Examining the relation between biodiversity and surface temperature regimes in localized coastal upwelling zones using ECOSTRESS

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Motivation to use ECOSTRESS over water

• High spatial resolution
• Non-uniform overpass times
• Ability to extract data up to and across the water-land interface

Composite of two ECOSTRESS scenes
Gulf of Maine - January 14, 2019

Maine
Processing and QC workflow

- Data obtained as GeoTIFF using AppEARS (LP-DAAC)

- Initial QC by visual inspection

- Masks based on ECOSTRESS QC files (marginal data and clouds)

- Iterative geolocation correction applied in MATLAB using digitized coastline from Google satellite basemap

- Re-project and output corrected LST GeoTIFF
## Regions of interest

<table>
<thead>
<tr>
<th>Region</th>
<th>Raw images (2019-2020)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel Islands</td>
<td>183</td>
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<tr>
<td>Florida Keys</td>
<td>267</td>
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<tr>
<td>Biscayne Bay</td>
<td>64</td>
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<tr>
<td>Gulf of Maine</td>
<td>194</td>
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<tr>
<td>Fortaleza, Brazil</td>
<td>32</td>
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<tr>
<td>Serra, Brazil</td>
<td>37</td>
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</tbody>
</table>

Overpass times for Gulf of Maine images (n=194)
ECOSTRESS data extraction
Shore Temperature Profiles
- Approx. 1400m long
- Perpendicular to shoreline
- Beach at midpoint
Channel Islands STP

LST (DegC)

31 DEC 2019 9:58 PST

09 JAN 2020 22:40 PST

14 AUG 2020 16:56 PDT
Comparison of STP – Channel Islands

Δ = Water LST – Land LST

31 DEC 2019 9:58 PST

09 JAN 2020 22:40 PST

14 AUG 2020 16:56 PDT
ECOSTRESS on rocky shores in Gulf of Maine
Comparison with in situ temperature observations

Chamberlain

Bailey Island

Biddeford
Hourly in situ temperature observations (2019)
Rocky shore at Chamberlain, ME
Mid tidal zone, exposed location

Biomimic data courtesy of Brian Helmuth Lab – Northeastern Univ.
ECOSTRESS comparison to hourly in situ temperature observations (2019)
Rocky shore at Bailey Island, ME
Mid tidal zone, exposed location

Data courtesy of Brian Helmuth Lab – Northeastern Univ.
ECOSTRESS and in situ temperature observations (2019)
Rocky shore at Biddeford, ME
Mid tidal zone, exposed location

Data courtesy of Brian Helmuth Lab – Northeastern Univ.
Next steps:
Continue validation of ECOSTRESS at L-W interface with in situ data:
- Robolimpets from MBON Pole-to-Pole
- Robo mussels from Helmuth lab (N. Gulf of Maine, US West Coast)
How can we use ECOSTRESS to help make sense of patterns in biodiversity?

- Biodiversity records from Ocean Biodiversity Information System (OBIS)
- MBON Pole to Pole rocky shore surveys (quadrats)

OBIS data records

ECOSTRESS LST granules
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