Observing ECCO Model vs Tidal Gauges around Hurricane Maria

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with Faith Hunja, Hannah Krohn, and Franck Proteus

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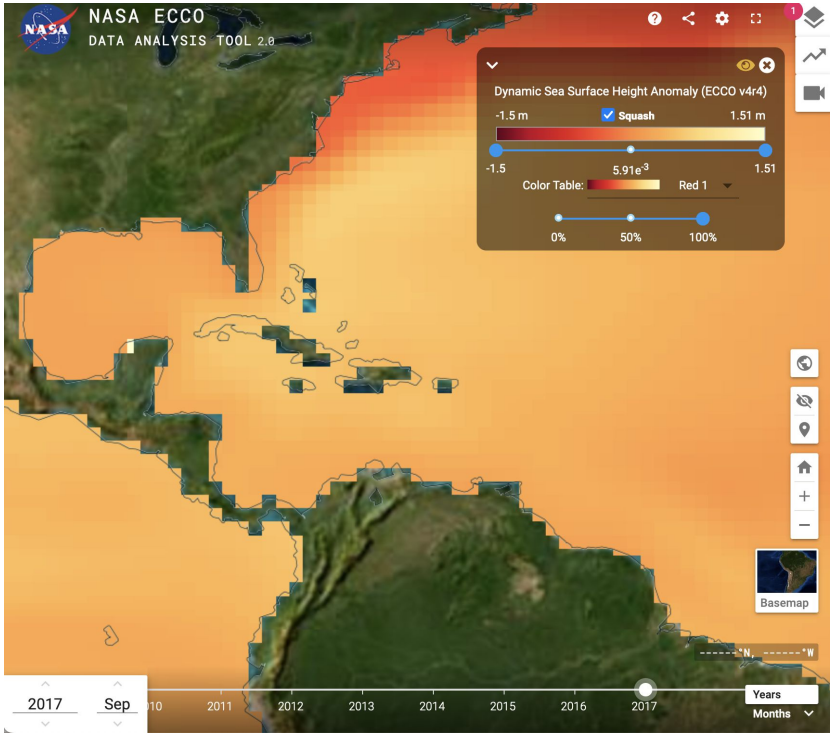
Anomalous Sea Level Height Over Hurricane Maria's Path



[Animation]

ECCO Consortium, Fukumori, I., Wang, O., Fenty, I., Forget, G., Heimbach, P., & Ponte, R. M.. 2021. ECCO Sea Height Anomaly (Version 4 Release 4). Ver. V4r4. PO.DAAC, CA, USA. Dataset accessed [2024-03-12] at https://doi.org/10.5067/ECTSD-MSL44

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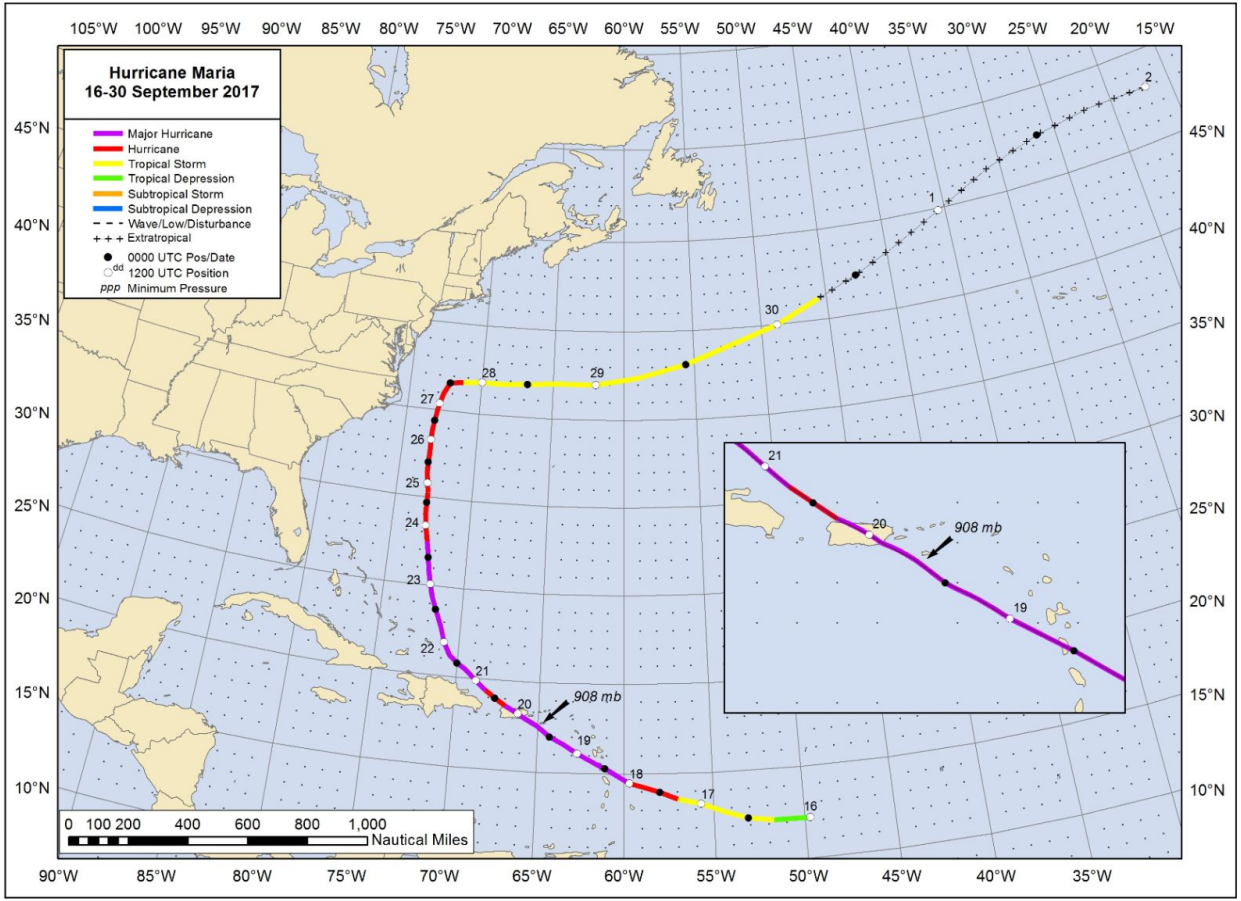
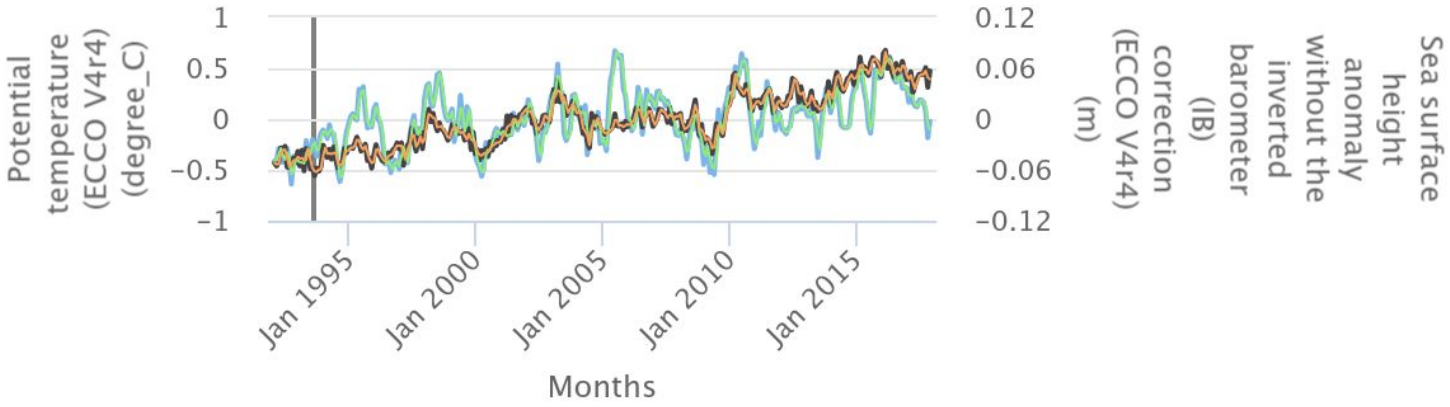


Figure 1. Best track positions for Hurricane Maria, 16–30 September 2017. Track during the extratropical stage is partially based on analyses from the NOAA Ocean Prediction Center.

Pasch, Richard J., Andrew B. Penny, and Robbie Berg. "National Hurricane center tropical cyclone report: Hurricane Maria (AL152017)." National Hurricane Center (2019).

Potential temperature (ECCO V4r4) vs. Sea surface height anomaly without the inverted barometer (IB) correction (ECCO V4r4)

Source: ECCO consortium (http://ecco-group.org/), ECCO consortium (http://ecco-group.org/)
9.7345N, 74.5959W – 28.2052N, 55.0555W
Jan 1992 – Oct 2017



- Potential temperature (ECCO V4r4)
- Sea surface height anomaly without the inverted barometer (IB) correction (ECCO V4…
- 2 Month SMA (Potential temperature (ECCO V4r4))
- 2 Month SMA (Sea surface height anomaly without the inverted barometer (IB) correc…

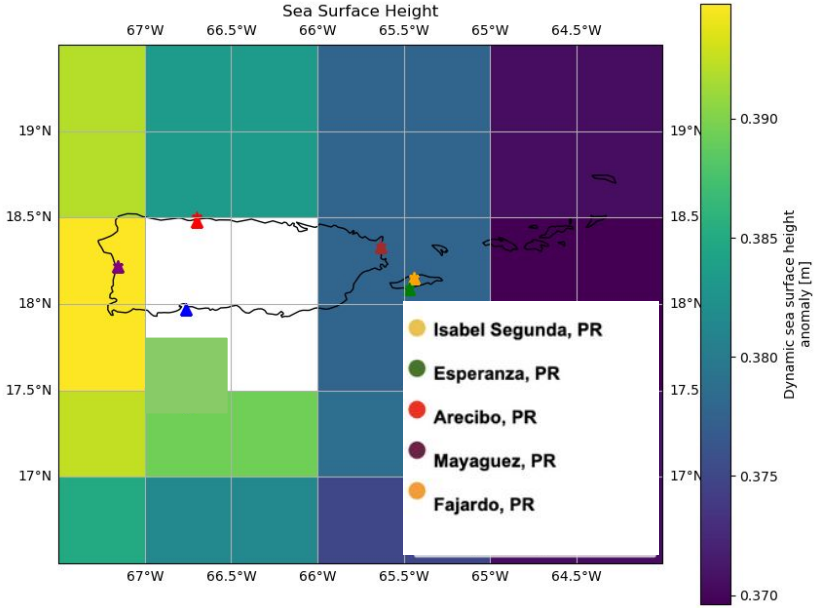
ECCO Consortium, Fukumori, I., Wang, O., Fenty, I., Forget, G., Heimbach, P., & Ponte, R. M.. 2021. ECCO Global Mean Sea Level - Daily Mean (Version 4 Release 4). Ver. V4r4. PO.DAAC, CA, USA. Dataset accessed [2024-03-12] at https://doi.org/10.5067/ECTSD-MSL44

NOAA Center for Operational Oceanographic Products and Services (CO-OPS)

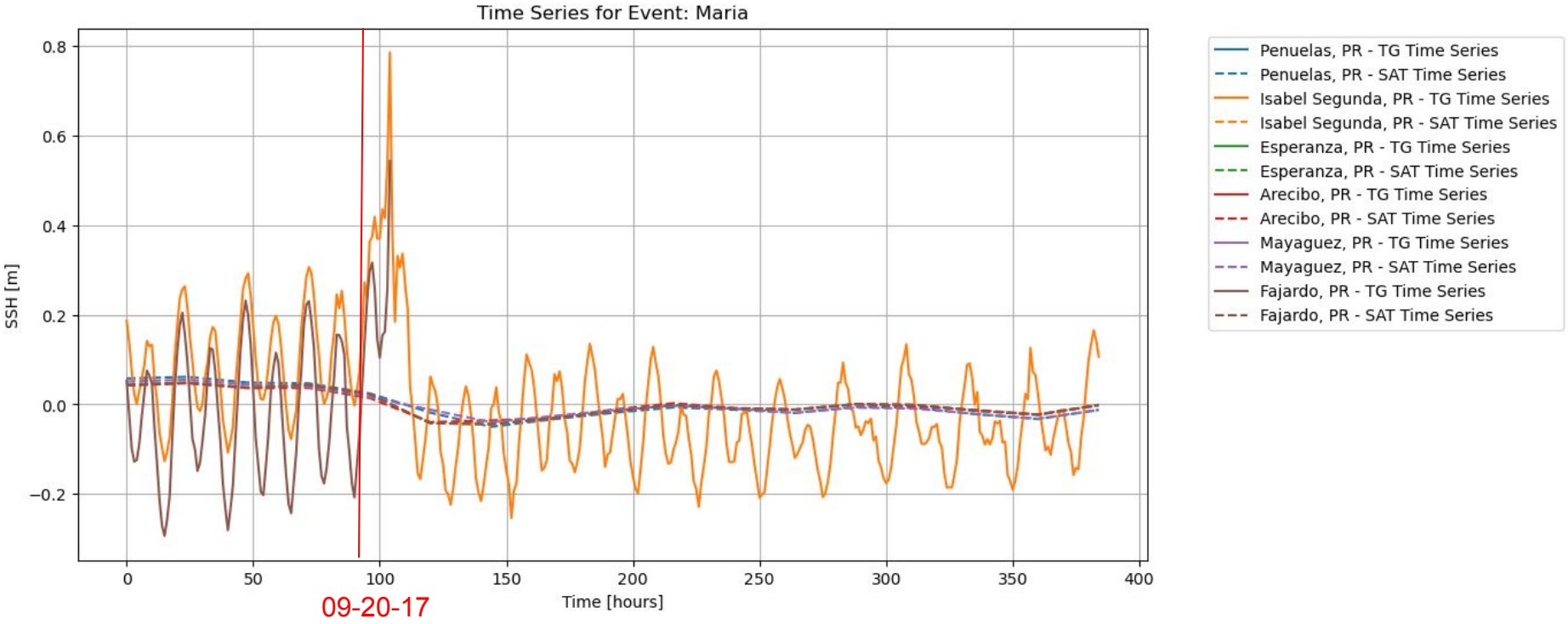
- Gauges active during Maria from 16-09-17–02-10-17
- ECCO per grid vs precise location of NOAA TG

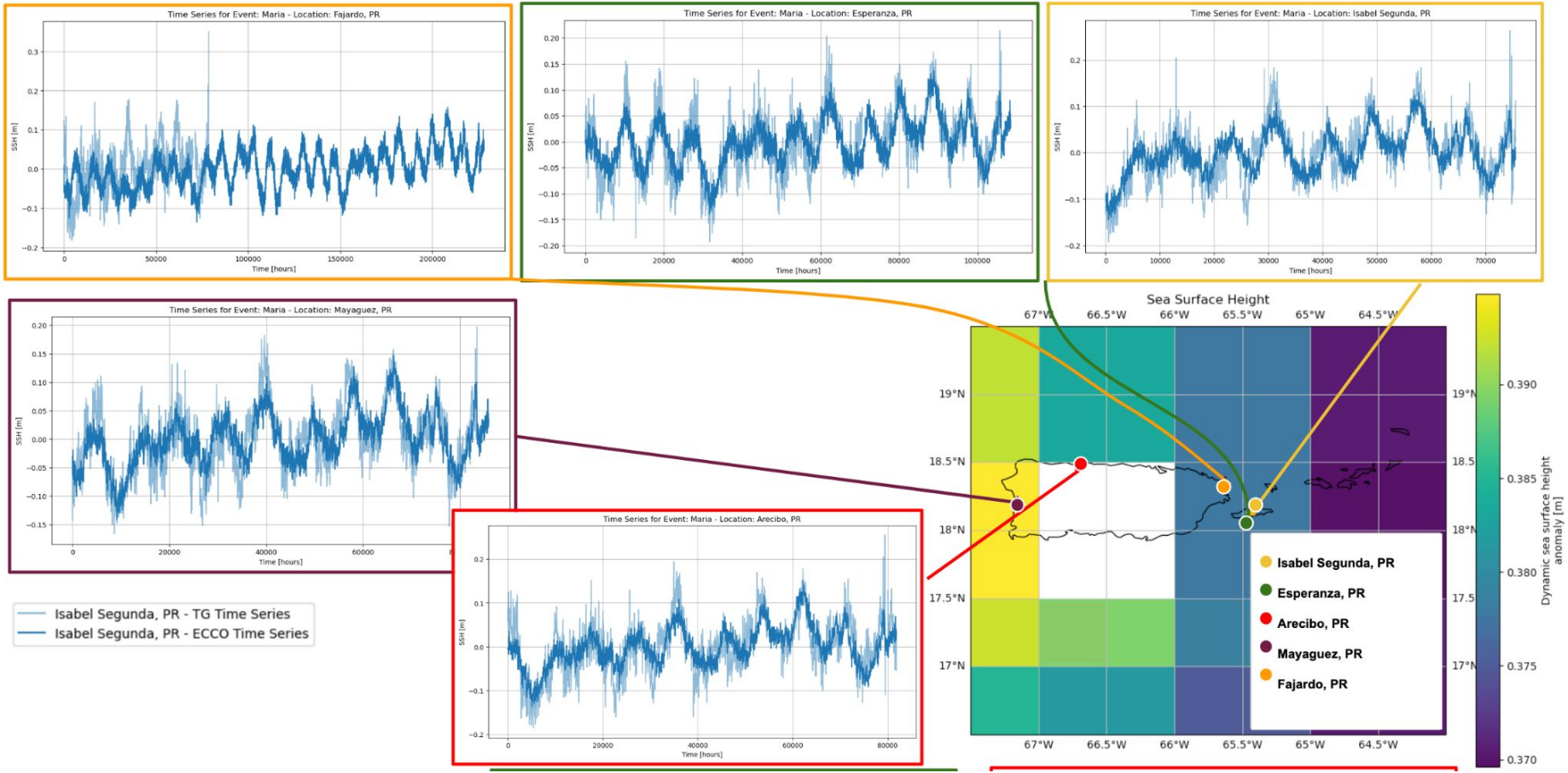
Station 9752695 Esperanza, Vieques Island, PR

https://tidesandcurrents.noaa.gov/stationphotos.html?id=9752695

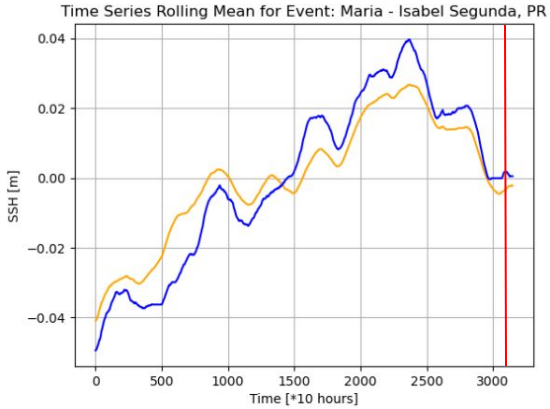


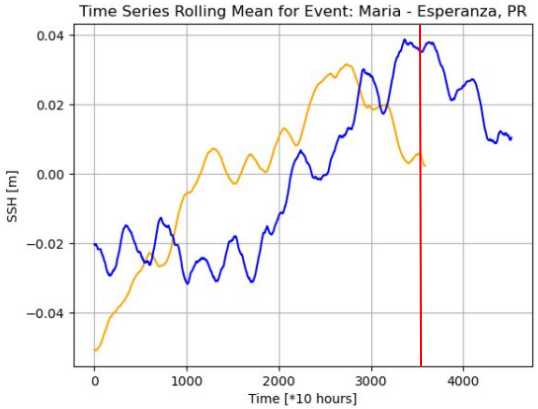
Baseline Comparison During Maria 16-09-17–02-10-17

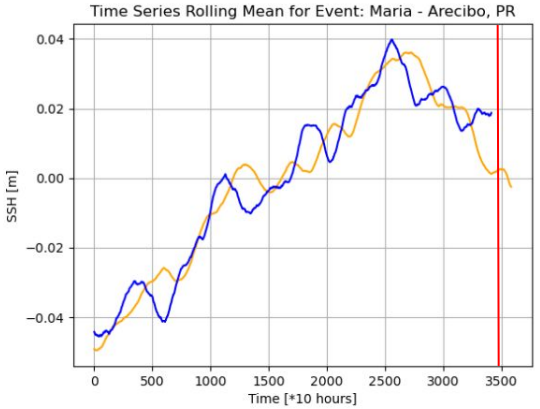


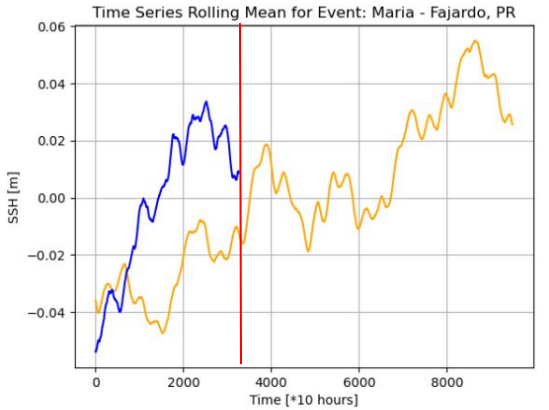

Time Series for Event: Maria - Location: Fajardo, PR
Time Series for Event: Maria - Location: Esperanza, PR
Time Series for Event: Maria - Location: Isabel Segunda, PR
Time Series for Event: Maria - Location: Mayaguez, PR
Time Series for Event: Maria - Location: Arecibo, PR
SSH [m]
Time [hours]
Isabel Segunda, PR - TG Time Series
Isabel Segunda, PR - ECCO Time Series
Sea Surface Height
67°W
66.5°W
66°W
65.5°W
65°W
64.5°W
19°N
18.5°N
18°N
17.5°N
17°N
Isabel Segunda, PR
Esperanza, PR
Arecibo, PR
Mayaguez, PR
Fajardo, PR
Dynamic sea surface height anomaly [m]
0.390
0.385
0.380
0.375
0.370

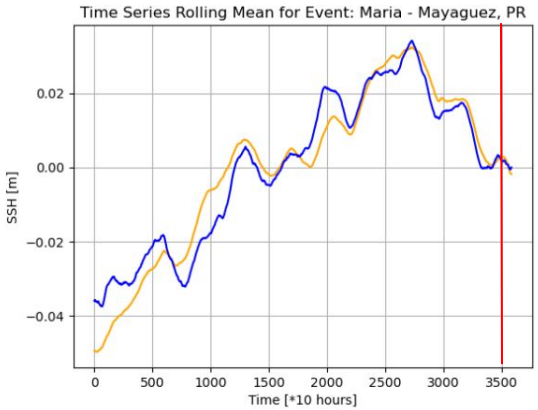
Rolling Mean Comparison





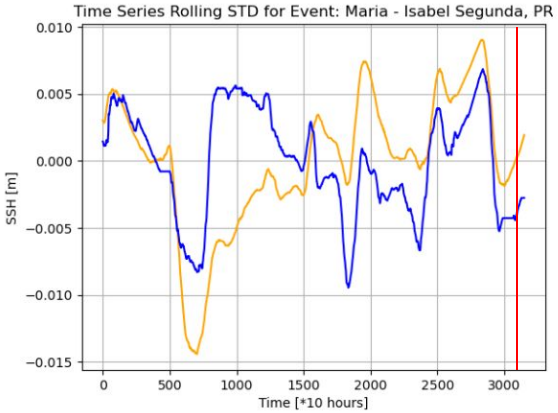


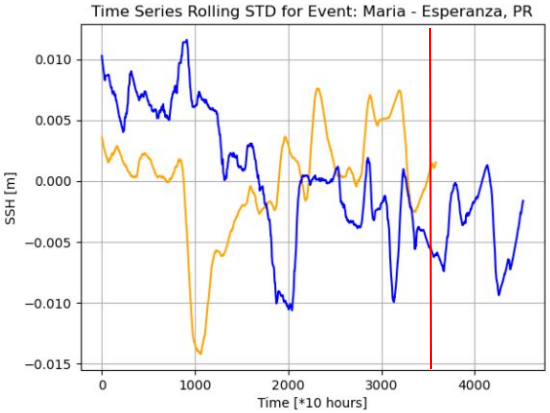


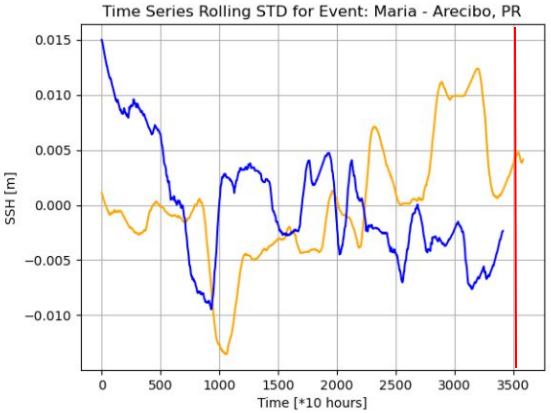


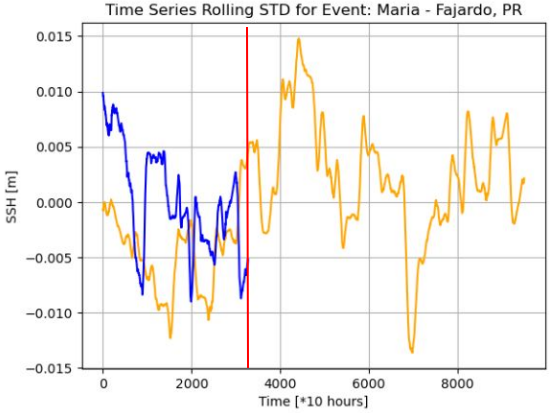
Location	Pearson's correlation coefficient	P-value
Isabel Segunda, PR	0.39	p<0.01 ***
Esperanza, PR	0.55	p<0.01 ***
Arecibo, PR	0.96	p<0.01 ***
Mayaguez, PR	0.93	p<0.01 ***
Fajardo, PR	0.96	p<0.01 ***

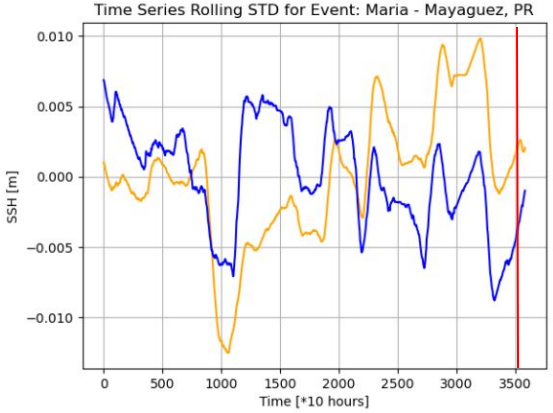
Rolling STD Comparison











Location	Pearson's correlation coefficient	P-value
Isabel Segunda, PR	0.39	p<0.01 ***
Esperanza, PR	-0.32	p<0.01 ***
Arecibo, PR	-0.35	p<0.01 ***
Mayaguez, PR	0.07	p<0.01 ***
Fajardo, PR	0.07	p<0.01 ***

Limitations of Analysis

- Extent of SLR impact on other ocean physics
- Tidal Gauge Calibration cycle
- Hurricane turbidity vs TG

Future Work and Applications

- Other better forms of statistical analysis
- Compare to other storm events
- Input of TG into ECCO for anomalous events
- Creation and maintenance of more TGs

Thank You

Climatematch and the Impact Scholars Team

Fabrizio Falasca

Adolfo Lugo

Climatematch
Academy