Pollution in the Lagos Lagoon, Nigeria

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Background

• The **Lagos Lagoon (LL)** is the **largest lagoon system in West Africa (WA)** (Alo et al., 2014).

• Located between latitude 6°27´ to 6°48´N and longitude 3°23´ to 3°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 (Adeyeye, 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](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”

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Thank you for your attention!