Remote sensing for turbidity in the Tijuana River Estuary using Sentinel 2A and 2B data and in-situ measurements

Stephany Garcia[1], Trent Biggs[2]

[1]NOAA-CESSRST Summer Bridge Scholar [2]Department of Geography Watershed Science, San Diego State University

NOAA CESSRST Summer Symposium

Monday August 9th, 2021

NOAA-CESSRST
CENTER FOR EARTH SYSTEM SCIENCES AND REMOTE SENSING TECHNOLOGIES

SAN DIEGO STATE UNIVERSITY

Introduction

Research site

Estuary importance

Turbidity

Remote sensing with Sentinel 2A and 2B

Objective

Create an algorithm that allows for the remote sensing of turbidity utilizing Sentinel 2A and 2B data

Methods

in-*situ* measurements

Locate turbidity data

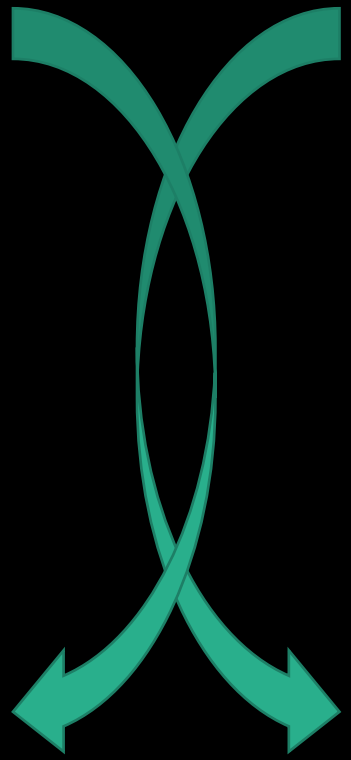
Import data into R Studio

Filter the data

Graph data into water years

Assess for times frames of interest

Locate discharge data (repeat steps)



Sentinel 2A and 2B data

Install sen2r package into R

Find sentinel 2A and 2B imagery

Complete atmospheric correction

Pixel classification

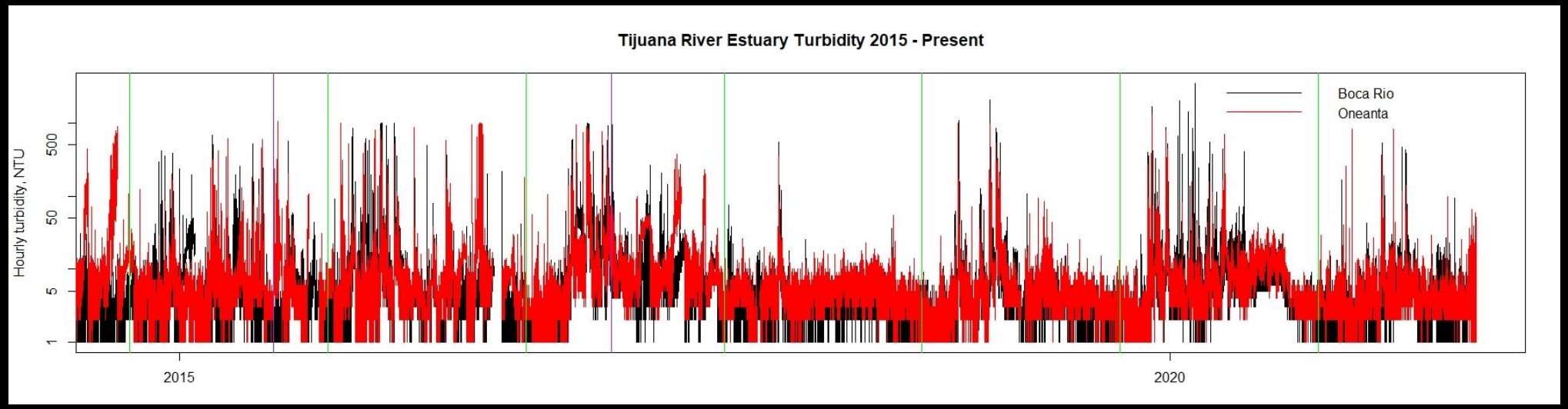
Image filtering

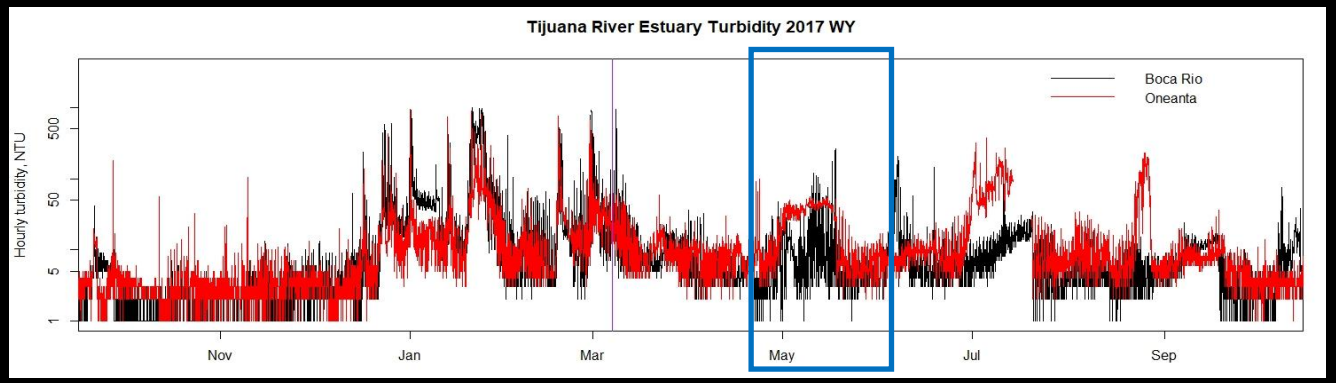
Turbidity algorithm

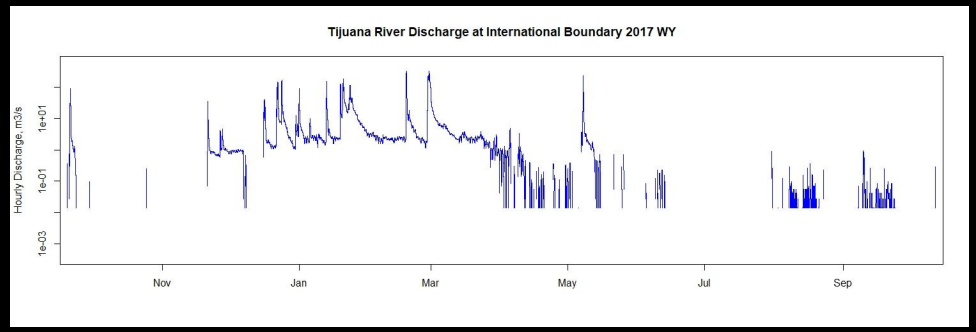
merging both datasets

Assess the validity of the model by completing statistical analyses

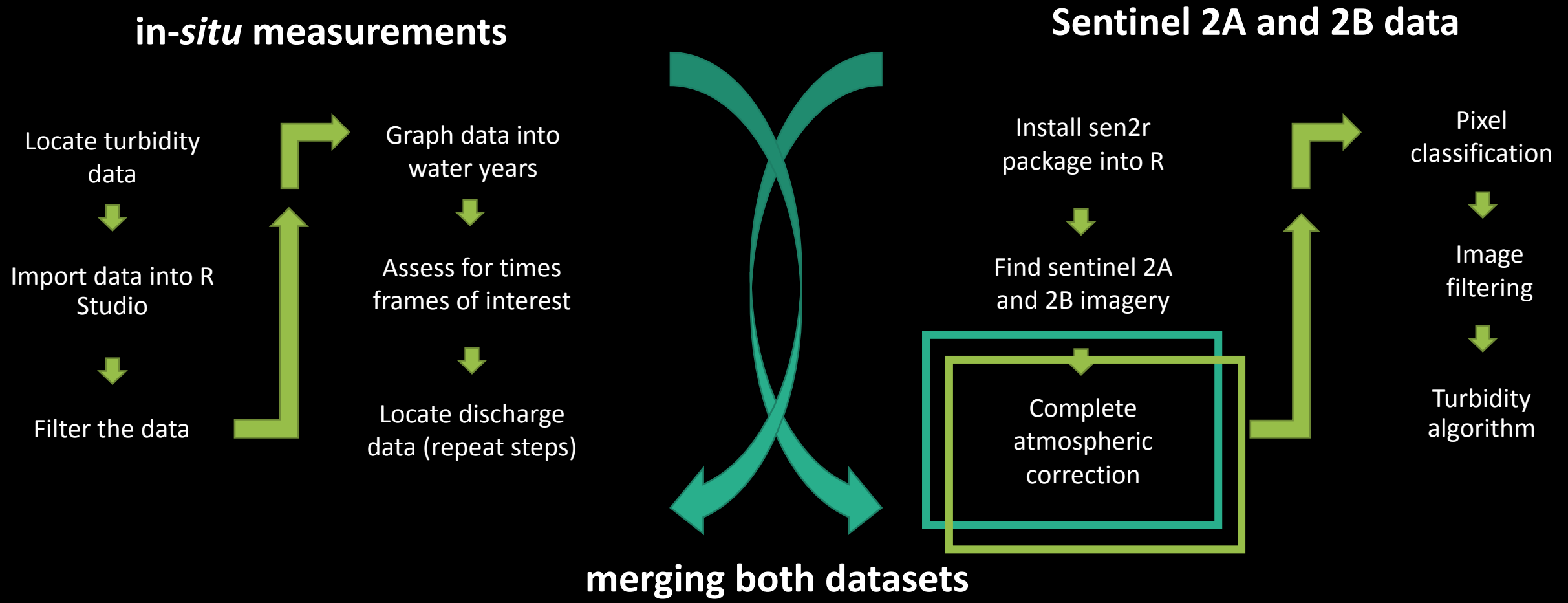
Results


Tijuana River Estuary Turbidity 2015 - Present
Hourly turbidity, NTU
1
5
50
500
2015
2020
Boca Rio
Oneanta


Tijuana River Estuary Turbidity 2017 WY
Hourly turbidity, NTU
1
5
50
500
Nov
Jan
Mar
May
Jul
Sep
Boca Rio
Oneanta


Tijuana River Discharge at International Boundary 2017 WY
Hourly Discharge, m3/s
1e-03
1e-01
1e+01
Nov
Jan
Mar
May
Jul
Sep

The next steps are…



Assess the validity of the model by completing statistical analyses

Acknowledgements

Trent Biggs, Research Advisor, San Diego State University

Oscar Sanchez, NOAA EPP/MSI CESSRST Scholar and Geography Department Undergraduate Student at San Diego State University

Former NOAA EPP/MSI CESSRST Scholar and Masters student from San Diego State University, Sean Quezada

This study is supported and monitored by The National Oceanic and Atmospheric Administration – Cooperative Science Center for Earth System Sciences and Remote Sensing Technologies under the Cooperative Agreement Grant #: NA16SEC4810008.

The authors would like to thank NOAA Educational Partnership Program with Minority Serving Institutions for fellowship support for Stephany Garcia and NOAA Center for Earth System Sciences and Remote Sensing Technologies.

The statements contained within the poster are not the opinions of the funding agency or the U.S. government but reflect the author's opinions.

References

- Ayad, M., Li J, Holt, B., and Lee, C. (2020) Analysis and Classification of Stormwater and Wastewater Runoff From the Tijuana River Using Remote Sensing Imagery. Front. Environ. Sci. 8:599030. doi: 10.3389/fenvs.2020.599030Nechad 2009
- Katlane, R., Dupouy, C., El Kilani, B. and Berges, J.C. (2020) Estimation of Chlorophyll and Turbidity Using Sentinel 2A and EO1 Data in Kneiss Archipelago Gulf of Gabes, Tunisia. International Journal of Geosciences, 11, 708-728. doi:10.4236/ijg.2020.1110035
- Nechad, B., Ruddick, K. G., Neukermans, G. (2009) Calibration and validation of a generic multisensor algorithm for mapping of turbidity in coastal waters. Proc. SPIE 7473, Remote Sensing of the Ocean, Sea Ice, and Large Water Regions 2009. doi: 10.1117/12.830700
- NOAA National Estuarine Research Reserve System (NERRS). System-wide Monitoring Program. Data accessed from the NOAA NERRS Centralized Data Management Office website: http://www.nerrsdata.org; accessed 12 July 2021
- Ranghetti, L. Coschetti, B., Nutini, F., Busetto, L. (2020) “sen2r”: an R toolbox for automatically downloading and preprocessing Sentinel-2. Computers and Geosciences. doi: 10.1016/j.cageo.2020.104473
- Vanhellemont, Q. (2019) Daily metre-scale mapping of water turbidity using CubeSat imagery. Optics Express. doi:10.1364/OE.27.0A1372
- Images Retrieved from the following websites:
    1. Google Earth Pro Engine
    2. https://trnerr.org/about/tijuana-river-watershed/
    3. http://cdmo.baruch.sc.edu/dges/
    4. https://www.usgs.gov/media/images/visualization-turbidity
    5. https://www.satimagingcorp.com/satellite-sensors/other-satellite-sensors/sentinel-2a/
    6. https://sentinels.copernicus.eu/web/sentinel/home