Level-2 Land Surface Temperature Emissivity, and Cloud Mask

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1. Jet Propulsion Laboratory, California Institute of Technology
2. Karlsruhe Institute of Technology

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ECOSTRESS Virtual Science Team meeting, 1 December, 2020
Outline

1. L2 highlight
2. Cloud mask update
3. Stage-2 Validation

LPDAAC AppEEARS requests
Sanjana Paul,
Cofounder & Executive director, Earth Hacks

Katie Patrick,
Founder, Urban Canopy, Hello World Labs
103 People working on 21 cities

<table>
<thead>
<tr>
<th>Member Name</th>
<th>City</th>
<th>Owner</th>
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<tbody>
<tr>
<td>1. Abdul Aziz</td>
<td>Beijing</td>
<td>Li Ming Tan</td>
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<tr>
<td>2. Alice Lin</td>
<td>Boston</td>
<td>Lucia Layritz</td>
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<td>3. ANO</td>
<td>New York City</td>
<td>Audrey Ackon</td>
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<td>4. Ana Cristina Vasquez</td>
<td>Newcastle NSW Aus</td>
<td>Karenne Jurd</td>
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<td>5. Anamika Shreevastava</td>
<td>Philadelphia</td>
<td>Leandra Lipat</td>
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<td>6. Anamika Shreevastava</td>
<td>Portland</td>
<td>Anna Hugney</td>
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<td>7. Anamika Shreevastava</td>
<td>San Diego</td>
<td>Drew Resnick</td>
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<td>8. Anamika Shreevastava</td>
<td>Seattle</td>
<td>Anna Hugney</td>
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<td>9. Anamika Shreevastava</td>
<td>Silicon Valley, 2020.08.03</td>
<td>John Noble</td>
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<td>10. Anamika Shreevastava</td>
<td>Tacoma</td>
<td>Phillip Carew</td>
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<td>11. Anamika Shreevastava</td>
<td>Team San Jose</td>
<td>hannahchatham</td>
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<td>12. Anamika Shreevastava</td>
<td>Vancouver</td>
<td>Lucia Layritz</td>
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TIR-only Cloud Mask Update

• ECOSTRESS has two TIR cloud tests:
  1. BT11: Band 4 brightness temperature threshold (day/night, elevation)
     - Commission errors for clouds over cold background
     - Omission errors for low, warm summertime clouds
  2. BT11 – BT12: Band 4 – 5 brightness temperature difference threshold for thin cirrus

But due to variable overpass and high spatial resolution:
  1. BT11 threshold (location, hour of day, month, elevation)
Threshold = Q1 – 1.5*IQR
Q1 = 25\textsuperscript{th} percentile
IQR = Interquartile range (75-25\textsuperscript{th} percentile)
Example 1:
Cold scene
Chesapeake bay
Example 2:
Warm cumulus clouds
Illinois

- Mid-level cold cumulus
- Low-level warm fair-weather popcorn cumulus
CEOS LST validation best practices

1. Temperature-based validation
2. Radiance-based validation
3. Sensor LST product intercomparisons
4. Time-series analysis
Temperature-based sites

Gobabeb, Namibia

Lake Constance, Switzerland
T-based validation, All sites, 08/2018-04/2020

bias = -0.69 K
rmse = 1.13 K
$r^2 = 0.993$
n = 493
LST validation summary: T-based and R-based sites

bias = -0.38 K
rmse = 1.07 K
n = 1139

Hulley et al. 2020, RSE
Algodones Dunes, CA

5-band Emissivity: Algodones Dunes, CA

3-band Emissivity: Algodones Dunes, CA
Questions?
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