An Evapotranspiration Data Product at 2km resolution from NOAA GOES-16

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INTRODUCTION

- GOES Evapotranspiration (ET) and Drought (GET-D) has been operationally generating ET and Evaporative Stress Index (ESI) data products at 8km resolution for NCEP NWP model validation and drought monitoring.
- Continuation of GET-D operation using the current high-resolution thermal observations of the Advanced Baseline Imagers (ABI) from GOES-R series is in high demand.
- This study introduces the architecture of the upgraded GET-D system, the core model (Atmosphere-Land Exchange Inversion model; ALEXI) and preliminary validation results of ET product.

ALEXI MODEL

- Atmosphere-Land Exchange Inversion (ALEXI) model exploits the mid-morning rise in LST from GOES to deduce the land surface fluxes, including evapotranspiration.
- Implementation of the two-source energy balance (TSEB) model which balances components of energy budgets for the soil and canopy components separately.

SYSTEM OUTPUTS

<table>
<thead>
<tr>
<th>Variables</th>
<th>Spatial Resolution</th>
<th>Unit</th>
<th>Format</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET</td>
<td>2km</td>
<td>mm/day</td>
<td>NetCDF, GRIB2</td>
<td>Evapotranspiration</td>
</tr>
<tr>
<td>ET QC</td>
<td>2km</td>
<td></td>
<td>NetCDF, GRIB2</td>
<td>Quality control flag for retrieved ET</td>
</tr>
<tr>
<td>Fluxes</td>
<td>2km</td>
<td>W m⁻² day⁻¹</td>
<td>NetCDF, GRIB2</td>
<td>Daily short wave down, long wave down, net radiation, Quality control flag for retrieved fluxes</td>
</tr>
<tr>
<td>Flux QC</td>
<td>2km</td>
<td></td>
<td>NetCDF, GRIB2</td>
<td>Quality control flag for retrieved fluxes</td>
</tr>
</tbody>
</table>

PRODUCT

ET retrieval comparison between operational GOES-13/15 based ET product and upgraded GOES-16 LST based 2km product; Monthly composite of July 2017 (mm/day)

RESULTS

MEAD, NE Ameriflux site (J. Vama, 2010) Rainfed and irrigated corn and soybean

Field #1: 41°09'54.2"N, 96°28'35.9"W
Field #2: 41°09'53.5"N, 96°28'12.3"W
Field #3: 41°10'46.8"N, 96°26'22.7"W

Error Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Satellite</th>
<th>RMSE</th>
<th>Correlation</th>
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</thead>
<tbody>
<tr>
<td>MEADsite1</td>
<td>GOES-13 based</td>
<td>0.555</td>
<td>1.318</td>
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<tr>
<td>MEADsite2</td>
<td>GOES-13 based</td>
<td>0.561</td>
<td>1.094</td>
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<td>MEADsite3</td>
<td>GOES-13 based</td>
<td>0.754</td>
<td>1.132</td>
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<td>Average</td>
<td>GOES-13 based</td>
<td>0.623</td>
<td>1.181</td>
</tr>
</tbody>
</table>

OBSERVATIONS

- The GET-D system has been upgraded successfully to generate ET at much improved spatial resolution of 2km over CONUS using GOES-16 observations.
- The comparison proves ET estimates from the upgraded GET-D system to be very consistent with the current operational products.
- The spatial correlation between the two products reaches 0.946 averaged over CONUS domain for the studying period.
- Upgraded GET-D is validated against MEAD in situ observations.
- Accuracy of the new GET-D ET product is satisfactory with the bias of 0.588 mm/day and the correlation of 0.914 averaged from three Mead sites.