

Pollution in the Lagos Lagoon, Nigeria

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Date: August 4, 2018

Presented at COESSING 2018, University of Ghana, Accra, Ghana.

Background

- The **Lagos Lagoon (LL)** is the **largest lagoon system in West Africa (WA)** (Alo et al., 2014).
- Located between latitude $6^{\circ}27'$ to $6^{\circ}48'$ N and longitude $3^{\circ}23'$ to $3^{\circ}40'$ E.
- One of the **most anthropogenically impacted lagoons in WA.**
- Anthropogenic influences include;
 - shipping /port activities
 - petroleum tank farms
 - saw mills
 - pharmaceutical industries
 - coastal development

Justification

- The current use of ground *in situ* measurements have limited sampling and or observation points, and often suffer from large data gaps.
- **Space based techniques** which includes high spatio-temporal resolution, low cost (mostly free), and all weather capabilities are advantageous.

Objective

- To show the impact of polluting activities on the LL ecosystem over spatio-temporal time scales.
- To use satellite imageries/observations to provide spatio-temporal context to sparse in-situ measurements of heavy metals and hydrocarbon concentrations.

Methods & Results

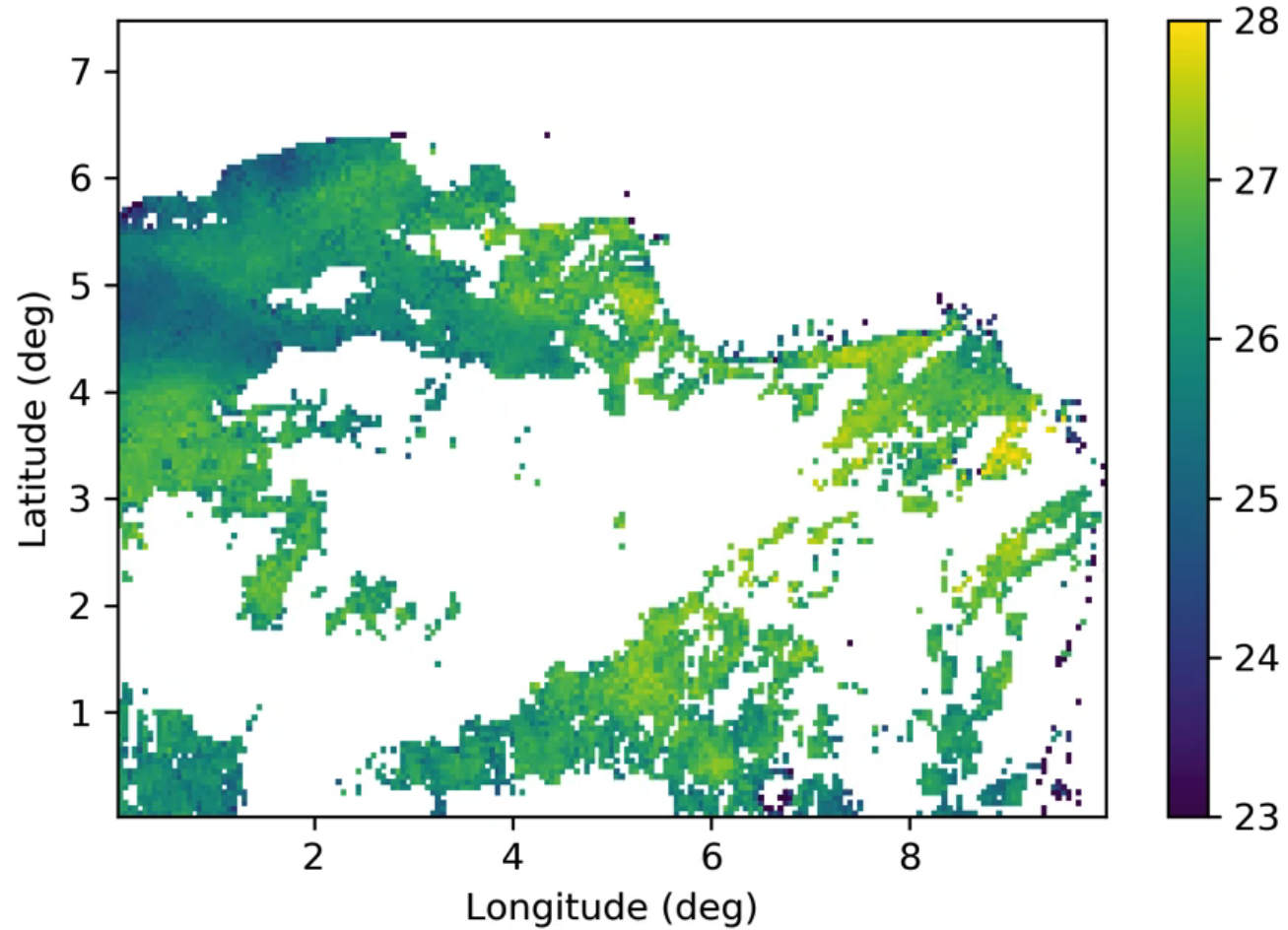
• **METHODS:**

- We obtained **geostationary satellite images** from the SEVIRI sensor onboard Meteosat Second Generation (MSG-2), (see supporting documentation),
- We used **Python® programming language** to demonstrate the capability of reading NetCDF files,
- We generated animation of **sea surface temperature (SST)** near Nigeria.

• **RESULTS:**

- Below, we show a **simple animation**.
- Each frame is 1 hr starting on 2018/08/02 at 00:00 UTC.

Animation Made within Python®



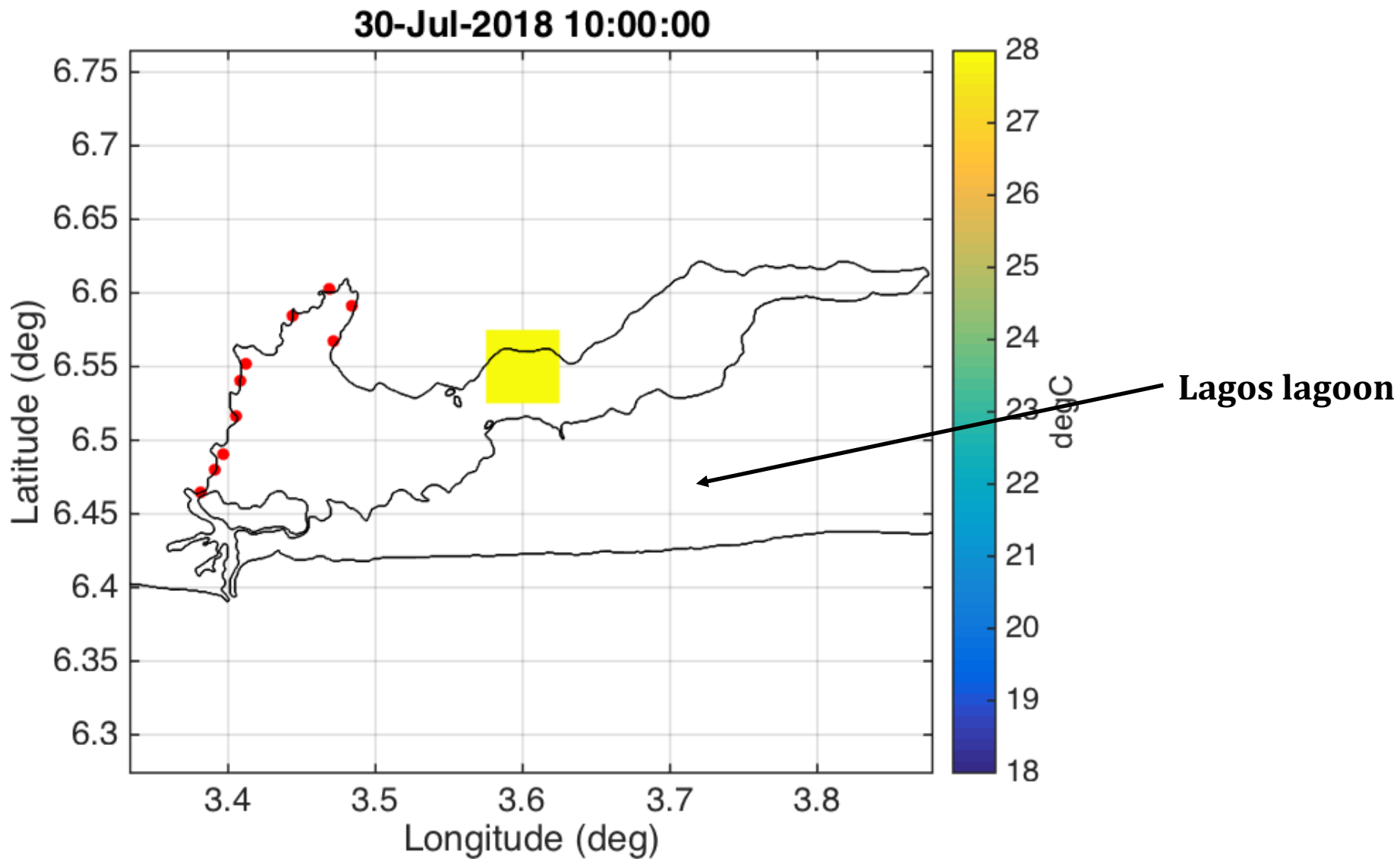
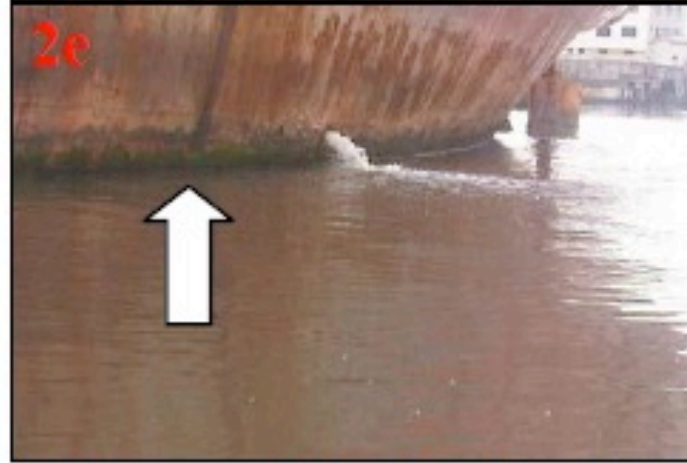


Figure 1: Station Locations - Estimates of Heavy Metals

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Figures 2a-f: Anthropogenic Activities at Okobaba (2a-c) and Apapa (2d-f) Areas of the Lagos Lagoon, Nigeria

Source: Figures 2a (Ogunkoya, 2018), 2b (Adewuyi, 2017), 2c (Sogbanmu *et al.*, 2017), 2d-f (Amaeze *et al.*, 2015a)

Future Studies

- Obtain different satellite products and examine over Lagos Lagoon
 - Nigersat-2
 - Geosynchronous satellite (dt = 15 min), similar to MSG-2
 - Visible and infrared
 - <https://directory.eoportal.org/web/eoportal/satellite-missions/n/nigeriasat-2>
 - chlorophyll concentration – MODIS, VIIRS
 - visible and infrared spectrum – MODIS, VIIRS, Landsat 8
 - synthetic aperture radar (SAR) – Sentinel
- The secondary set of satellites should provide measurements relevant to pollution (e.g. river run-off, sediment, oil slicks)
- Use these data [to place sparse *in situ* measurements into context](#)

Acknowledgements

- Python® programming software available within the Anaconda distribution:
 - <https://anaconda.org/anaconda>
- The satellite data were obtained as follows:
 - Register an account at <http://cersat.ifremer.fr/data/collections/o-si-saf> (free and instantaneous)
 - Log on to the File Transfer Protocol (FTP) server at <http://eftp.ifremer.fr>
 - cd to the directory “cersat-rt/project/osi-saf/data/sst/l3c/seviri”
- We thank [Stephane Saux Picart \(Meteo-France\)](#) for helping with geosynchronous satellite data.

Thank you for your attention!

