CrIS and ATMS SDR Processing and VIIRS Ground Track Mercator in CSPP

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Overview

- CrIS SDR package
- Installing and running the CrIS SDR algorithm
- CrIS full-resolution data
- CrIS SDR future plans
- ATMS SDR status
- VIIRS Ground-Track Mercator Products

CrIS SDR package

- Generates CrIS Sensor Data Records (SDR) HDF5 files containing radiance spectra and Geo product

- Input is Raw Data Record (RDR) HDF5 files containing interferograms, instrument and Geo parameters

- Can run on RDRs generated with RTSTPS (from antenna), or RDRs from operational system

- Runs on 64-bit Linux

- Third-party COTS software is included

Installing and Running CrIS SDR

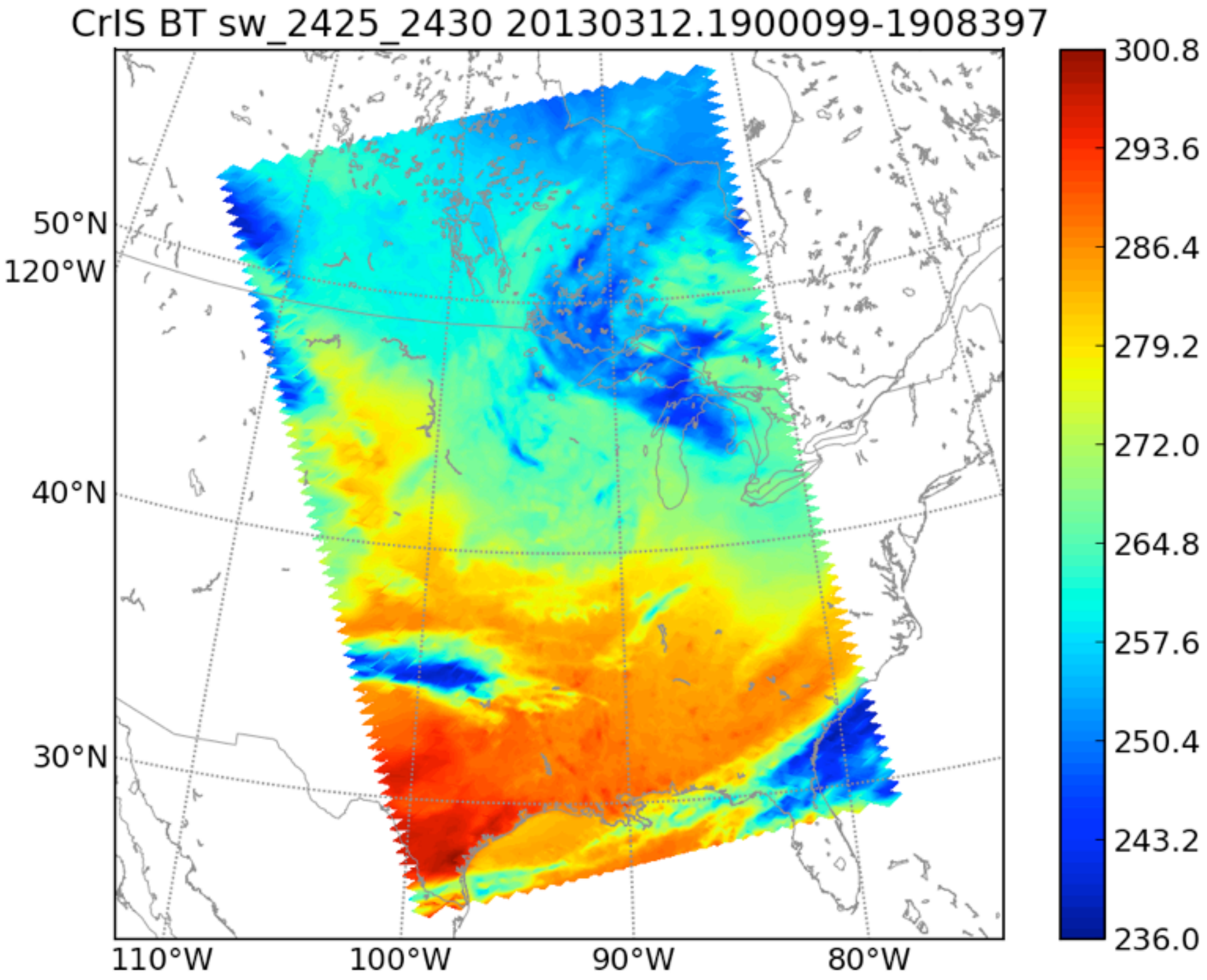
- Easy to set up and easy to run
- Download SDR algorithm and ancillary data packages from CSPP website:

  http://cimss.ssec.wisc.edu/cspp/
- Unpack tarballs, set an environment variable and source a settings script
- Run the SDR algorithm

```
cris_sdr.sh path/to/RDRs/RCRIS*.h5
```

- Optionally run the quicklooks script

```
ql_cris_sdr.sh path/to/sdrs
```


CrIS BT sw_2425_2430 20130312.1900099-1908397
50°N
120°W
40°N
30°N
110°W
100°W
90°W
80°W
300.8
293.6
286.4
279.2
272.0
264.8
257.6
250.4
243.2
236.0

Current version, 1.3

- Based on ADL / IDPS Mx 6 baseline
- Most Cal/Val fixes that were in previous versions of the CrIS SDR were not needed
- One remaining fix: engineering packet is always associated with the first granule being processed
    - Still needed because of differences between IDPS and CSPP processing modes
    - Different engineering values may be used in processing (particularly CMO generation) compared to operational system
- Users can expect slight differences in spectra compared with operational data
    - Engineering values have been stable, so differences should be small

1.4 beta

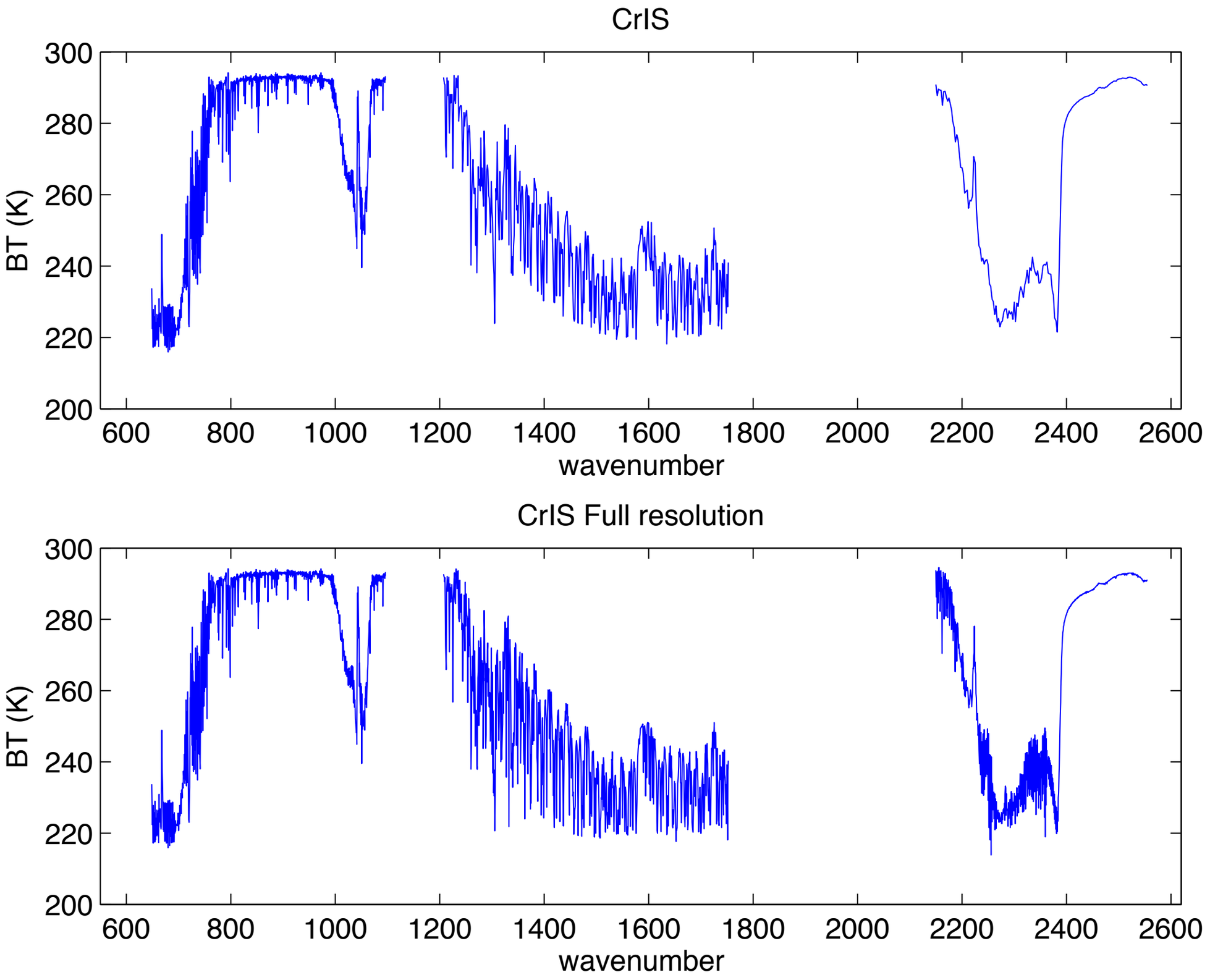
- built with gcc4.7; better optimization
- includes truncation algorithm to handle full-res CrIS data
- works with RTSTPS 5.3
- beta will be released soon

Full resolution CrIS data

- Currently RDRs received from spacecraft contain reduced resolution MW and SW data
- Future RDRs will contain interferograms at full resolution: more points in the MW and SW bands
- Originally transition was planned for June 2013, may be delayed
- March 2013 full-res test: spacecraft sent down full-res data for several orbits
- RDR files from full-res test were nearly twice normal size

Reduced res vs full-res spectra

Calculated data, provided by Dave Tobin



RDR truncation in CSPP

- Current ADL and IDPS (operational) software cannot process full resolution data
- Initial goal: allow CSPP users to continue to process data after switch to full-res
- Accomplished via added code in SDR algorithm that truncates interferograms to create low-res data
- SDRs produced by CSPP will contain spectra at the current, reduced resolution
- Users should not notice a difference in the SDRs generated by CSPP after the switch

Interferogram truncation algorithm

- code was written by Yong Han, NOAA/NESDIS/STAR
- algorithm is fairly complex; more than just resampling an interferogram
- similar to the truncation algorithm in IDPS (Mx7), currently in testing
- CSPP will likely switch to the IDPS version of the algorithm when the Mx7 baseline is integrated

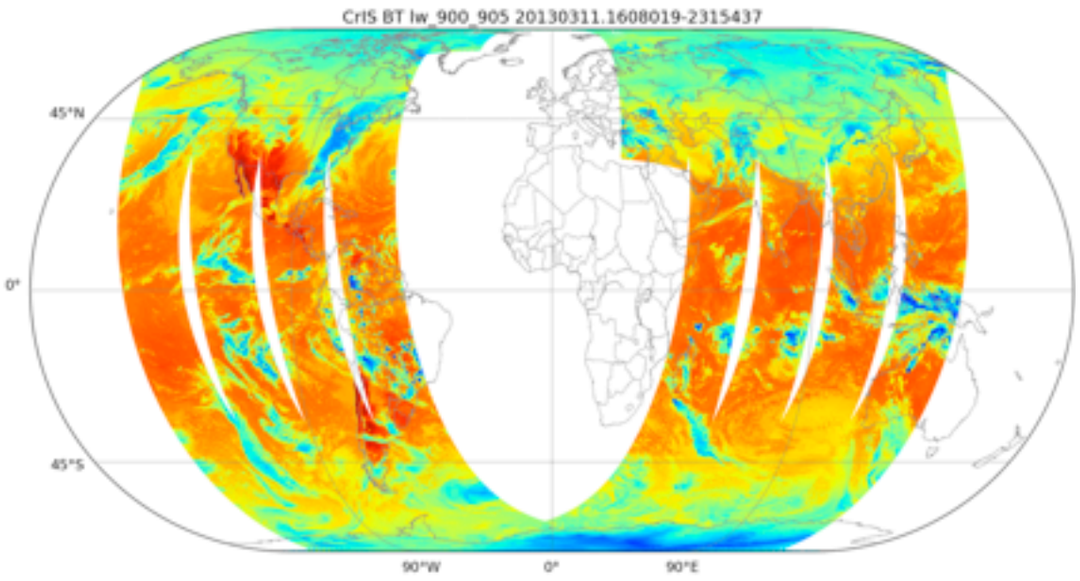
Analysis of truncation algorithm

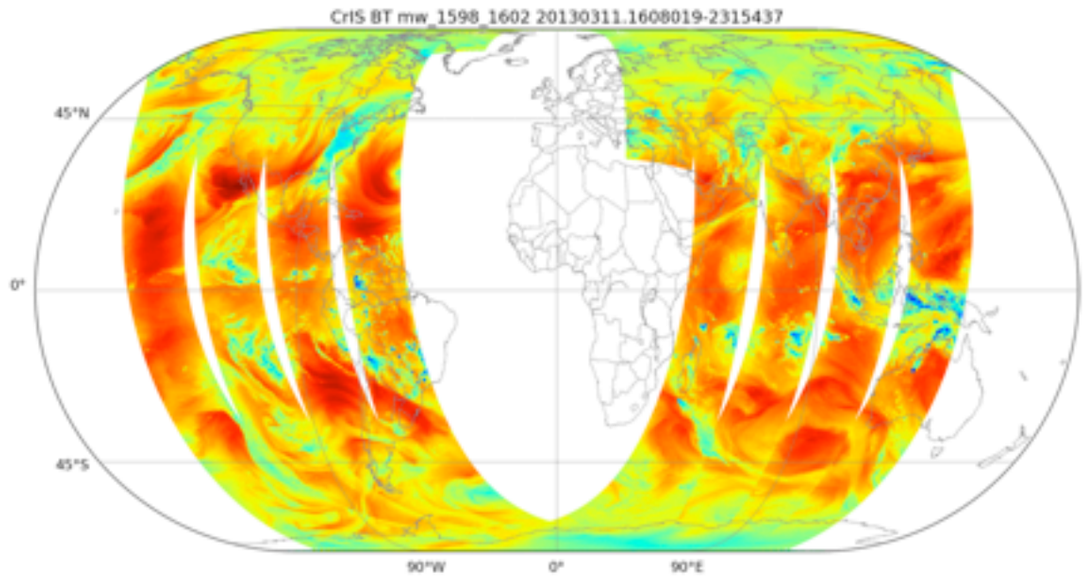
- Are SDRs generated by CSPP by truncating full-res RDRs the same quality as SDRs currently generated from reduced-res RDRs?
    - Important question for anyone who currently uses CSPP to process CrIS data
- Ideally would have an RDR dataset in both full-res and reduced-res form. Could process both datasets through CSPP and compare output.
    - We do not have such a dataset

Analysis of truncation algorithm: methodology

- Our approach: evaluate quality of SDRs produced from full-res RDRs. Should be similar to quality of SDRs produced from reduced-res RDRs.
  - High-res test case: March 12 dataset, ~4.5 orbits
  - Reduced-res reference case: March 11 dataset, similar time of day and number of orbits
- Quality metric: processed SDRs with CSPP Dual Regression (HSRTV), compared output to GDAS “truth”
- Used retrieved Relative Humidity and Temperature profiles from dual regression (HSRTV), clear pixels only
- Difference stats (“quality”) should be similar for the two datasets. Significantly lower quality from test case could indicate a problem with the truncation algorithm
- Datasets are from different days: not expecting quality metrics to match exactly

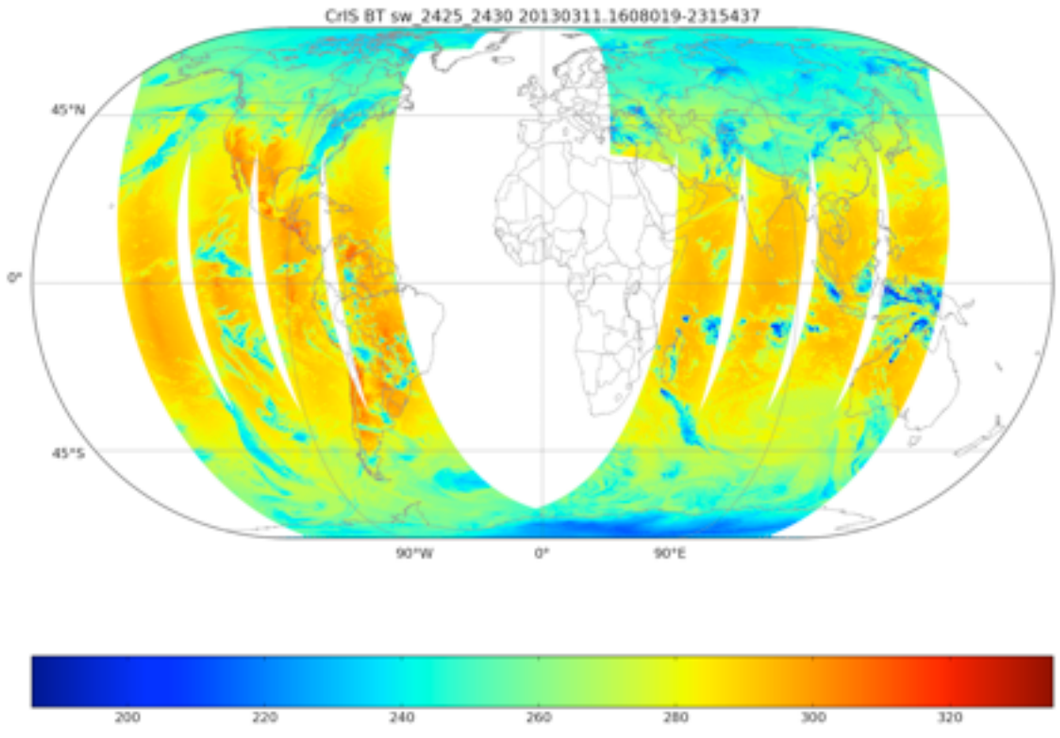
Reference data, March 11





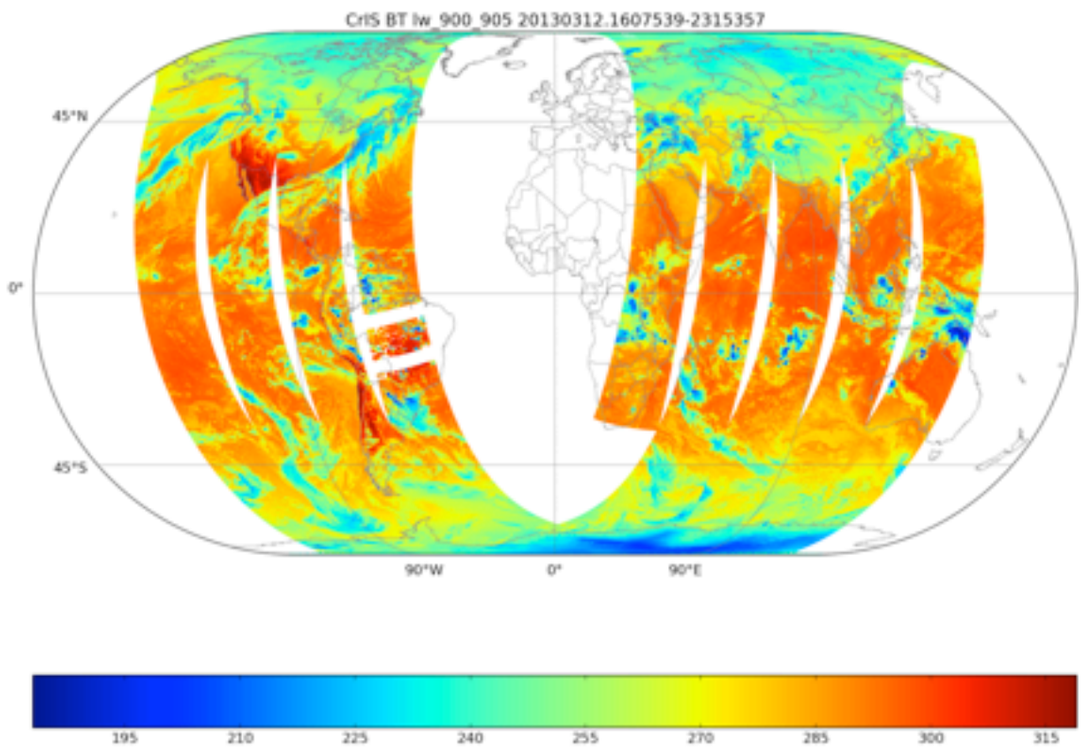
LW

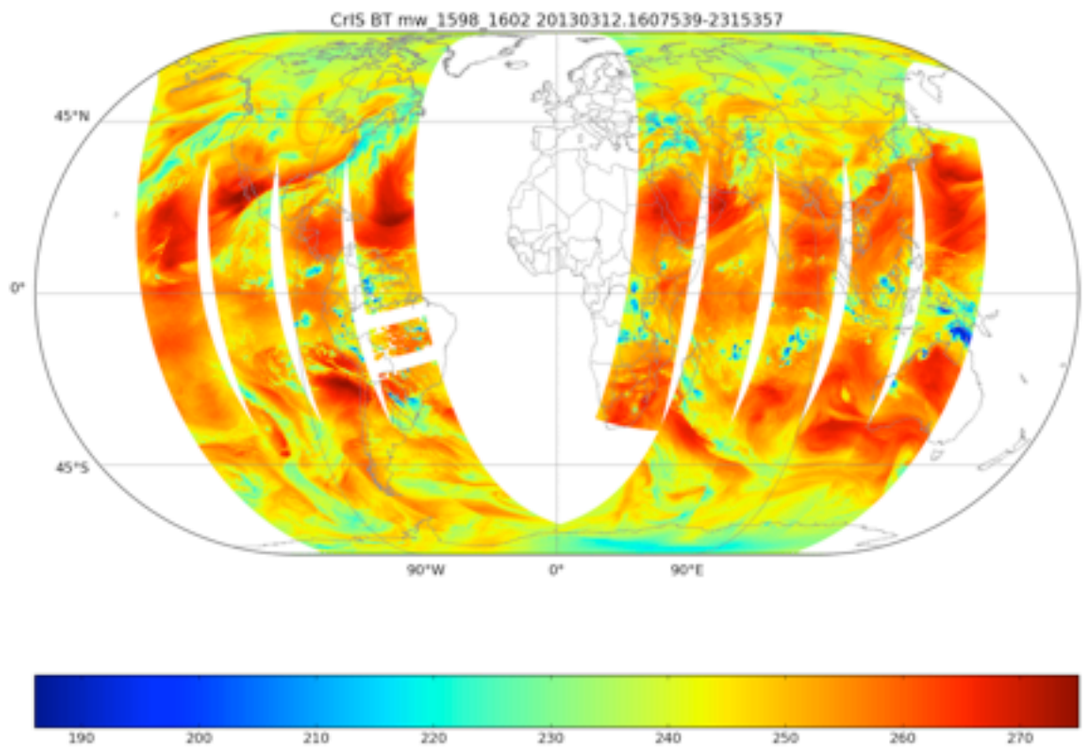
MW



SW

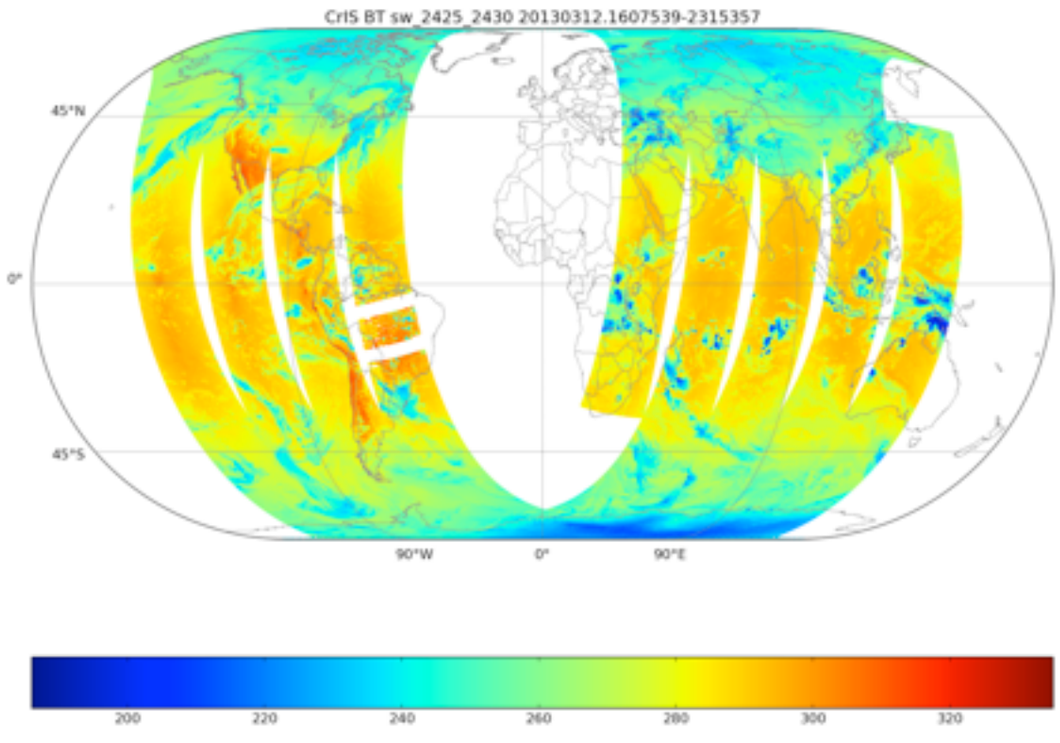
Truncated full-resolution data, March 12





LW

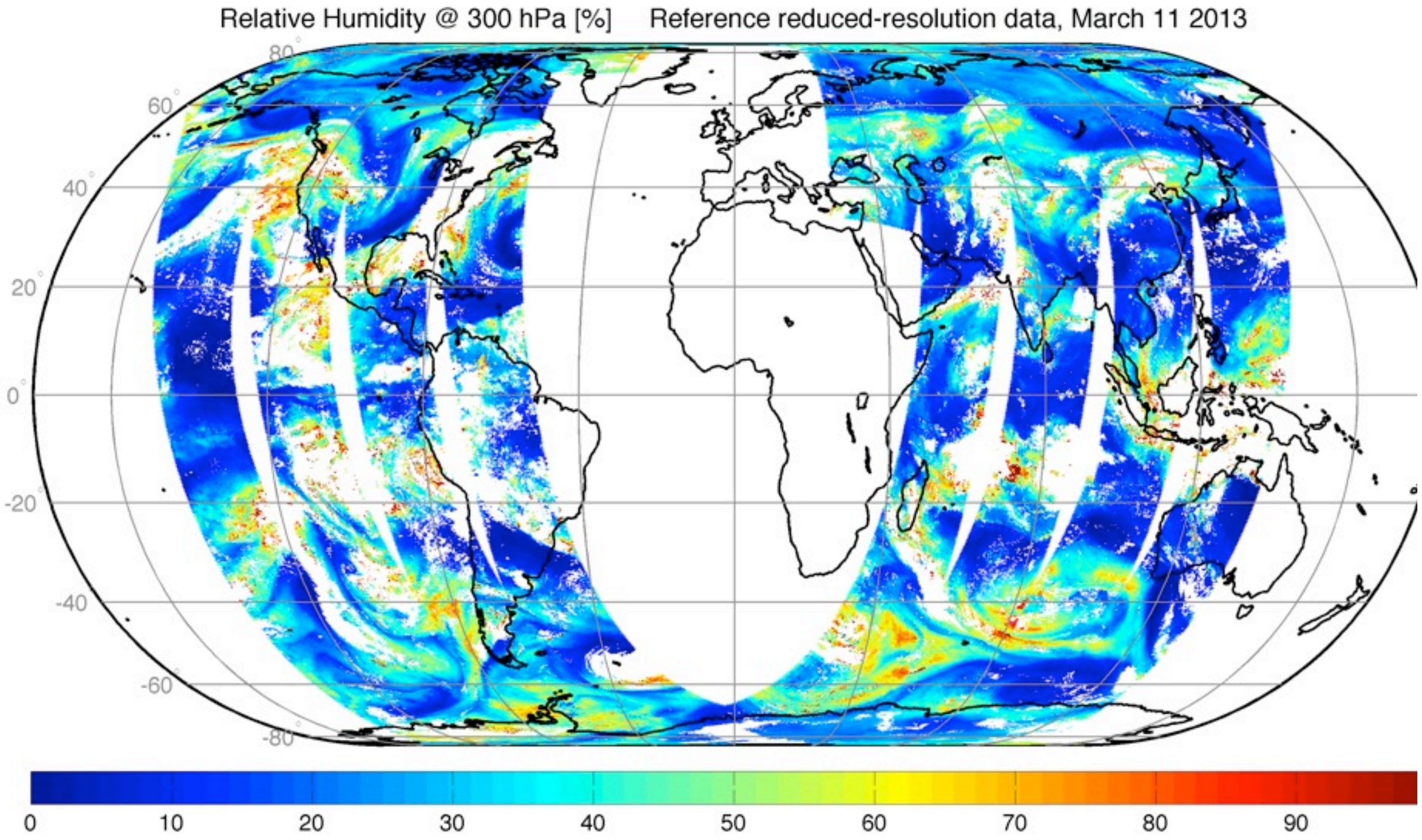
MW



SW

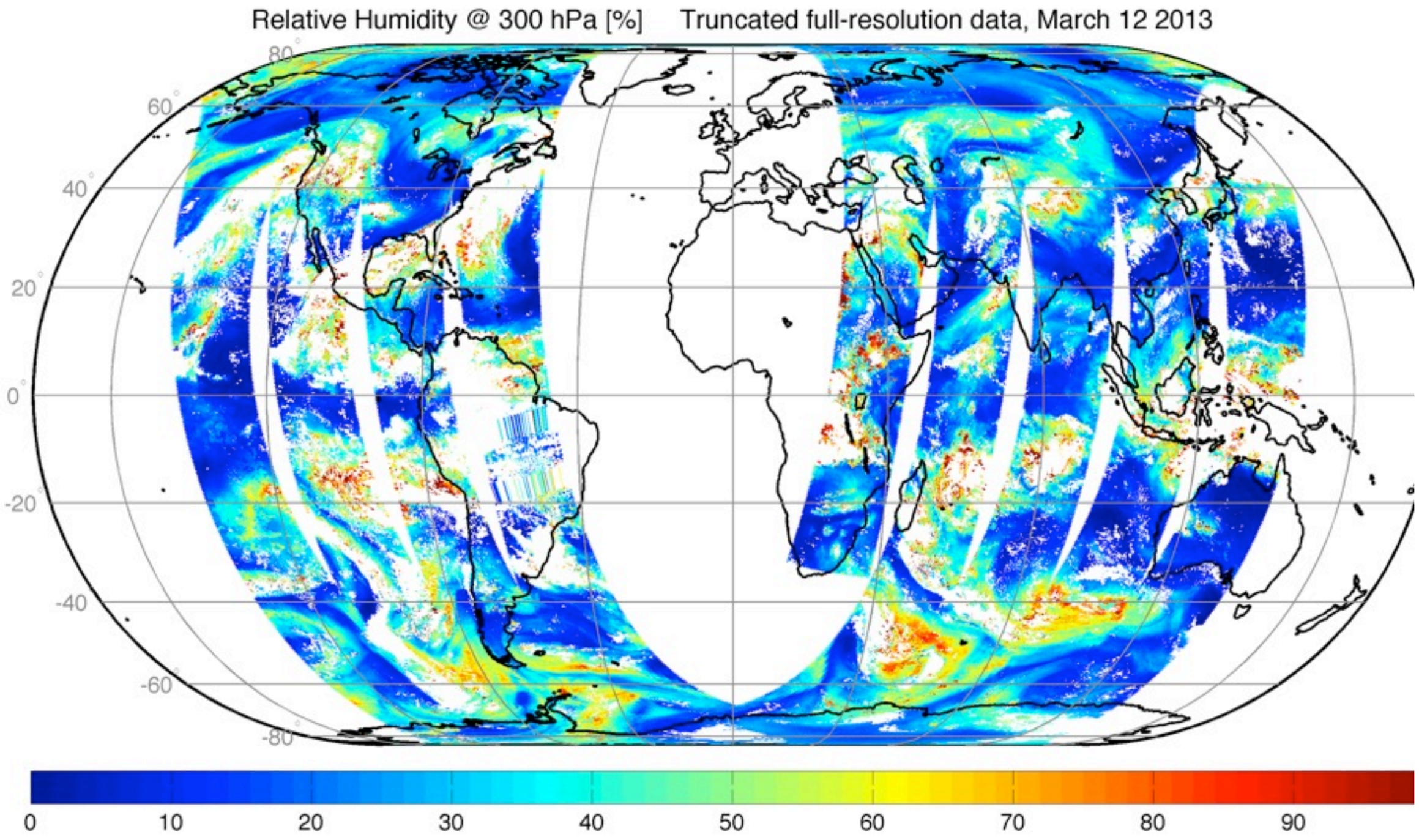
Retrieved Relative Humidity @ 300 hPa

Reference data, March 11



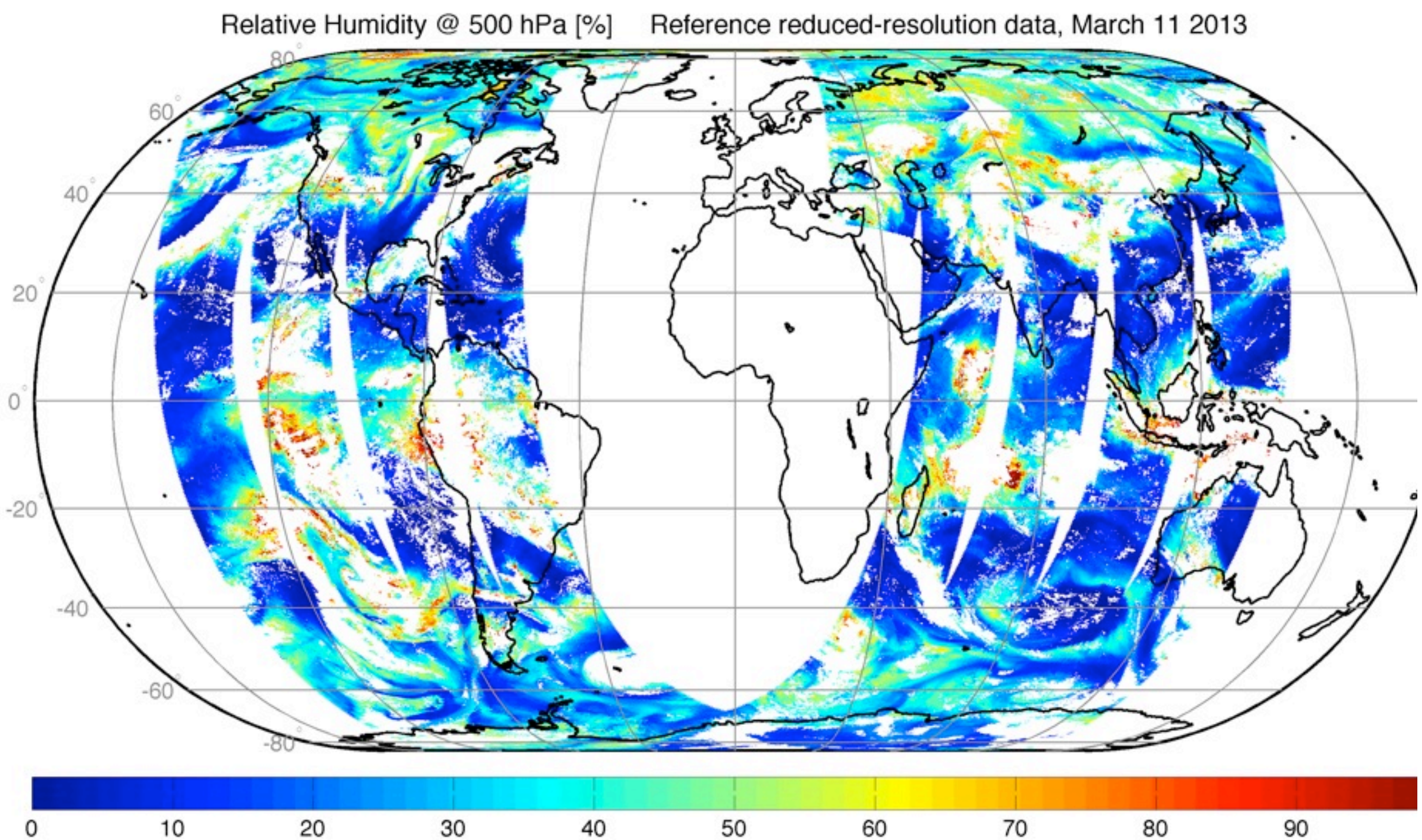
Retrieved Relative Humidity @ 300 hPa

Truncated full-res data, March 12



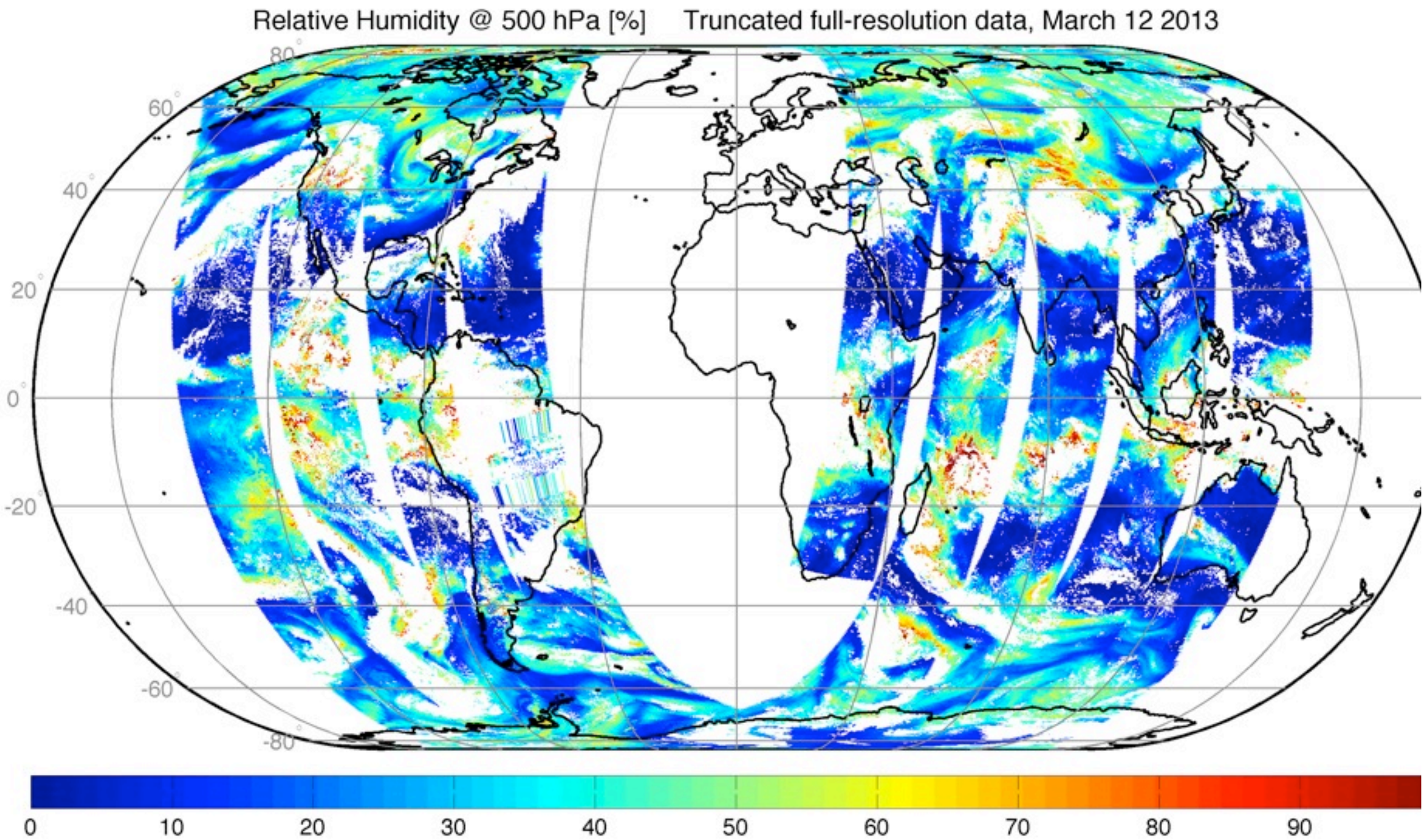
Retrieved Relative Humidity @ 500 hPa

Reference data, March 11



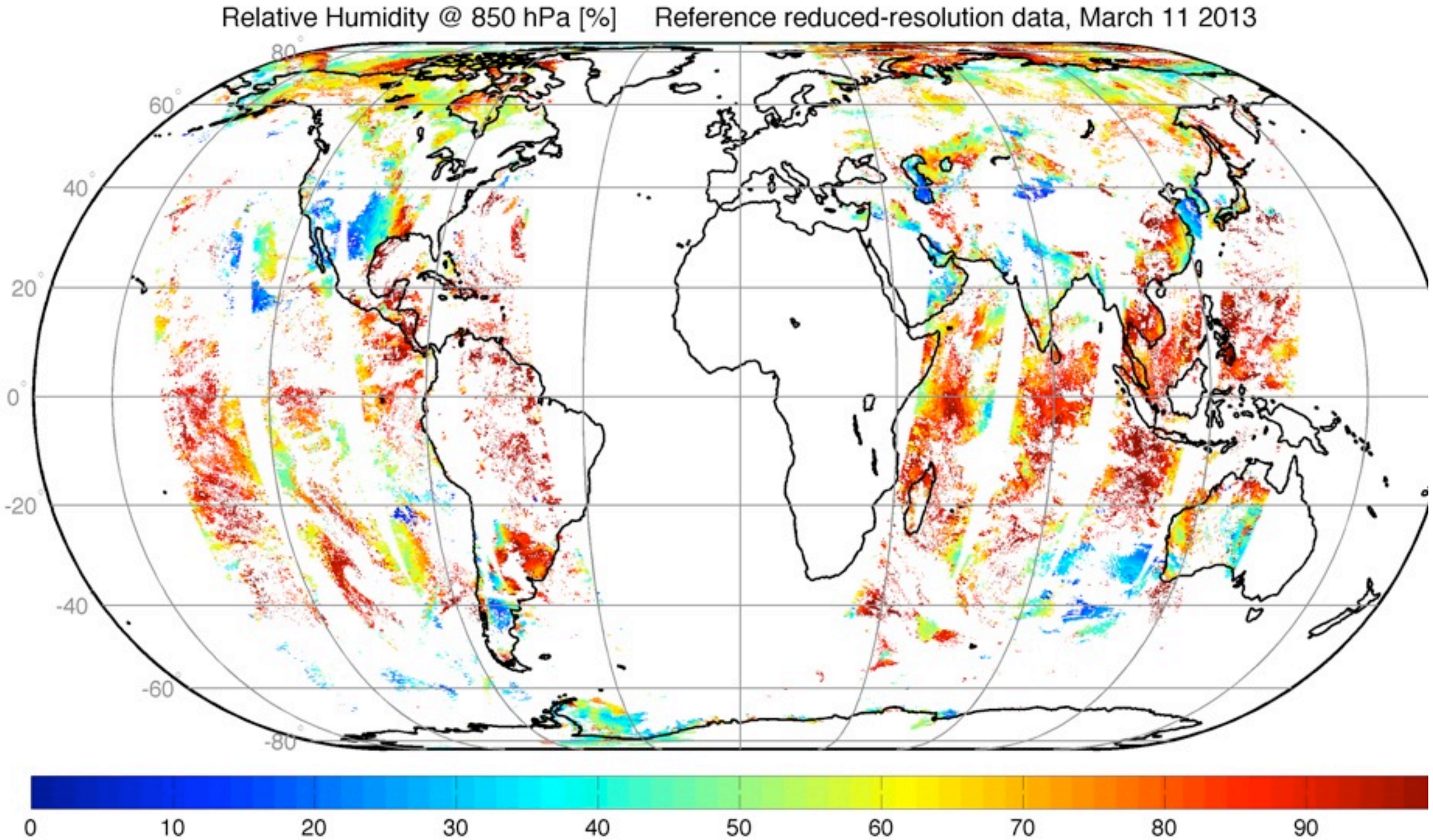
Retrieved Relative Humidity @ 500 hPa

Truncated full-res data, March 12



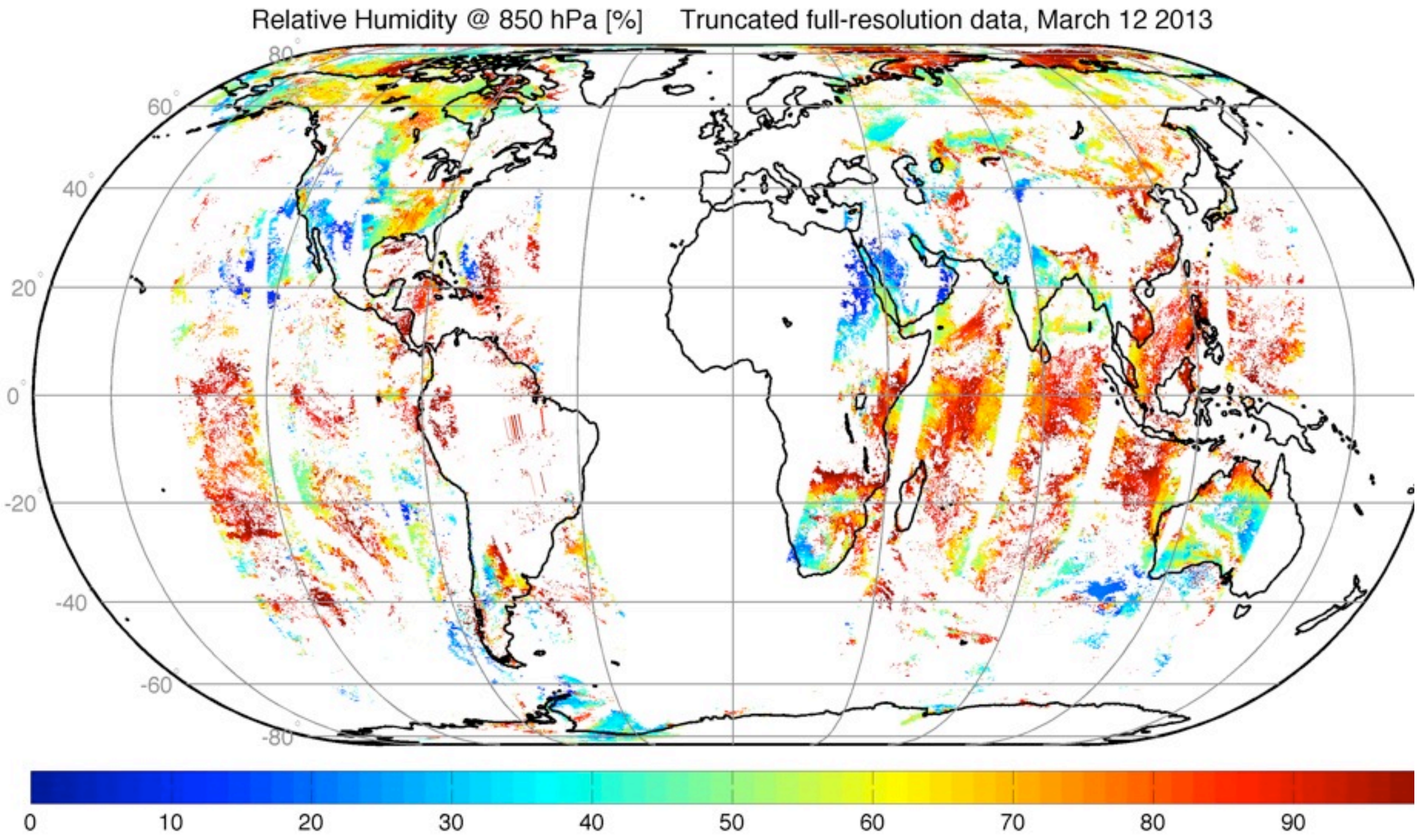
Retrieved Relative Humidity @ 850 hPa

Reference data, March 11



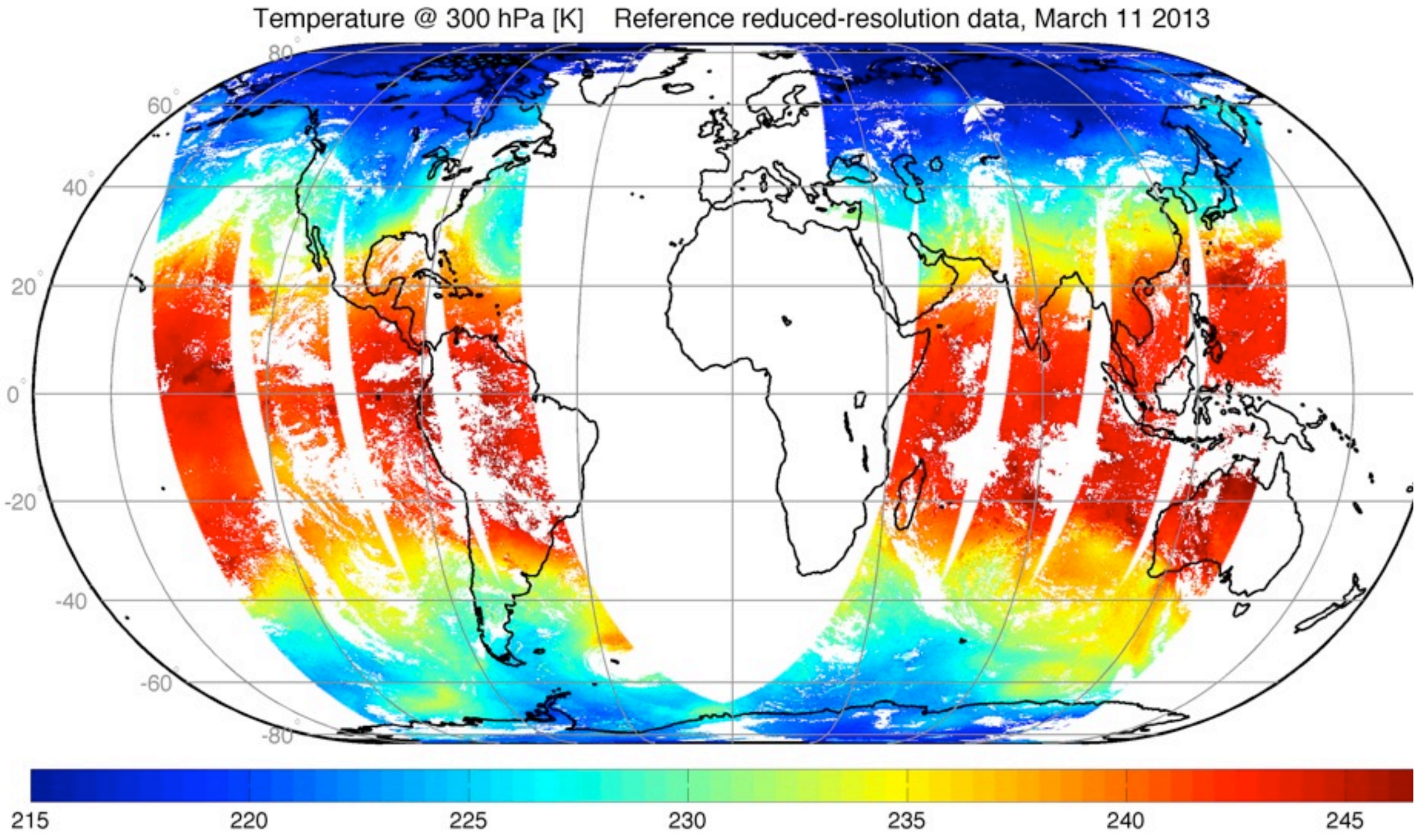
Retrieved Relative Humidity @ 850 hPa

Truncated full-res data, March 12



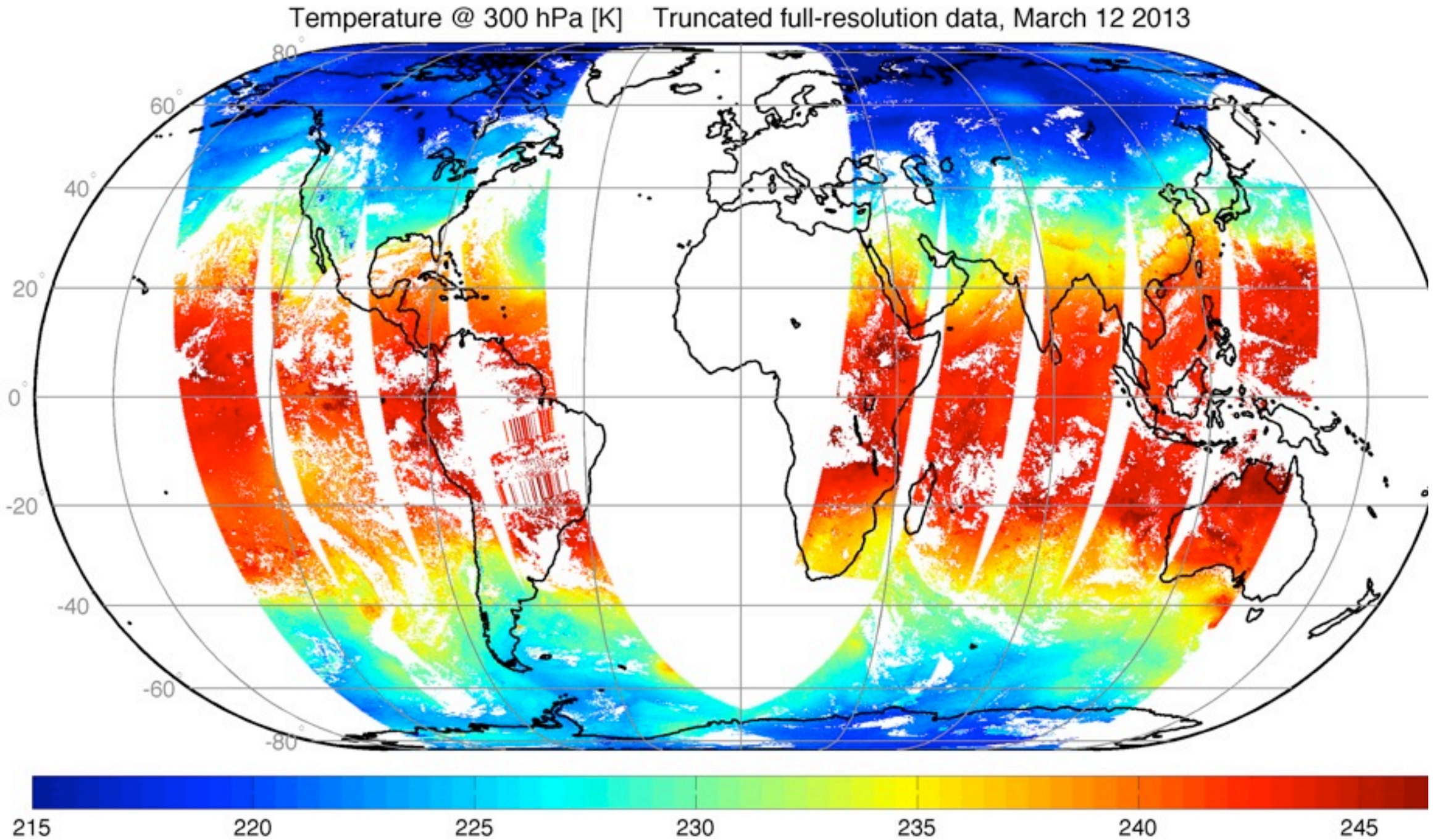
Retrieved Temperature @ 300 hPa

Reference data, March 11



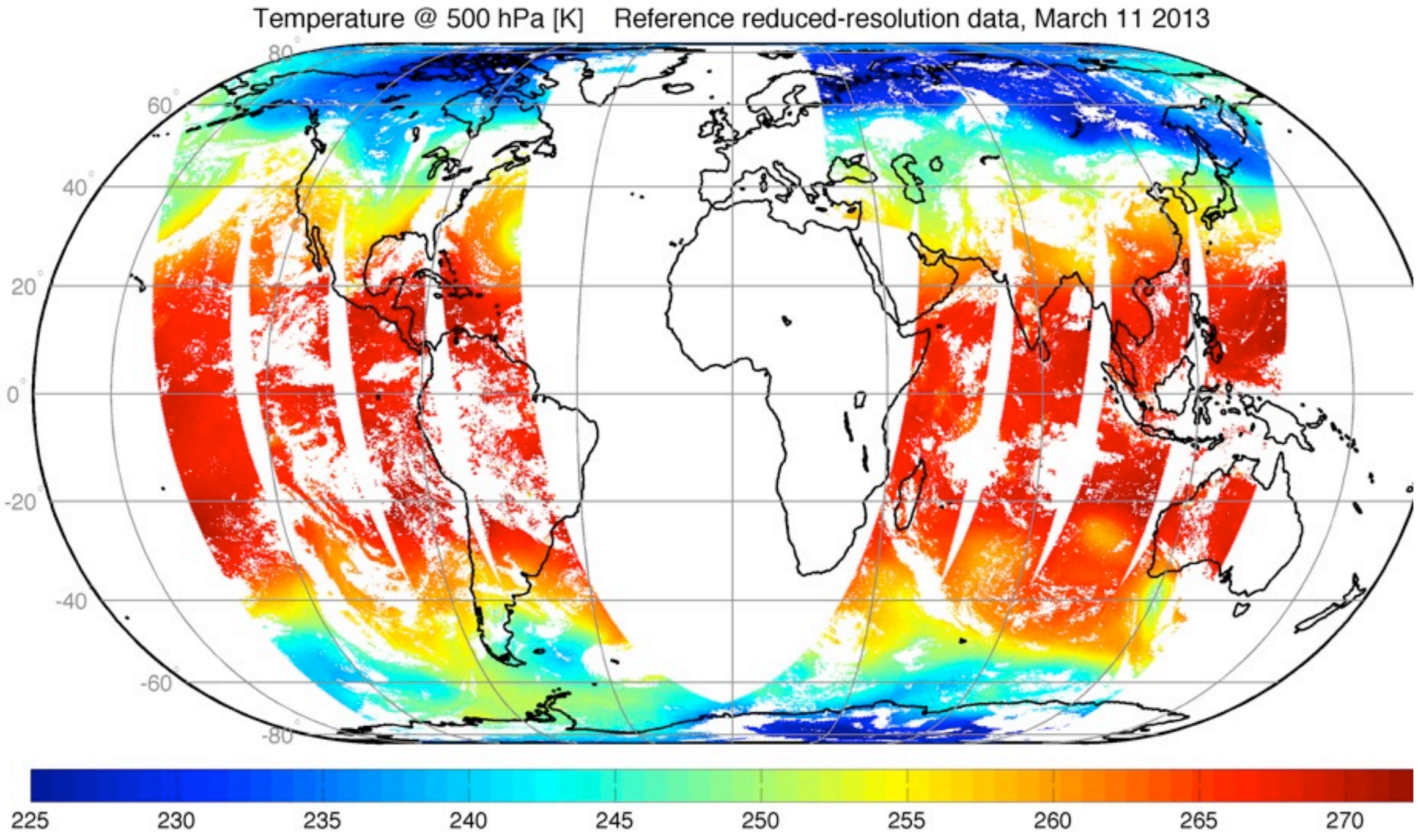
Retrieved Temperature @ 300 hPa

Truncated full-res data, March 12



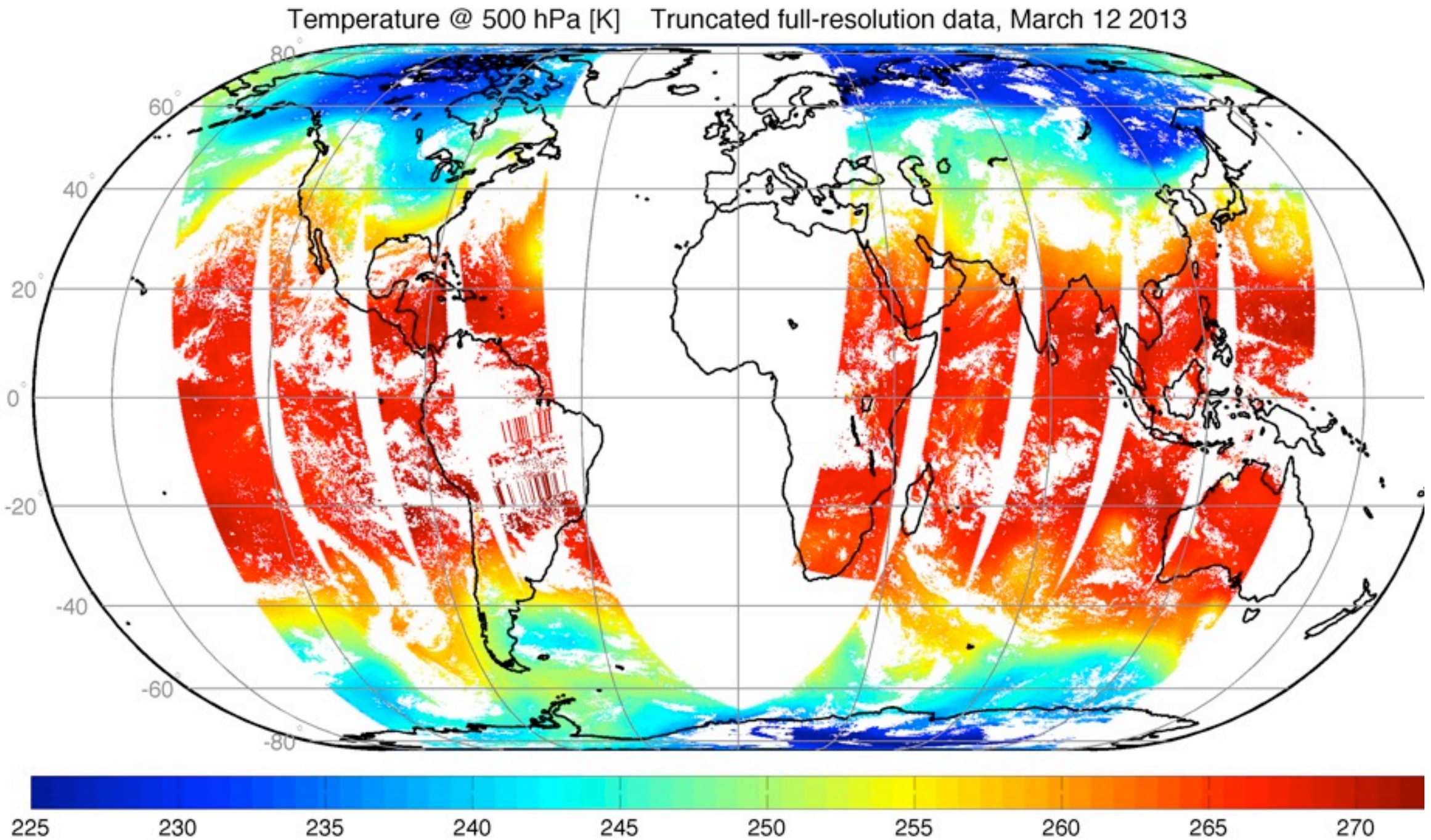
Retrieved Temperature @ 500 hPa

Reference data, March 11



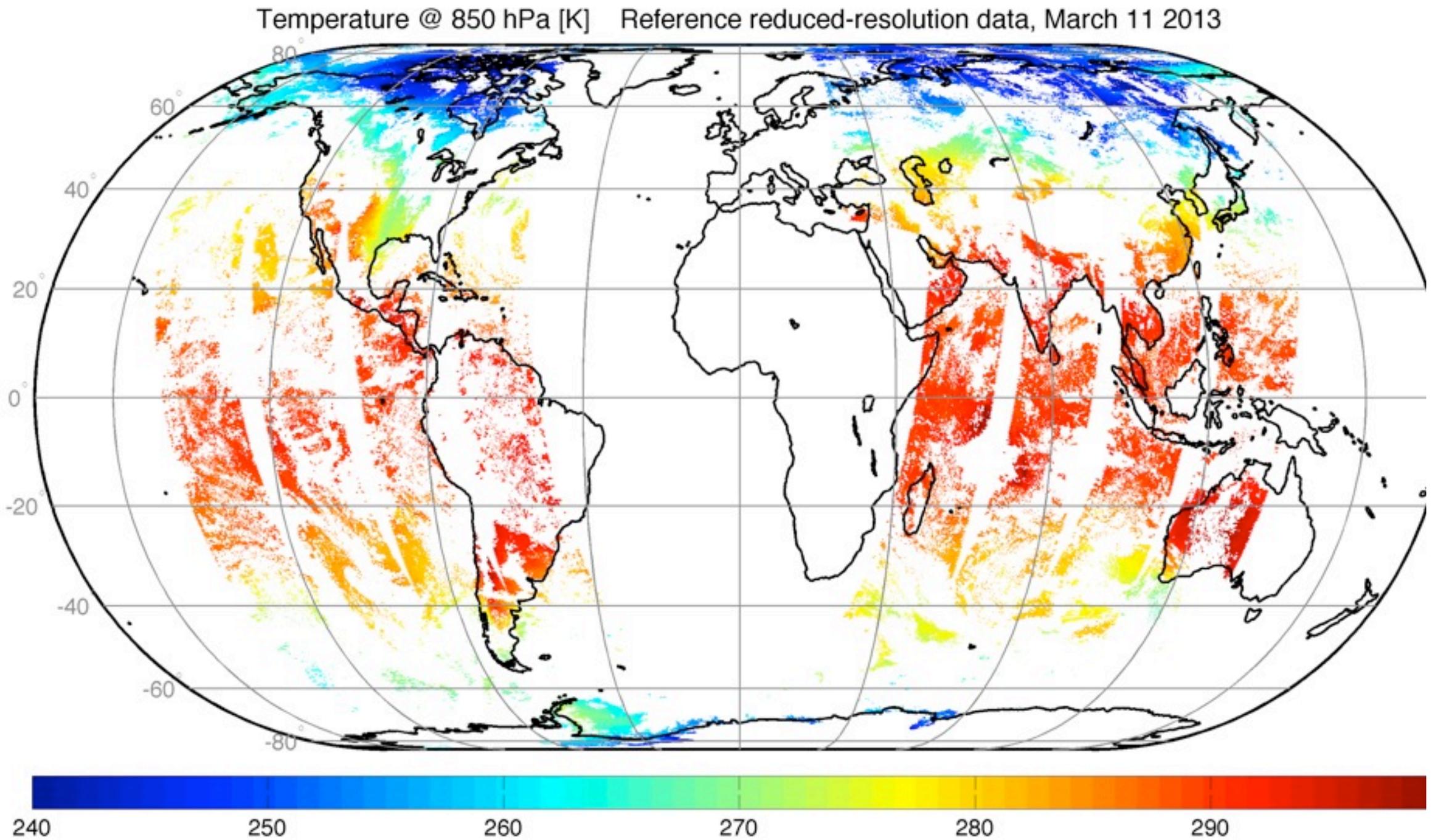
Retrieved Temperature @ 500 hPa

Truncated full-res data, March 12



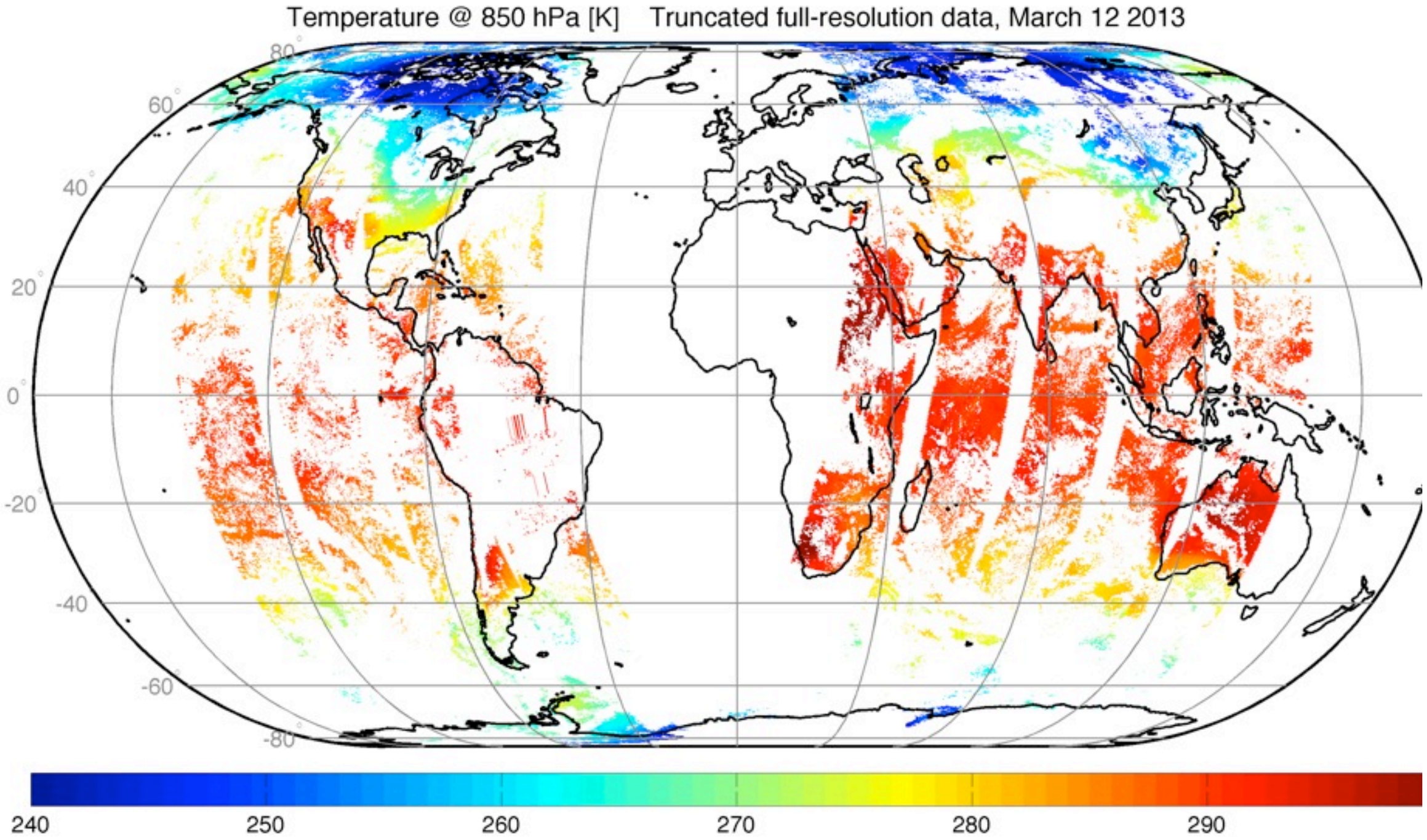
Retrieved Temperature @ 850 hPa

Reference data, March 11



Retrieved Temperature @ 850 hPa

Truncated full-res data, March 12



Analysis results

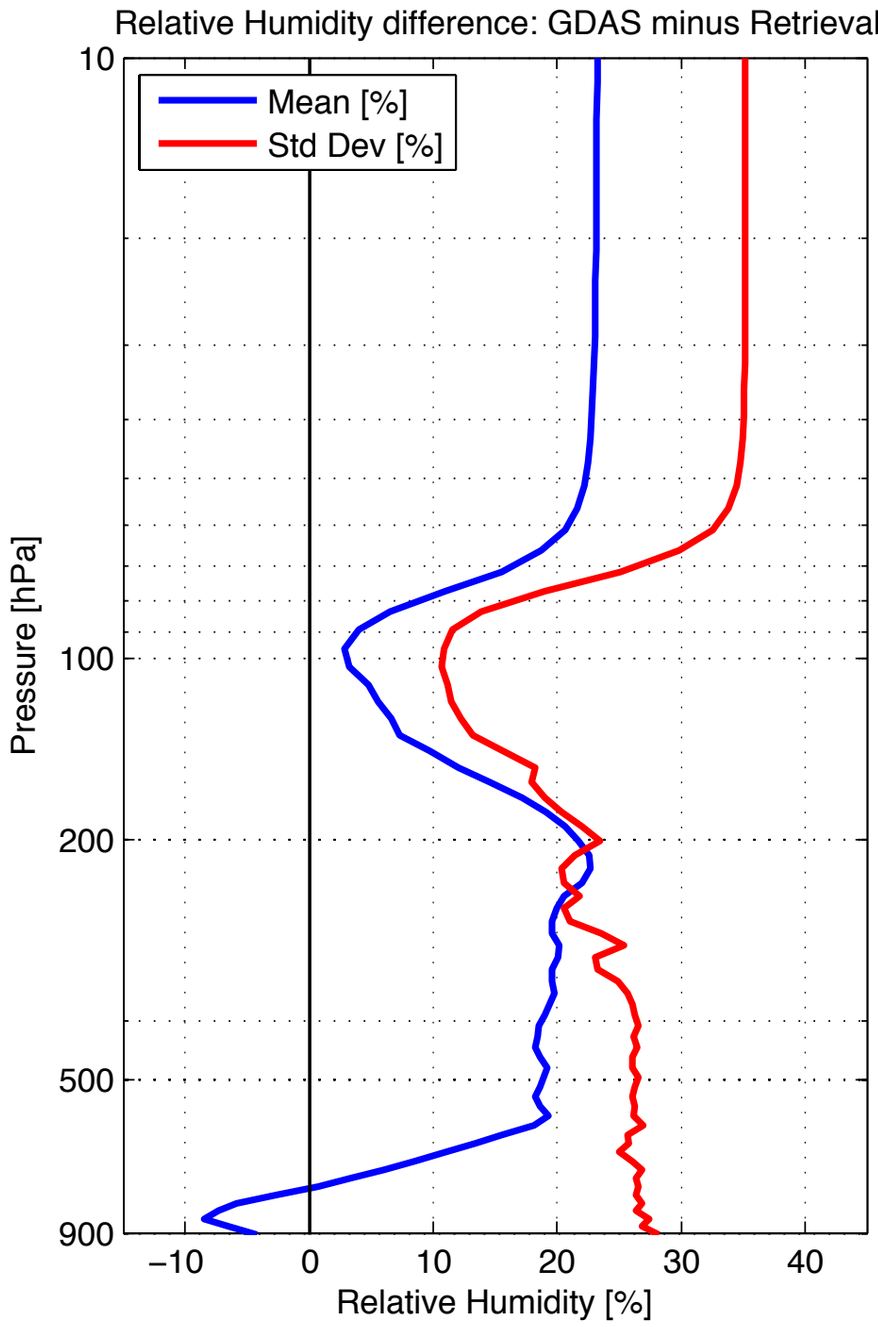
- For both reference and full-res datasets, differences between retrieved parameters and GDAS (“quality) are reasonable

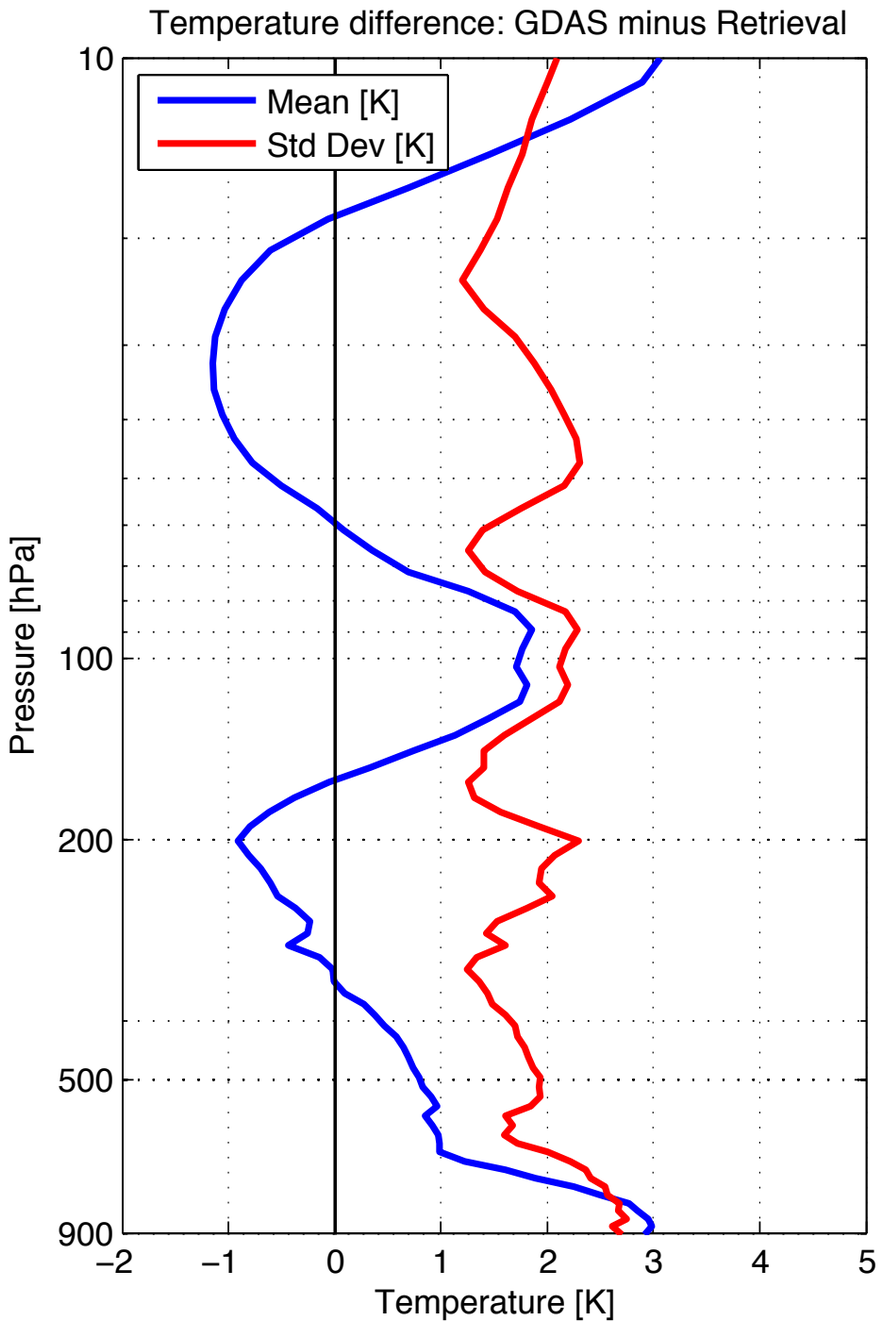
- Mean difference profiles for the two datasets are similar

- Differences between the profiles for the two datasets are reasonable for data from two different days

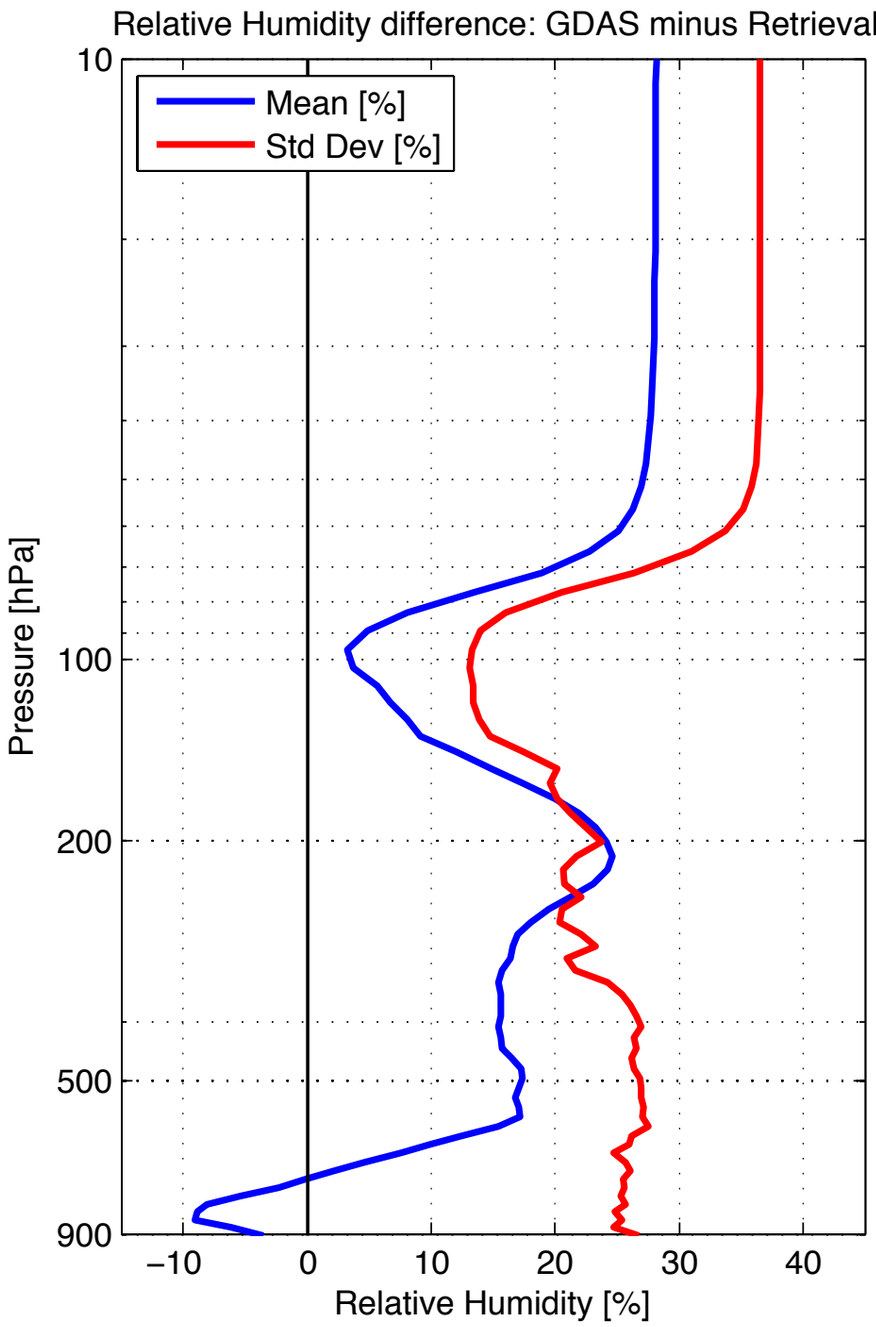
- No indication that SDRs will be adversely affected by the truncation algorithm in CSPP after switch to full-res

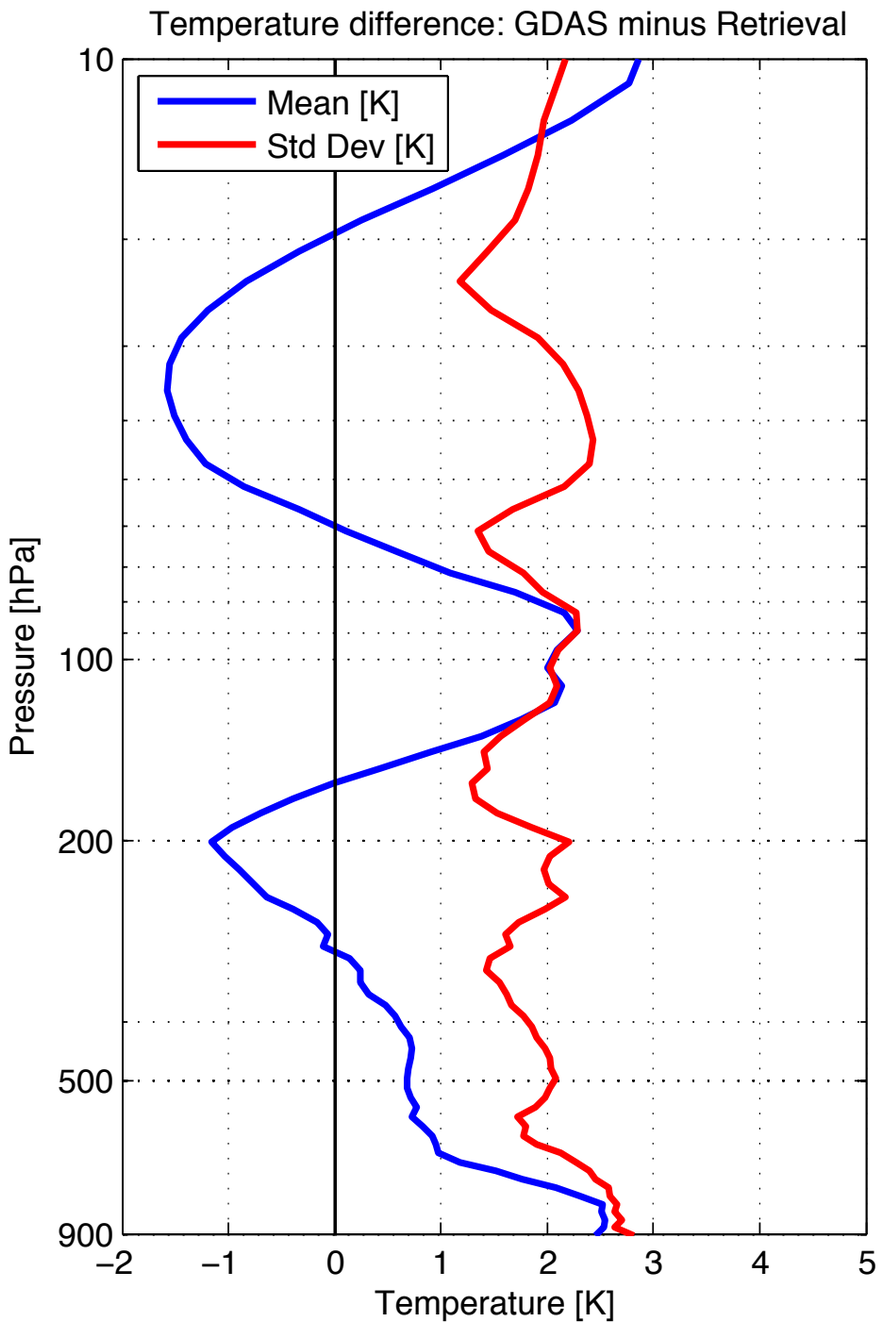
Mean difference profiles, Reference case





Mean difference profiles, Truncated full-res case



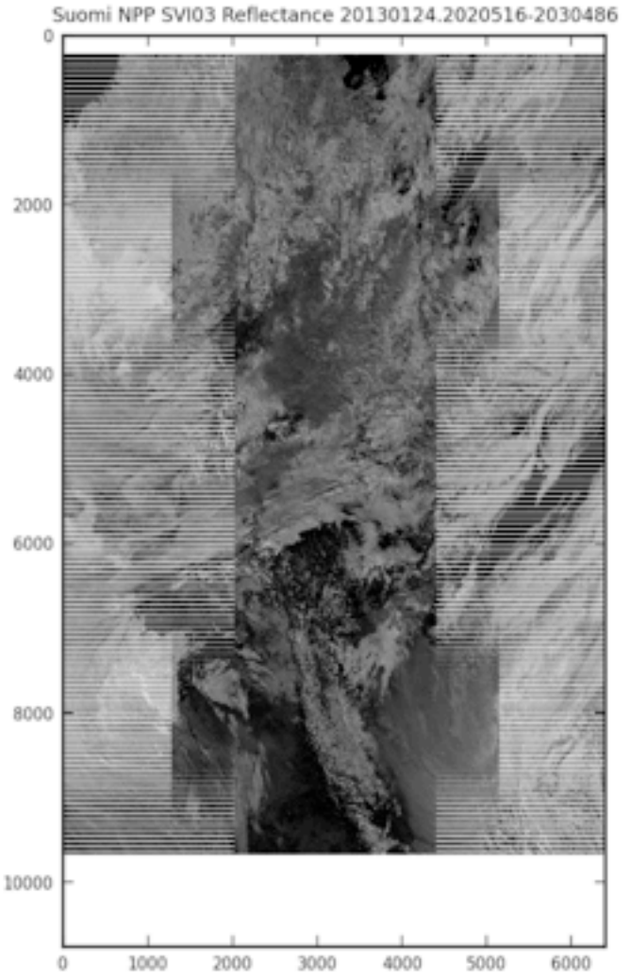


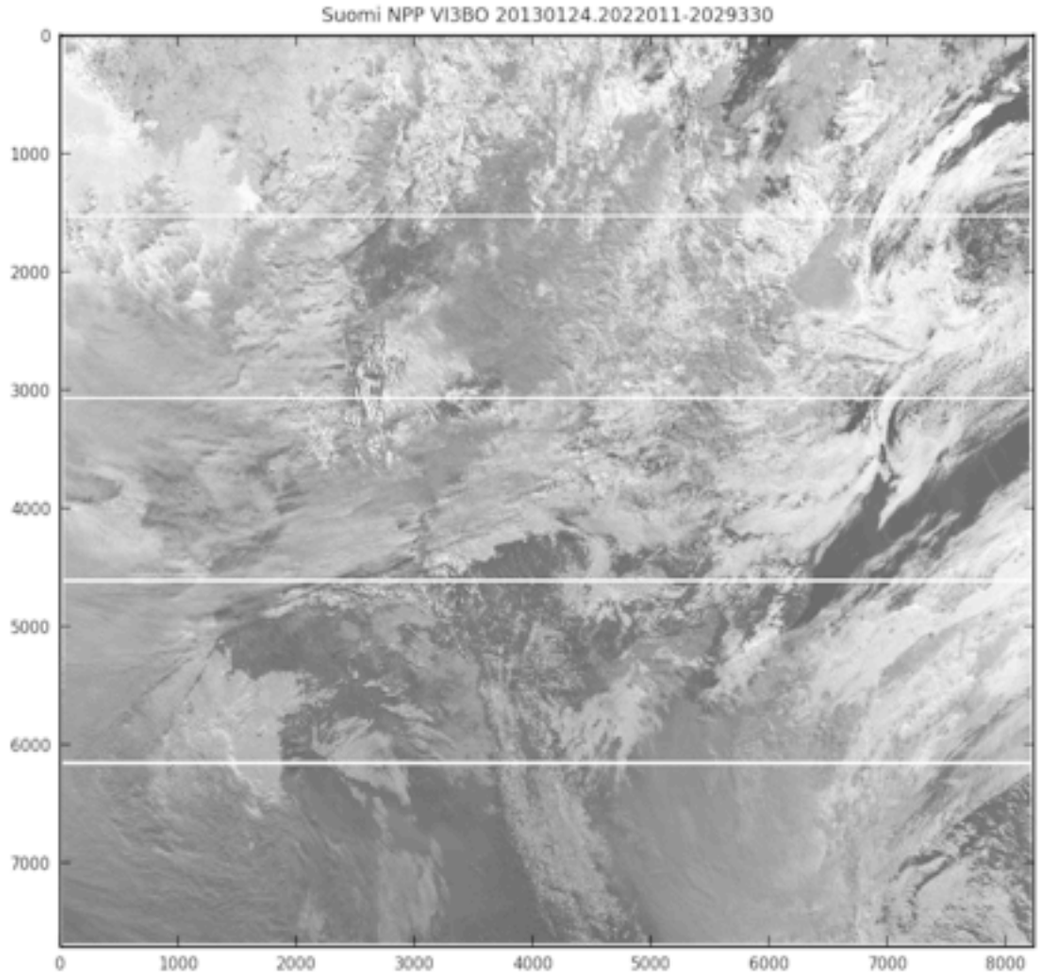
CrIS SDR Future plans

- Update to Mx7 baseline
- Generate full-resolution SDRs
- Real-time monitoring and automated verification vs operational data
- Multi-processing?
  - benefits are limited due to CMO processing

ATMS SDR Status

- algorithm mostly unchanged since first release
- periodic config/LUT updates
- verifies well with IDPS
- striping correction would be nice to have
- newer ADL may allow separating VRDR generation from SDR generation to insert a correction

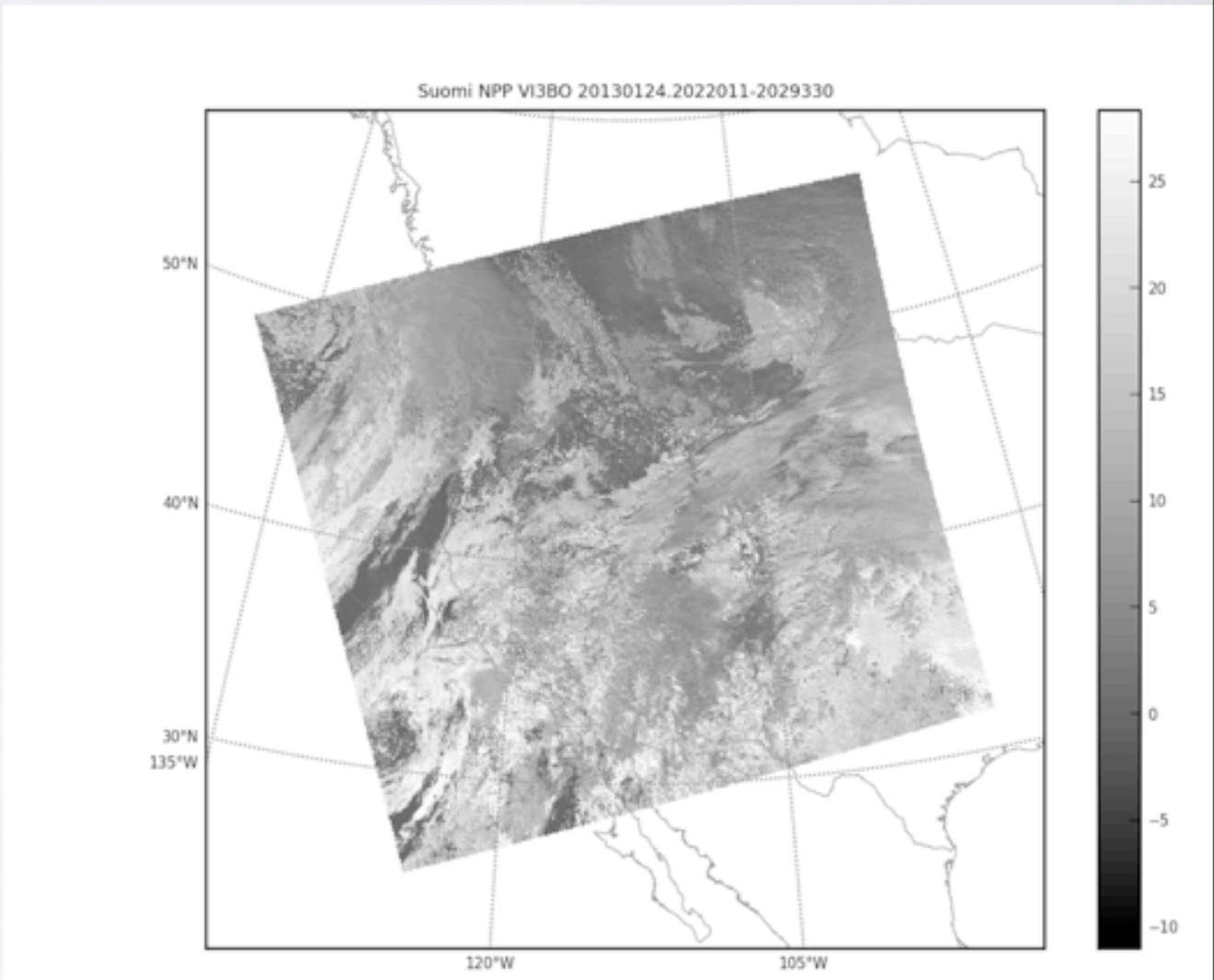




VIIRS Imagery EDR for CSPP Ground-Track Mercator Products

What it is

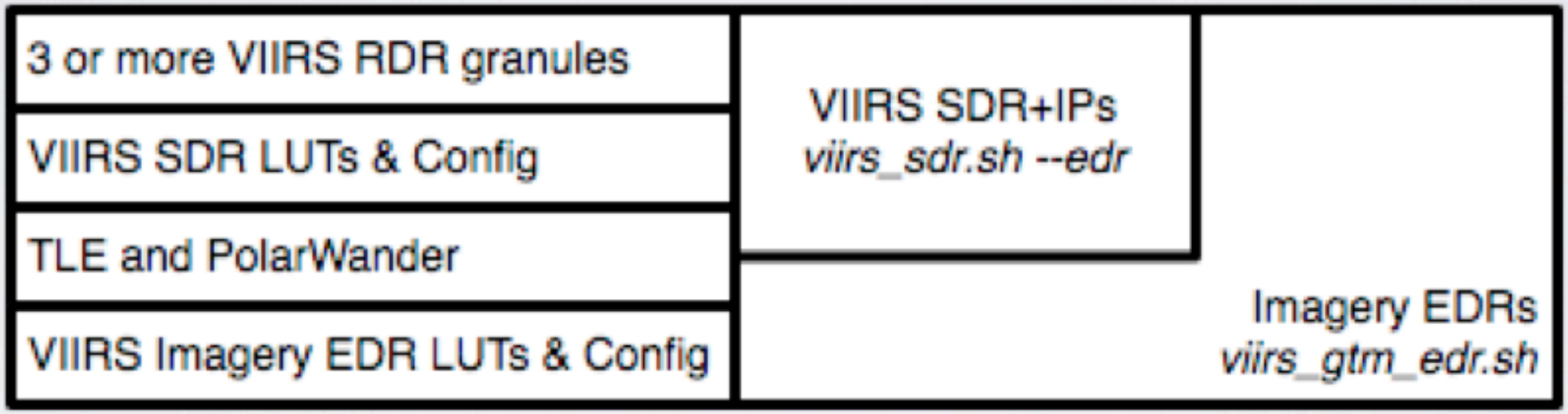
- Eliminates bow-tie effect from SDR to provide imagery
- Works on SVI, SVM, SVDNB
- Near-constant contrast (NCC) imagery for day-night band (DNB)



Input requirements

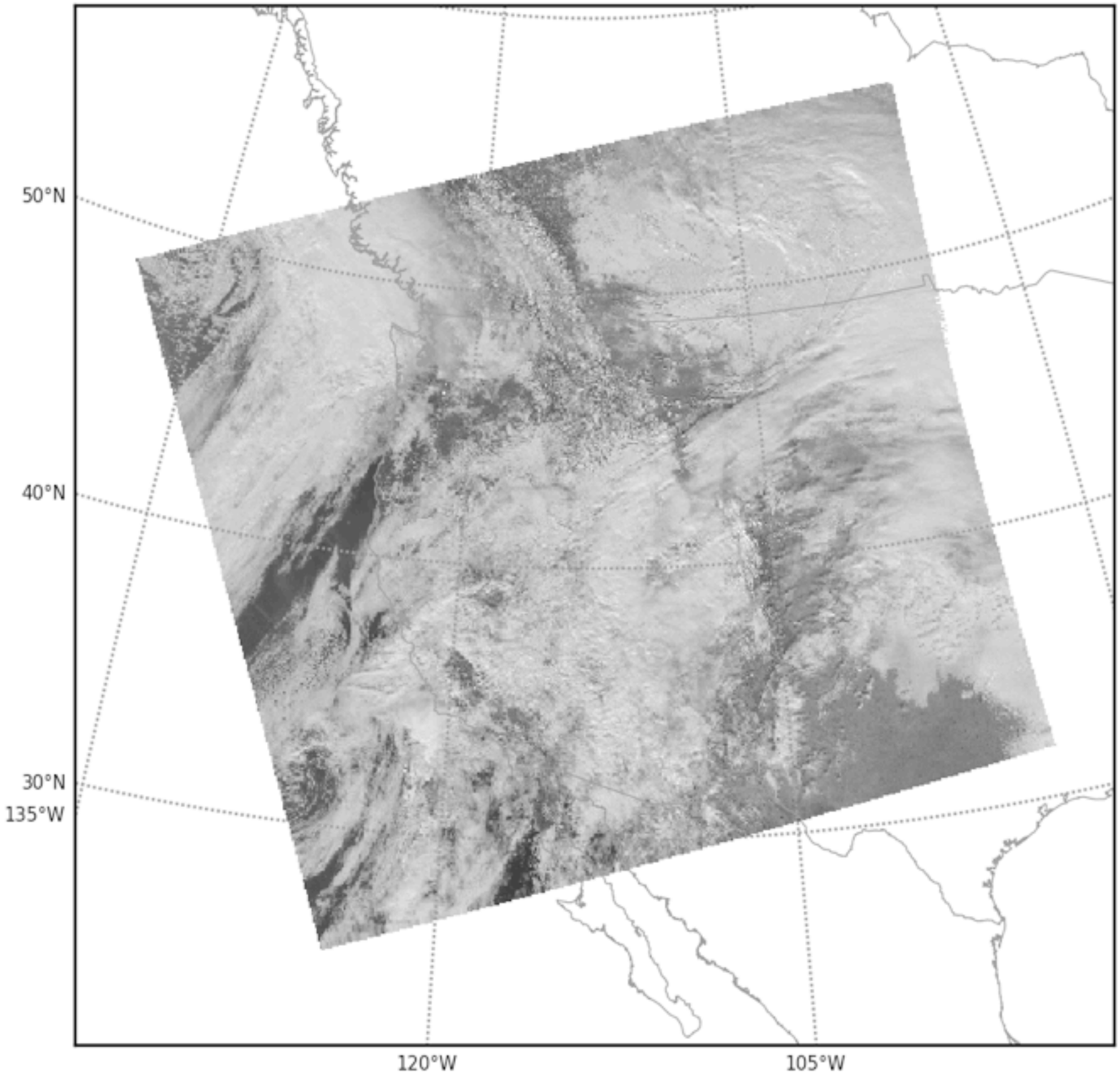
- 3 or more contiguous SDR granules (+/- 1 cross-granule)
- VIIRS SDR run in --edr mode to obtain GRC, FSDR IPs
  - Directory of intermediate "blob+asc" output files
- CSPP automation obtains TLE, Polar Wander for you
- At least 6 gigabytes of RAM per parallel core

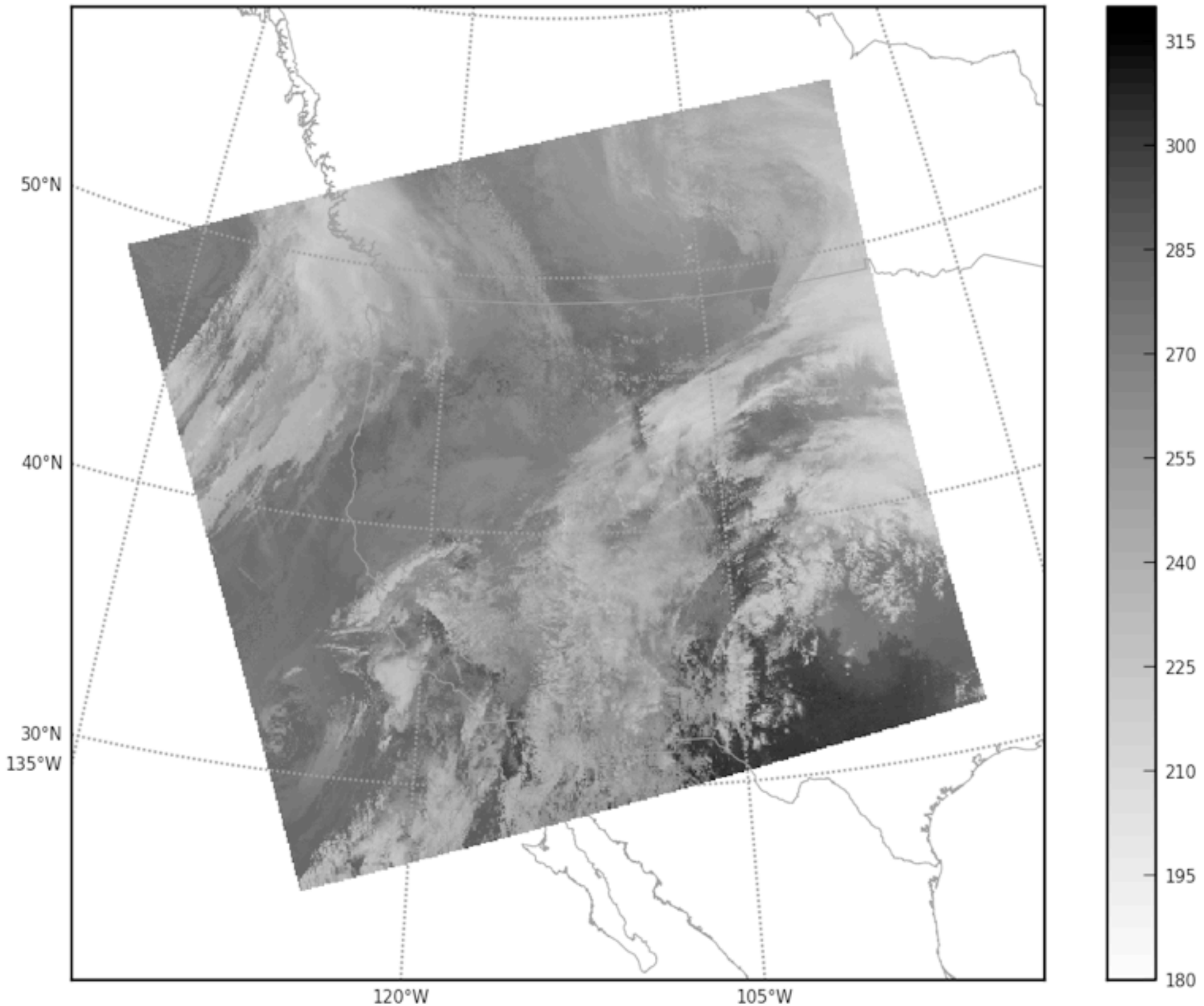
RECIPE



viirs_gtm_edr.sh /path/to/sdr/workspace

-p 4 : 4 parallel processes at a time
-z : run hdf5 compression on each granule


Suomi NPP VNCCO 20130124.2022011-2029330
50°N
40°N
30°N
135°W
120°W
105°W


Suomi NPP VI5BO 20130124.2022011-2029330
50°N
40°N
30°N
135°W
120°W
105°W
315
300
285
270
255
240
225
210
195
180

What's next and when

- Full verification vs IDPS: May/June
- AWIPS2 NetCDF4: June
- Live multiprocessing as SDR granules appear: June/July
- Eliminate cross-granule dependency eventually?

- Thanks to all of the CSPP users!

- Any requests for features or changes in SDR software? Please contact us.

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