GOES-17 Saturation Prediction
Reference Tools for 2020

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Data are based on NESDIS/OSPO File "*_2020_ABI_Thermal_Model_2020-07-28.xls"
Outline of Saturation Prediction
Reference Tools

• Caveats & Assumptions

• Daily Maximum Temperatures

• Daily Maximum Temperatures with Band Thresholds

• Hour-by-Hour Band Saturation

• Interpretation of Marginal and Unusable Hours

• Example Images of “Marginal” and “Unusable” Hours

• Details on Cooling Timeline
Important Caveat

• **NOTE:** All of the information in this slide deck is **predictive**.
• The actual extent of saturation will differ from the predictions by both temperature magnitude and time of day
• Differences between actual and prediction may also have seasonal variations
• The data in this slide deck indicate “marginal” saturation when imagery is still useful, but some saturation artifacts are present (see example imager at end of slide deck)
• In coming months the predicted data will be revisited and in cases where the predictions may be improved, this slide deck will be updated and redistributed
• Predictions for 2021 will be made available in late 2020
Assumptions

• Inclusions reflect current (July 29, 2020) operational status
  – Thermal model uses Mode 6 with GOES-West mesoscale domain sector (MDS) default locations over Alaska and California
  – Semi-annual yaw flip to reduce solar load (~3 weeks after and before each equinox – April 6, 2020 and September 8, 2020)
  – Predictive Calibration is included in setting the “marginal” and “unusable” per-band imagery thresholds
  – Mode 3 Cooling Timeline: 15 minute Full Disk, 2 MDS Domains each at 2 minute refresh
    • See slides 17-20 for explanation of cooling timeline
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This plot shows hourly maximum temperature of the ABI focal plane module. The higher the temperature, the more saturated imagery becomes. Where the temperature rises to approach a black line for each band, marginal saturation may be observed in imagery. Where the temperature curve exceeds a black line for each band, the imagery may begin to saturate so much that it becomes unusable. The hour of peak temperature varies from day to day.
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Predicted Marginally Saturated Hours by Band

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## Characterization of Marginal and Unusable Hours

<table>
<thead>
<tr>
<th>2020 Predictions</th>
<th>Characterization of Daily Maximum Values</th>
<th>Characterization of Diurnal Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 July – 12 August</td>
<td>Channel saturation begins starting with bands in this order: 12, 16, 10, 8, 9, 11 from marginal to unusable by the end of the time period.</td>
<td>Saturation may occur between approximately 1100-1530 UTC. Peak saturation occurs at the end of the time period at approximately 1300 UTC.</td>
</tr>
<tr>
<td>13 August – 30 August</td>
<td>The cooling timeline is implemented. Channel saturation begins starting with bands in this order: 12, 16, 10, 8, 9, 11, 15, 14 from marginal to unusable by the end of the time period.</td>
<td>Saturation can occur between approximately 1030-1600 UTC. Peak saturation occurs at the end of the time period at approximately 1300 UTC.</td>
</tr>
<tr>
<td>31 August – 7 September</td>
<td>After a 1-day spike when the cooling timeline is turned off, Channel saturation improves from September 1st starting with bands in this order: 11, 9, 8, 10, 16, 12 from unusable to mostly marginal by the end of the time period.</td>
<td>Saturation can occur between approximately 1100-1530 UTC. Peak saturation occurs at the beginning of the time period at approximately 1300 UTC.</td>
</tr>
<tr>
<td>8 September – 6 October</td>
<td>All bands nominal without marginal or unusable periods.</td>
<td>Diurnal values remain within usable imagery thresholds throughout this period.</td>
</tr>
<tr>
<td>8 October – 15 October</td>
<td>Channel saturation begins starting with bands in this order: 12, 16, 10, 8, 9, 11, 15 from marginal to unusable to mostly marginal by the end of the time period.</td>
<td>Saturation can occur between approximately 1015-1600 UTC. Peak saturation occurs at the end of the time period at approximately 1300 UTC.</td>
</tr>
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<td>16 October – 30 October</td>
<td>The cooling timeline is implemented. Channel saturation improves starting with bands in this order: 11, 9, 8, 10, 16, 12 from unusable to mostly marginal by the end of the time period.</td>
<td>Saturation can occur between approximately 1015-1600 UTC. Peak saturation occurs at the end of the time period at approximately 1300 UTC.</td>
</tr>
<tr>
<td>31 October – 19 December</td>
<td>After a 1-day spike when the cooling timeline is turned off, Channel saturation continues to improve starting with bands in this order: 11, 9, 8, 10, 16, 12 from unusable to mostly marginal by the end of the time period.</td>
<td>Saturation can occur between approximately 1015-1600 UTC. Peak saturation occurs at the end of the time period at approximately 1300 UTC.</td>
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Example of Marginally Saturated Image
Example of Unusable Saturated Image
Introduction to Cooling Timeline

- **Objective:** Lower focal plane temperatures and decrease hours of degraded and saturated imagery
- **Approach:** Alter ABI timeline to spend additional time looking at cool space-looks (vs. comparably hot Earth-looks)
- **Timeline:** Runs from 0600 UTC to 1200 UTC on days when cooling timeline is active

- **Past Activations**
  - Feb 26, 2020 – Mar 1, 2020
  - Apr 9, 2020 – May 1, 2020

- **Upcoming Activations**
  - Aug 11, 2020 – Sep 1, 2020
  - ~Oct 14, 2020 – ~Oct 31, 2020
• Classified as Mode 3:
  – 15 min Full Disk
  – No CONUS
  – Alternating MESO 1/minute

• Compare to Nominal Mode 6:
  – 10 min Full Disk
  – 5 min CONUS
  – MESO 2x1 min / 1x30 sec

Modified from https://www.ospo.noaa.gov/Operations/GOES/west/Mode3G_Cooling_Timeline_G17.html
Over the same time period, replaces three nominal Mode 6 Timelines with two Cooling Timelines:

- Full Disk: 3 to 2
- CONUS: 6 to 0
- MESO: 60 to 30
Cooling Timeline Results Summary

• Cooling timeline effectively reduced the peak FPM temperature by ~3-5 K from April 9 – May 1
  – Stronger impact on the hottest days

• The cooling timeline in April 2020 gained ~30-130 minutes of valid images at most cooling days
  – 50-150 Meso images
  – 2-10 CONUS images
  – 2-6 FD images

• More extra images at the falling FPM temperature side than at the rising side

• No saturated images at B07/B13/B14 on cooling timeline days

Source: Fred Wu