Inter-Sensor Comparison of Land Surface Emissivity Products

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NOAA-CREST
This study continues previous inter-comparison studies in Global scale.

Ferraro et al, 2012

Tian et al, 2013
# Emissivity Products

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Provider</th>
<th>Frequencies</th>
<th>Incidence Angle</th>
<th>Ancillary Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMSR-E</td>
<td>NOAA-CREST</td>
<td>6.9, 10.65, 18.7, 23.8, 36.5, and 89.0</td>
<td>55°</td>
<td>ISCCP-DX, TOVS</td>
</tr>
<tr>
<td>SSM/I</td>
<td>CNRS-France</td>
<td>19.35, 22.235(v), 37.0, and 85.5</td>
<td>53°</td>
<td>ISCCP-DX, NCEP Re-analysis</td>
</tr>
<tr>
<td>TMI</td>
<td>Nagoya Uni.</td>
<td>10.65, 19.35, 21.3(v), 37.0, and 85.5</td>
<td>52.88°</td>
<td>JRA-25</td>
</tr>
<tr>
<td>WindSat</td>
<td>JPL/NRL</td>
<td>6.8, 10.7, 18.7, 23.8, and 37.0</td>
<td>49.9° to 55.3°</td>
<td>NCEP-RA, AIRS</td>
</tr>
</tbody>
</table>
Notes

- It focuses on global scale to investigate inconsistencies and agreements at different land Covers.

- 5 years (2003 to 2008) of estimated emissivities from all sensors were used in comparison.

- Just Monthly estimates were used.

- There are differences in INCIDENT ANGLE, FREQUENCY, and TIMING of the sensors that can affect the retrieval. For instance 18.7 and 19.25 GHz.

- Inter-Comparison study is performed on 10, 19, 37, and 85 GHz (namely).

- Products are based on different algorithms and ancillary data sets.
Land Cover-based Analysis
Systematic Differences

\[ MRD = \sum_{1}^{n} \frac{S_{i,j} - \bar{S}_j}{\bar{S}_j} \]

Where \( S_{i,j} \) is the emissivity estimate from product \( i \) at the month \( j \). \( S_j \) is the average of all emissivity estimated for the month \( j \).
Global Spatial Histograms July 2003

10 GHz

19 GHz

37 GHz

85 GHz

V Pol.

H Pol.
Dynamics of Monthly Emissivity Estimates

STD of Emissivity from AMSR-E (2002 to 2008)

STD of Emissivity from SSM/I (2002 to 2008)

STD of Emissivity from TMI (2002 to 2008)

85 GHz

STD of AMSR-E Emiss 37H

STD of SSM/I Emiss 37H

STD of WindSat Emiss 37H

STD of TMI Emiss 37H

37 GHz
Relationship with Soil Moisture and NDVI

\[ \text{MPDI} = \frac{\varepsilon_v - \varepsilon_h}{\varepsilon_v + \varepsilon_h} \]
Correlation Map of Monthly Emissivities (H-V) and NDVI