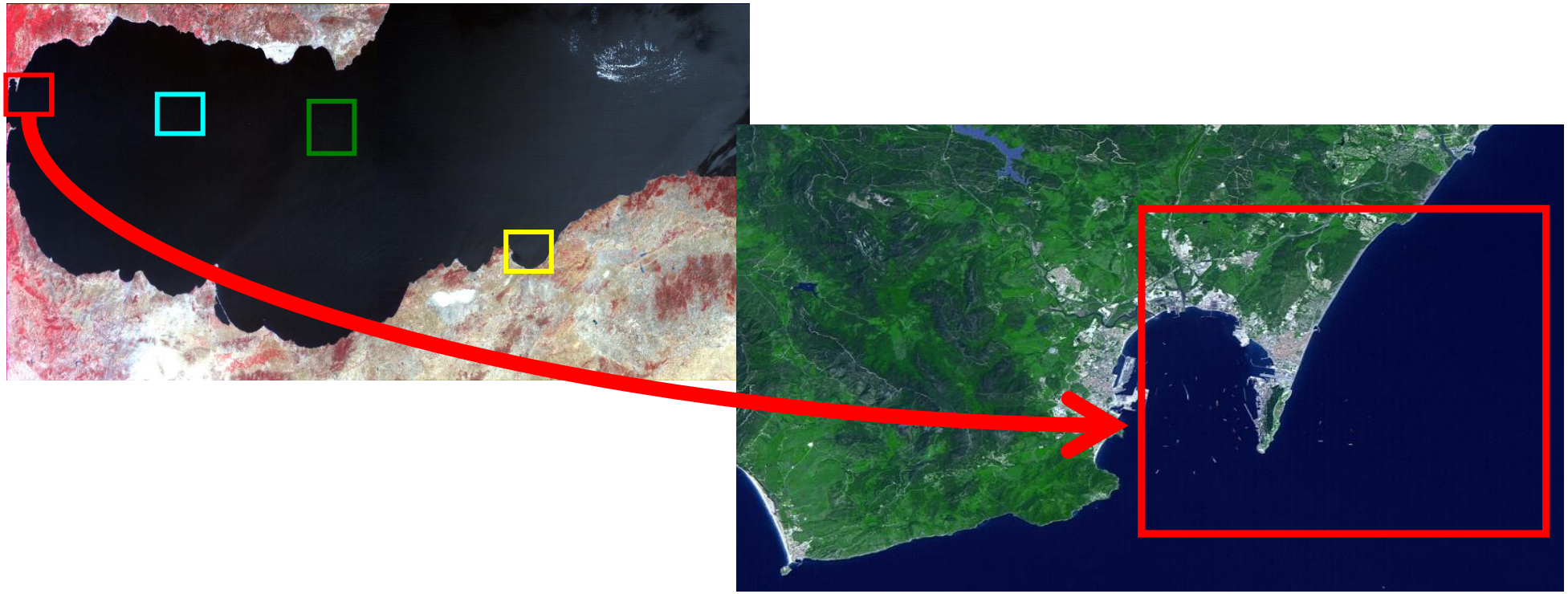
Area chosen to conduct demo with AIS information available from coastal station.



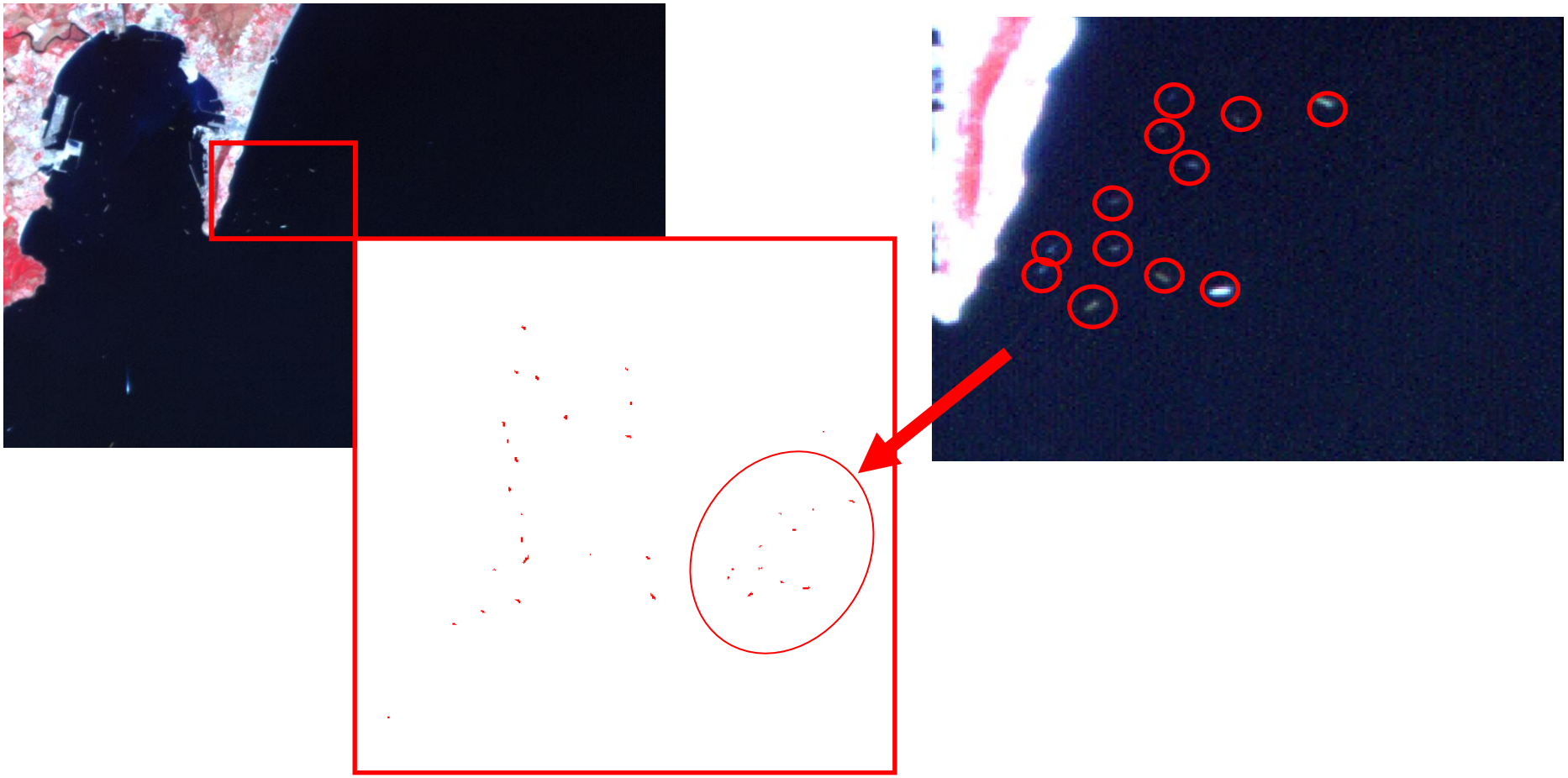
UK-DMC satellite image, 32 m GSD, 23/02/09
AIS data provided by the Spanish Navy close to the time of pass

# February 2009 Demo (1)

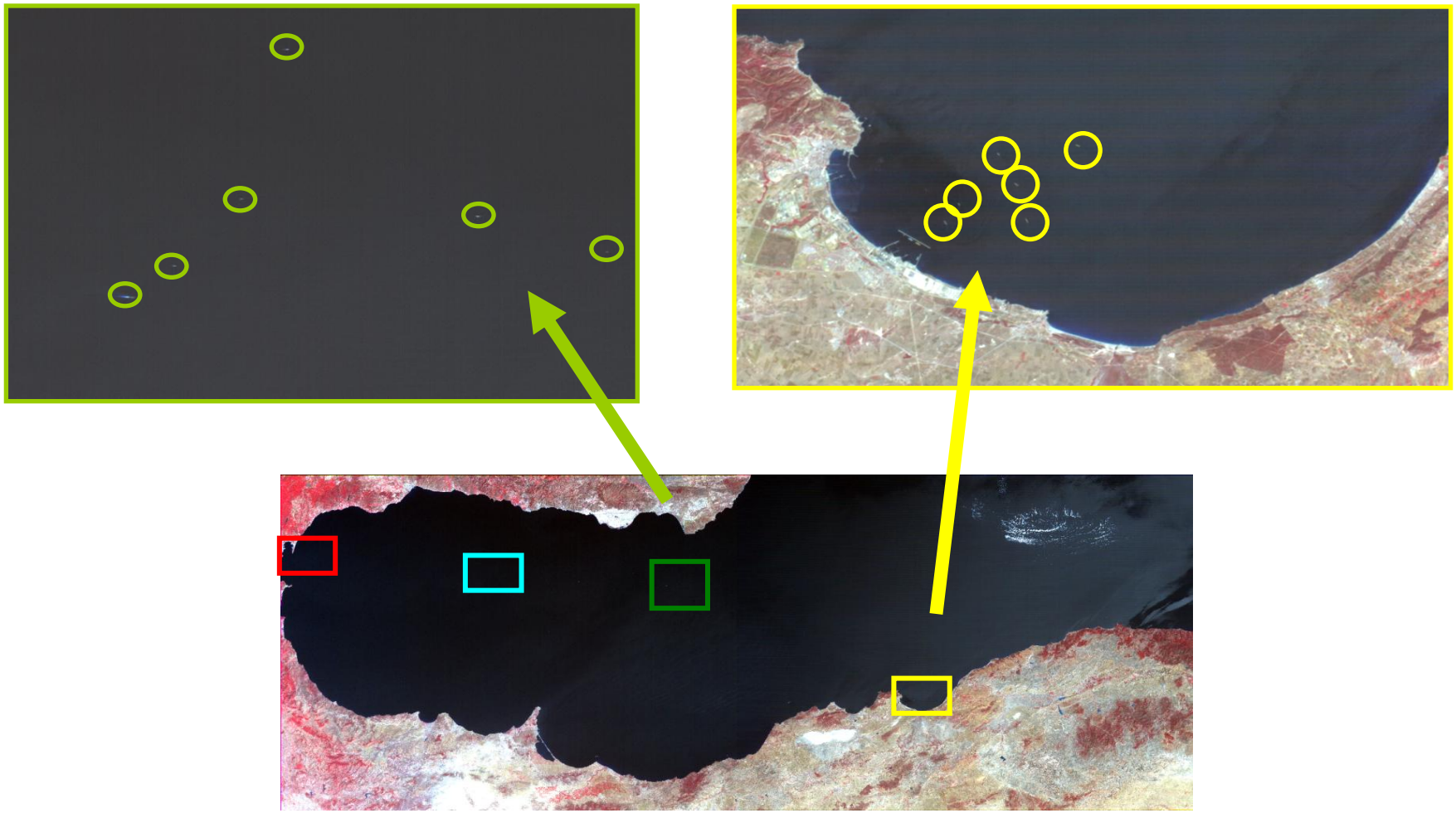
- The image on the left is the actual image captured for another demo.
- The algorithm is initially adjusted by comparing to a cloud free image of the AoI and cloud mask is applied. Then specific areas within the image were selected to conduct the demo.



- Red circles indicate pixels where a target has been found in all three (R,G,NIR) bands, thus reducing the signal noise level.
- The negative image is the raw output from the algorithm.



- Other targets in chosen areas



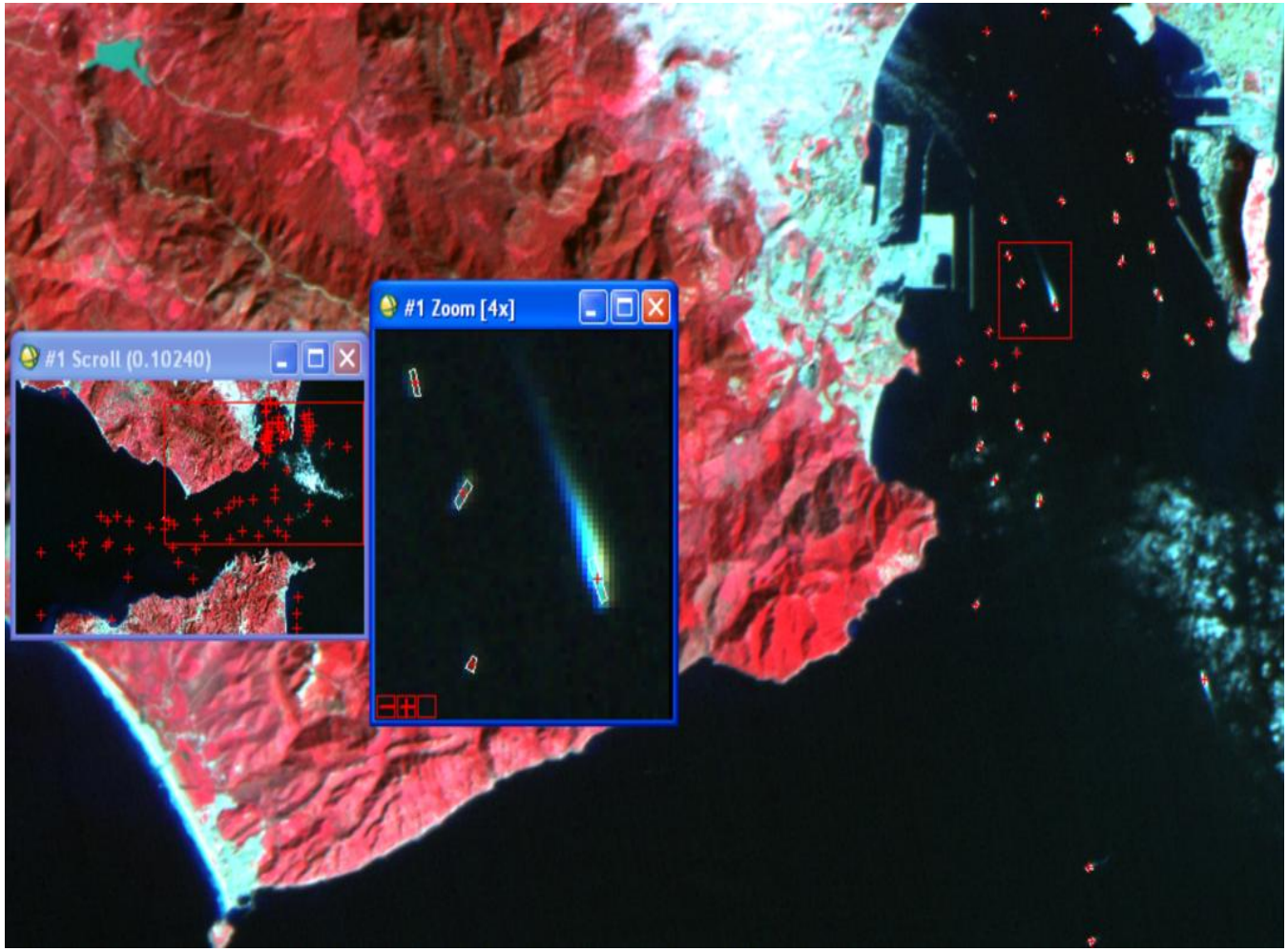
# Target cross check and data dissemination

- Basic video target data is cross checked with that in database to discard known targets such as islands, oilrigs, shoals, etc.
- Valid target data is compared with AIS data sets to eliminate known ships.
- All of the data, both discarded and studied is stored in the database for future reference and pattern recognition.
- Full data sets (video, maps, database, etc.) can be processed and displayed at a control center or it can be sent via data link to ships and aircraft. A reduced volume data set is compiled for this purpose.

- Good pointing accuracy is provided by obtaining precise reference data from external sources such as VHR optical imagery or SAR DEM.
- Pointing accuracy is subpixel (10-15 m) with landmass present in AoI, and 20 pixel (400-600 m) in open ocean.

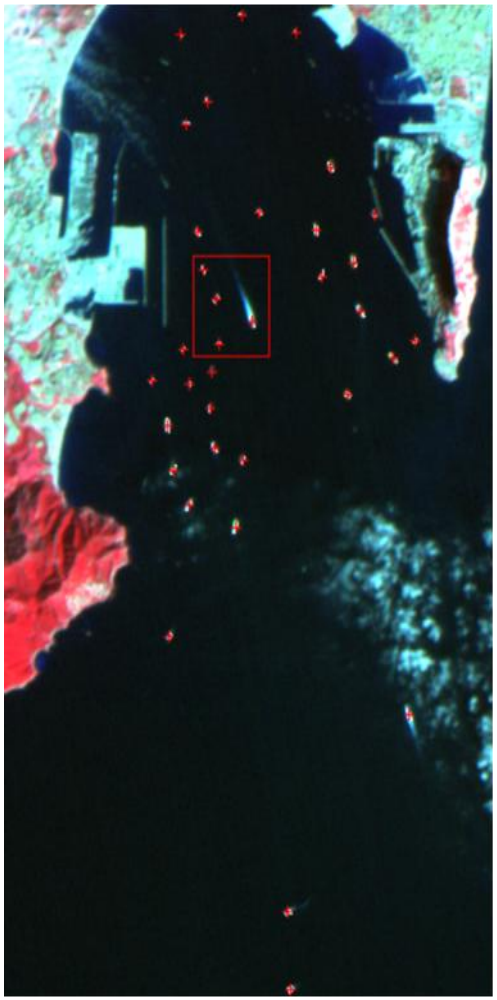
# MAIN OUTPUT:

- Targets identified and compared to available AIS data.
- Positive correlation of targets achieved.
- System is applicable to any part of the world
- 500,000 km$^2$ in one image
- Daily re-visit capability, at times more.




AIS data overlay on identified targets:
In red AIS targets
In white ship contour where avialble

# • Algorithm outputs:

- First alert quicklook, basic video image of AoI
- Early warning target map, LAT/LONG data set
- Target characterization map:
  - LAT/LONG of target center point
  - Number of pixels per target, pixel number for: length, width
- If possible from data set (wake shown) an estimate of ship bearing and movement detection. This requires operator input.
- Sub-pixel detection is possible due to reflectance based method

- Outputs can be produced daily, by using the DMC constellation, at times twice per day.
- Weekly and monthly tracking of known targets to check for mother ships and other types of special activities.
- Data set of discarded targets, plus AIS data for this available within the system