



Inspectie Leefomgeving en Transport
Ministerie van Infrastructuur en Waterstaat

SO₂ monitoring ship- emissions using Tropomi products

CAMS-workshop



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Innovation & Data lab

Geographic Information
Systems (GIS)

Remote Sensing (RS)

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- Inspection
- Services
- License
(authorisation)
- Detection
(misconducts)
- Research

1 transport

2 infrastructure

3 environment

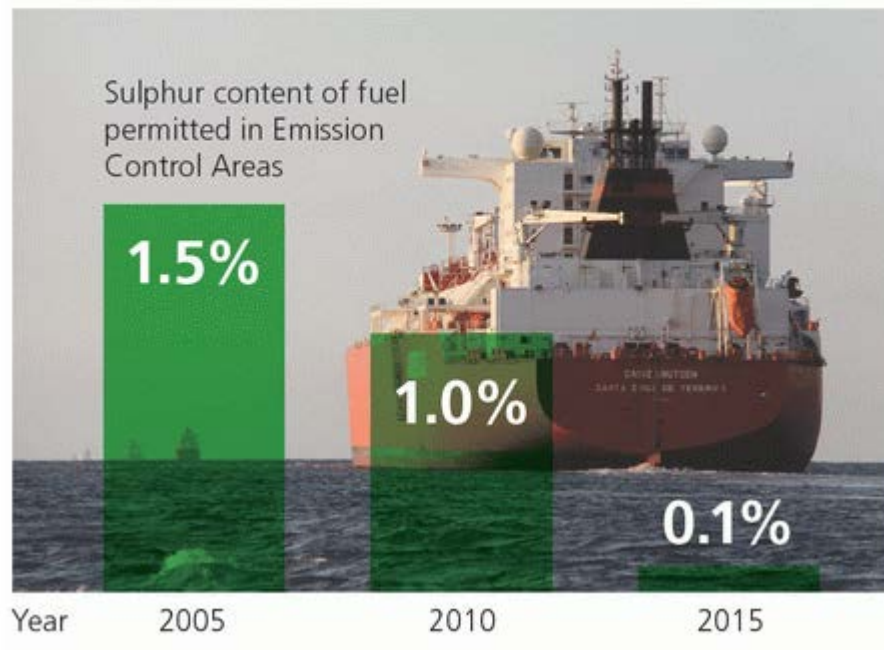
4 Housing/living

5 ...



Sulphur content fuel related to SO₂ emission

IMO agreement to reduce atmospheric pollution from ships





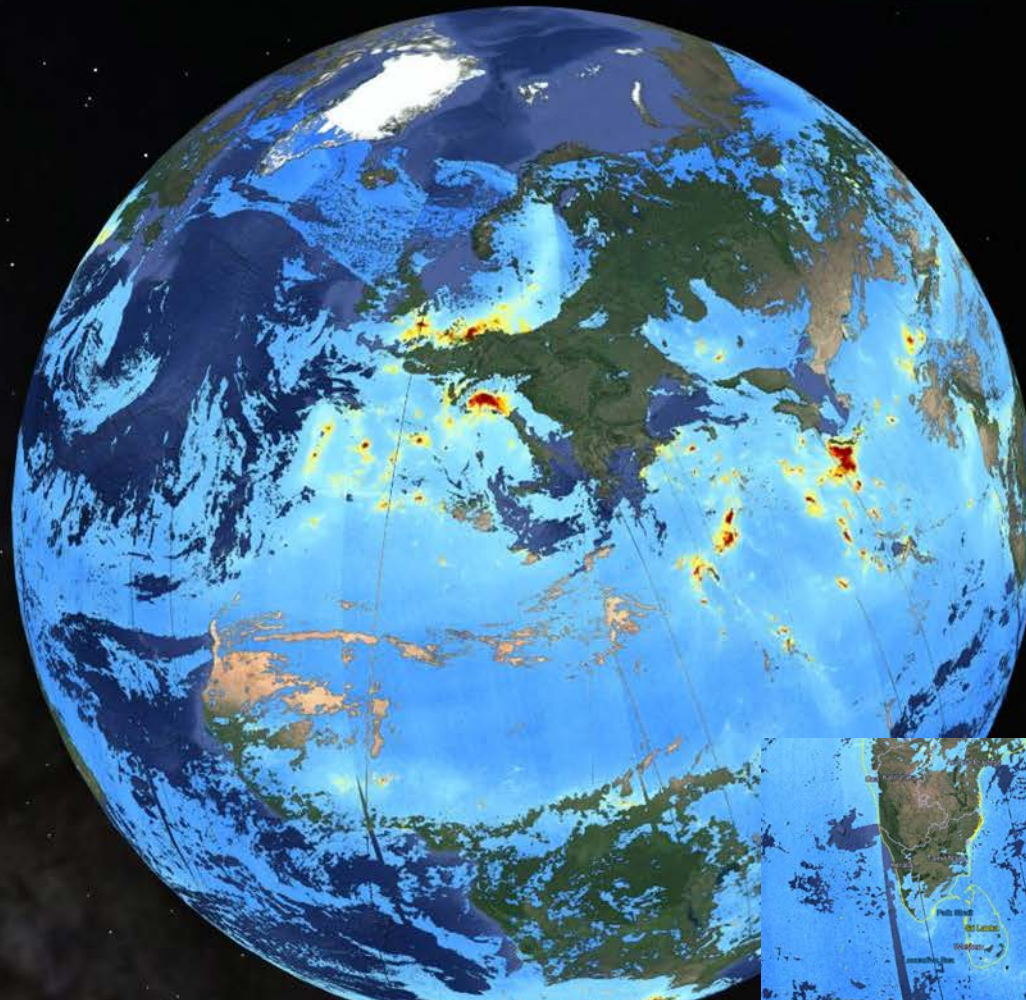
Combining data: AIS (EMSA) and Tropomi (ESA/KNMI)

- Data on emissions
- Data on vessel locations
- Model relation fuel/emission (engine type and load, etc.)
- Model plume (funnel types, etc.)
- Model plume dispersion
- Weather data
- Separation different sources per gridcell on a given moment



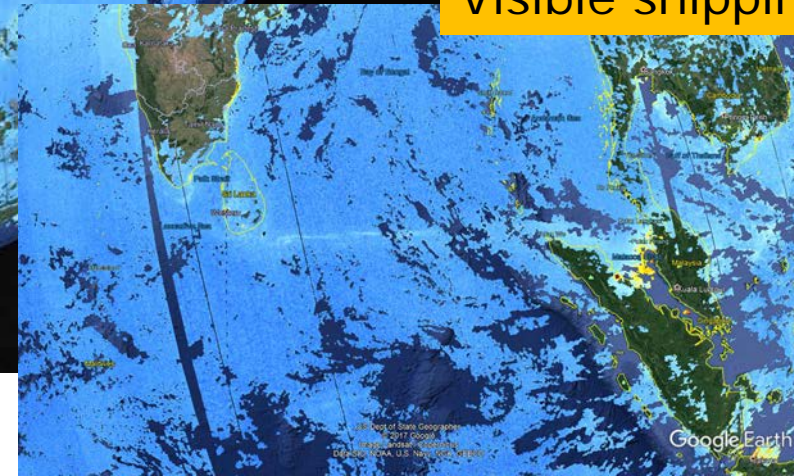
KNMI/NSO/ESA

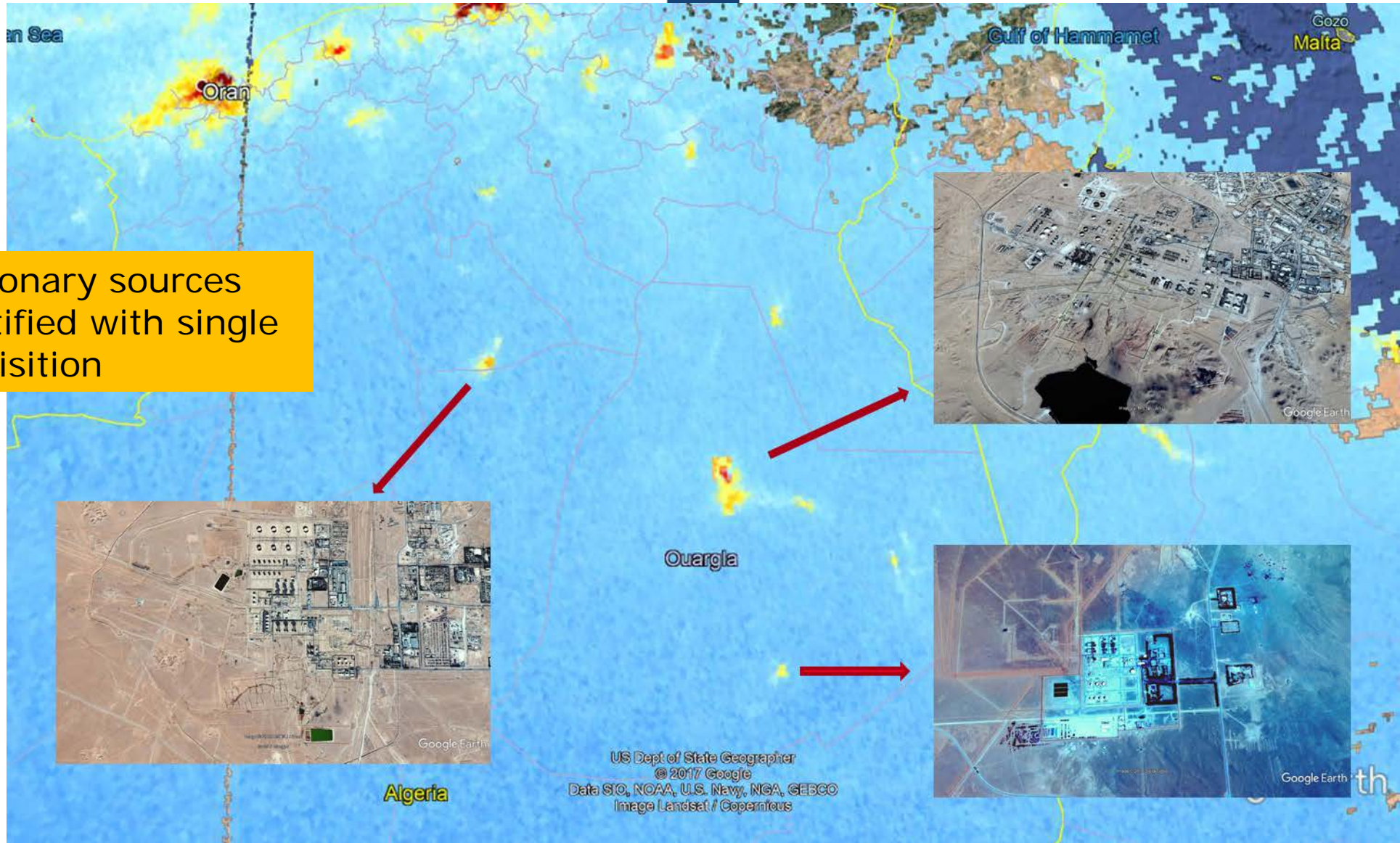
Daily world coverage
Example NO₂

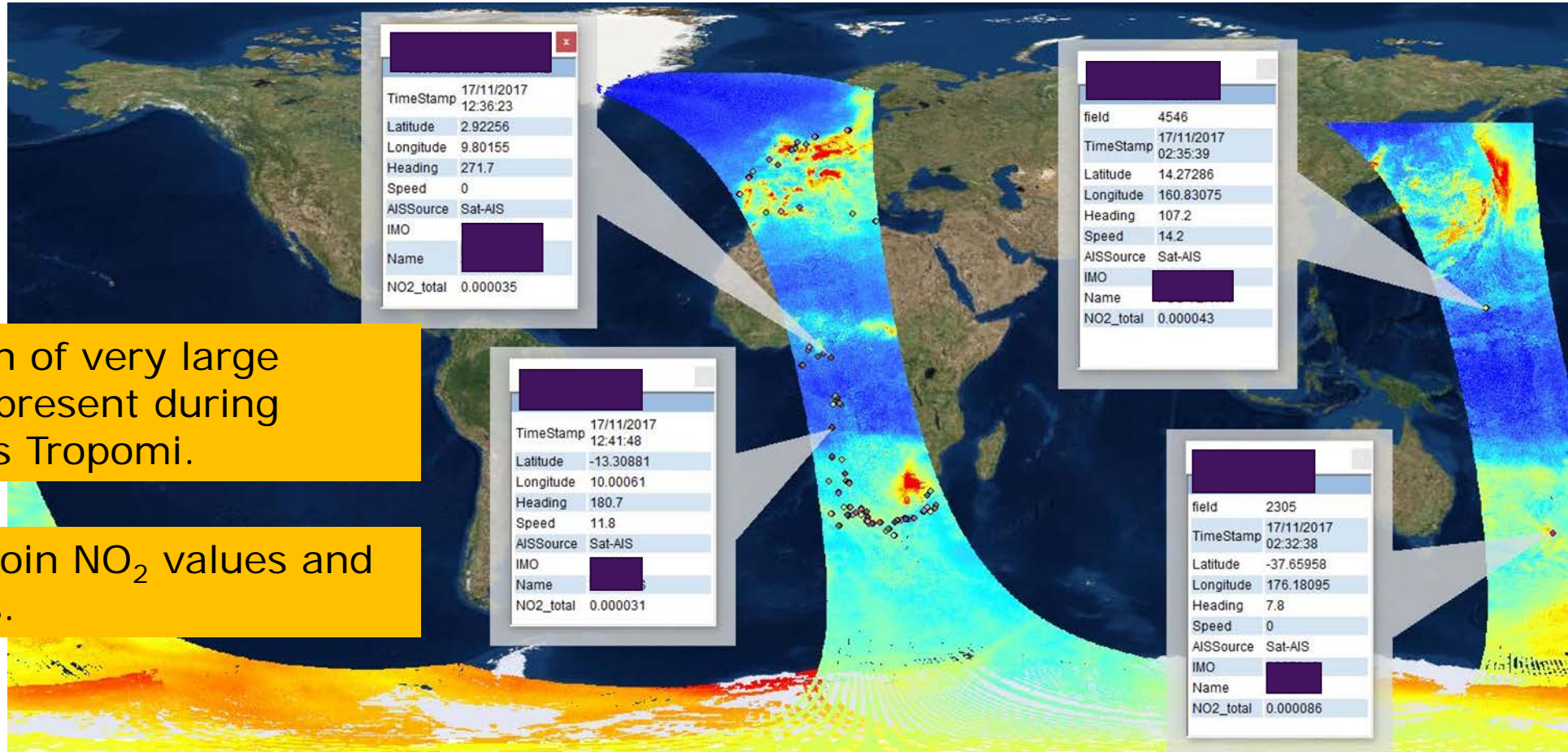


Data: SIO, NOAA, U.S. Navy, NGA, GEBCO
Image: IBCAO
Image: Landsat / Copernicus
Image: U.S. Geological Survey

Visible shipping lane

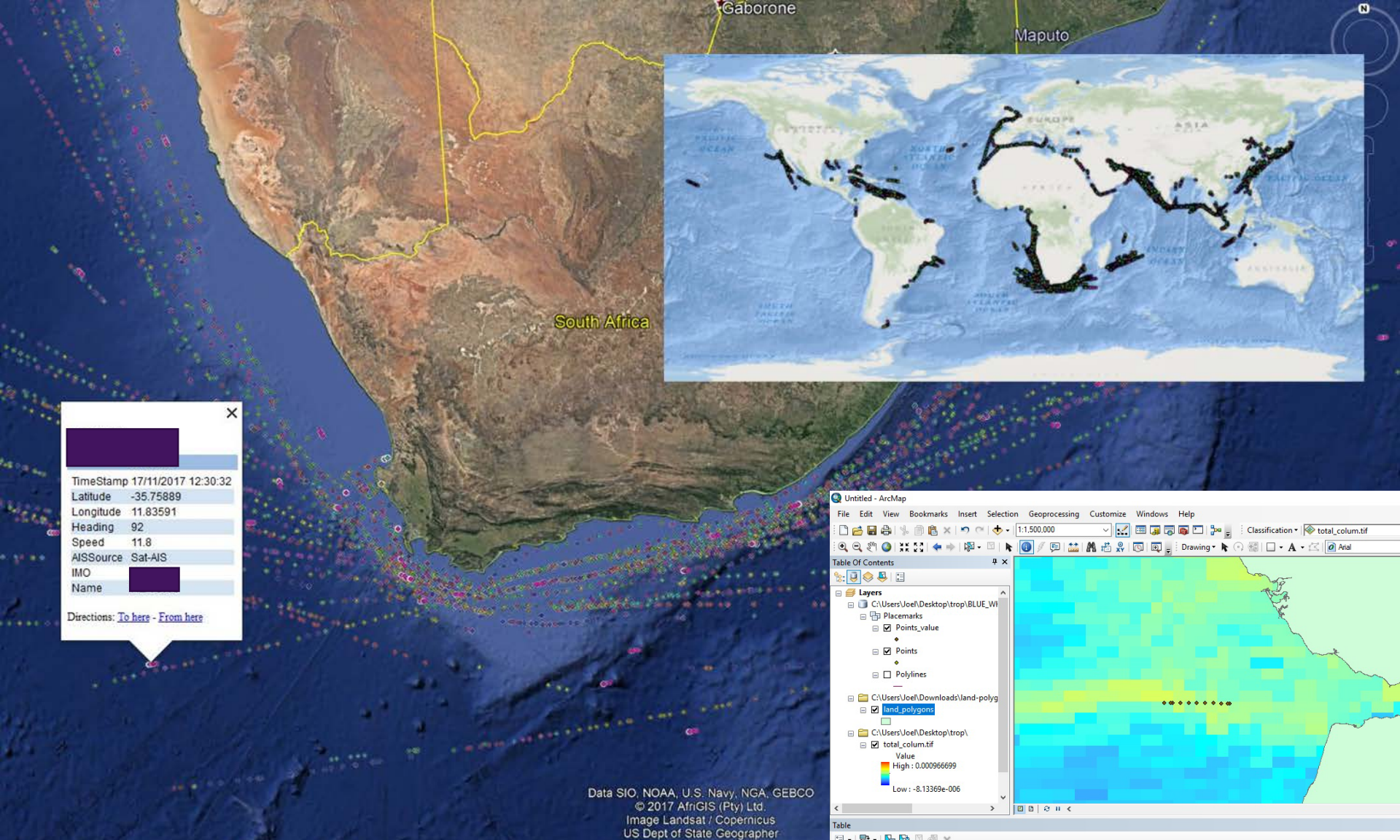






Selection of very large vessels present during overpass Tropomi.

Spatial join NO₂ values and IMO nr's.



TimeStamp 17/11/2017 12:30:32
 Latitude -35.75889
 Longitude 11.83591
 Heading 92
 Speed 11.8
 AISSource Sat-AIS
 IMO
 Name

Directions: [To here](#) - [From here](#)

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
 © 2017 AfrGIS (Pty) Ltd.
 Image Landsat / Copernicus
 US Dept of State Geographer

Untitled - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

Classification: total_col.tif

Table of Contents

- Layers
 - Placemarks
 - Points_value
 - Points
 - Polylines
 - land_polygons
 - total_col.tif
 - Value
 - High: 0.000966699
 - Low: -8.13369e-006

Identify

Identify from: <Top-most layer>

Points_value

Point 7

Location: -6.764337 35.915297 Decimal Degrees

Field	Value
OID	8
Shape	Point Z
Name	Point 7
FolderPath	Document/CMA CGM [redacted] Track points
SymbolID	0
AltMode	-1
Base	0
Snippet	
PopupInfo	Source:T-AIS Speed:21.5 knots Heading
HasLabel	-1
LabelID	0
Timestamp	2017-11-17 12:15:41Z
Lat	35°54'44"N
Lon	006°45'35"W
Heading	88.3
Speed	21.5
Source	T-AIS
total_col_NO2	0.000091

Identified 1 feature

HasLabel	LabelID	Timestamp	Lat	Lon	Heading	Speed	Source	total_col_NO2
-1	0	2017-11-17 12:52:05Z	35°54'29"N	006°29'28"W	91.1	21.6	T-AIS	0.000083
-1	0	2017-11-17 12:51:05Z	35°54'30"N	006°29'55"W	91.6	21.6	Sat-AIS	0.00009
-1	0	2017-11-17 12:46:05Z	35°54'32"N	006°32'07"W	92.3	21.4	T-AIS	0.00009
-1	0	2017-11-17 12:39:59Z	35°54'36"N	006°34'49"W	92	21.6	T-AIS	0.000088
-1	0	2017-11-17 12:33:54Z	35°54'40"N	006°37'31"W	91.9	21.6	T-AIS	0.000088
-1	0	2017-11-17 12:27:42Z	35°54'43"N	006°40'16"W	91.3	21.6	T-AIS	0.000088
-1	0	2017-11-17 12:21:41Z	35°54'44"N	006°42'55"W	90.9	21.6	T-AIS	0.000081
-1	0	2017-11-17 12:15:41Z	35°54'44"N	006°45'35"W	88.3	21.5	T-AIS	0.000091
-1	0	2017-11-17 12:09:36Z	35°54'41"N	006°48'17"W	88.4	21.7	T-AIS	0.000078
-1	0	2017-11-17 12:08:24Z	35°54'40"N	006°48'50"W	88.3	21.6	Sat-AIS	0.000078
-1	0	2017-11-17 12:03:28Z	35°54'38"N	006°51'01"W	89.7	21.9	T-AIS	0.000078

Points_value (0 out of 11 Selected)



CAMS: Connecting, **sharing**, learning, doing, benefit

Experience with:

- Methods
- Techniques
- Partners
- Products
- Legislation
- Software
- Hardware
- Processing environments
- ...



- Data
- Workflows
- Technical notes
- ...