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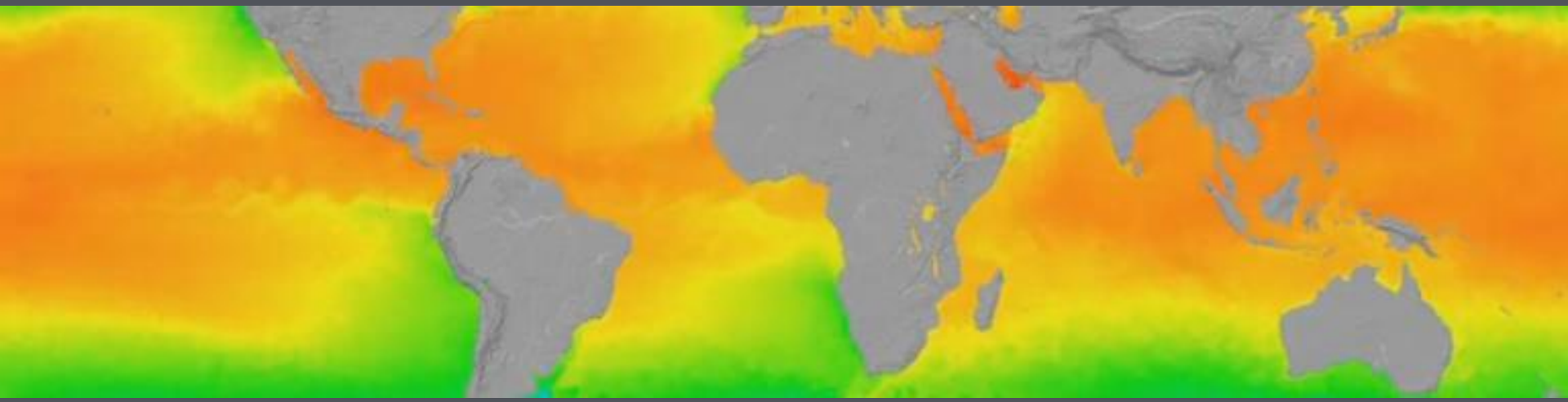
Surftemp Satellite Remote Sensing Group

University of Reading

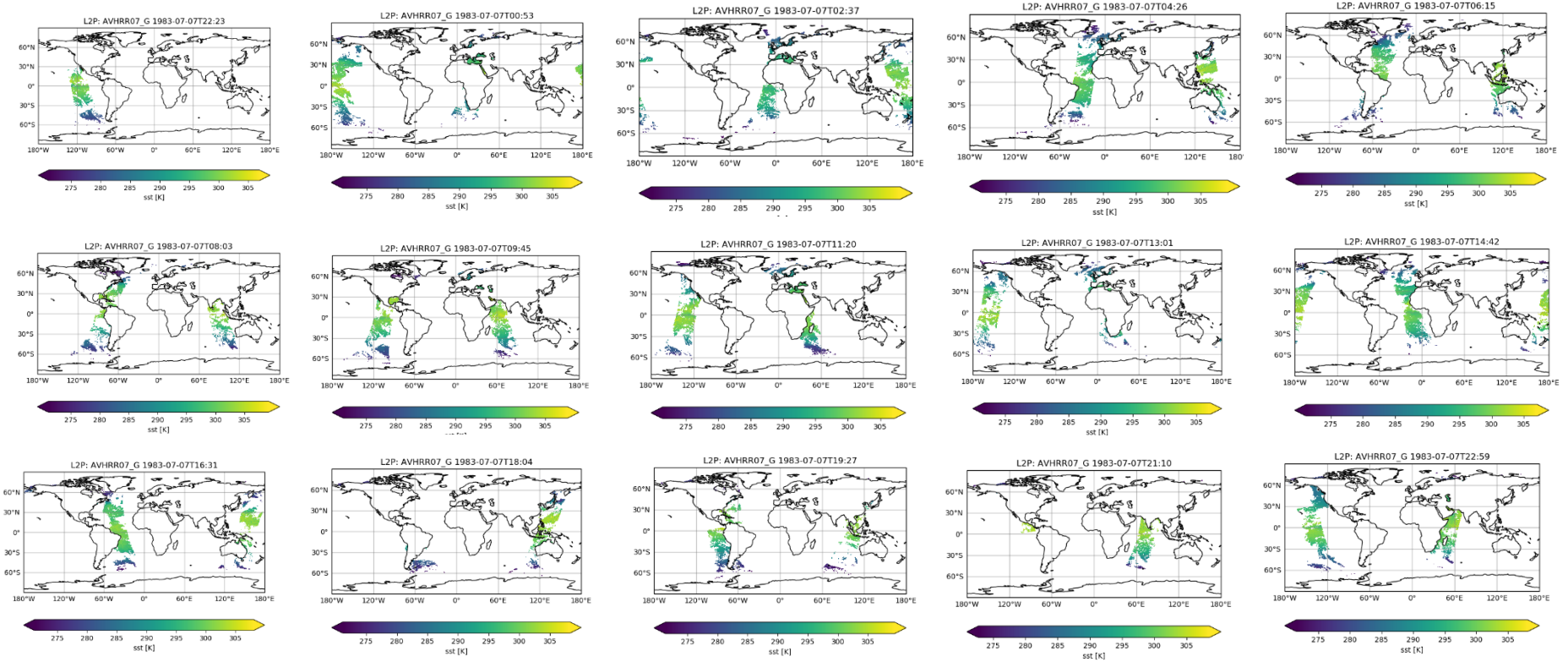
SST OBSERVATION DENSITY



Thoughts on how to present big data

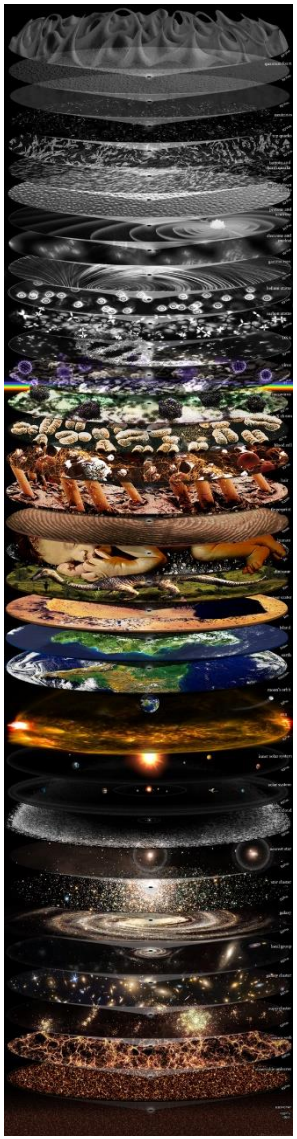
ORBITAL COVERAGE

- Our v2.0 SST CDR archive has 37.75 years of SST measurements from 17 sensors (AVHRR, AATSR, ATRS1, ATSR2)



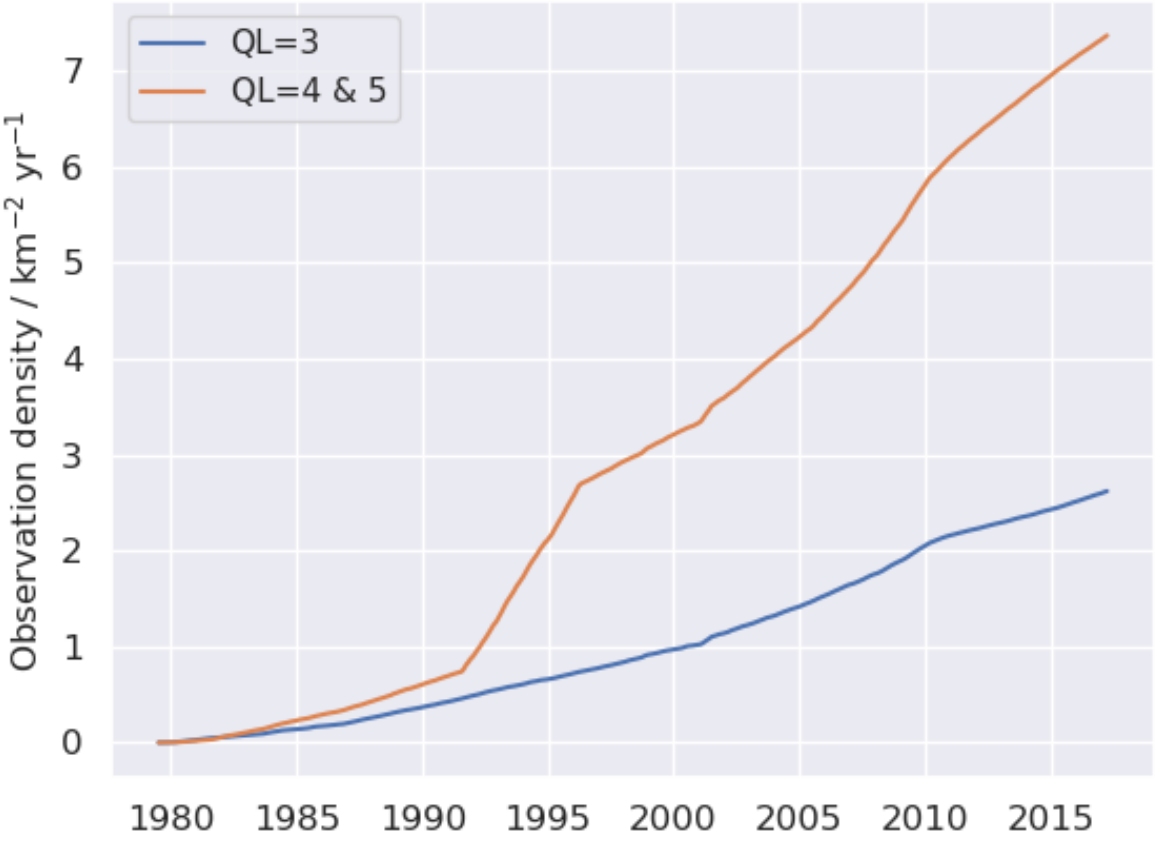
POWERS OF TEN

- At QL=3: we have 35,788,601,741 or 0.035×10^{12} (0.035T) SSTs
- At QL=4+5: we have 100,650,320,862 or 0.1×10^{12} (0.1T) SSTs
- For comparison:
  - neurons in the human brain ~ $1 \pm 0.2 \times 10^{11}$ *(Suzana Herculano-Houzel, 2009, "The human brain in numbers: a linearly scaled-up primate brain". Front. Hum. Neurosci. 3: 31)*
  - stars in the Milky Way ~ 1×10^{11} *(Elizabeth Howell, 21 May 2014, "How Many Stars Are in the Milky Way?", Wayback Machine, space.com)*
  - galaxies in the observable universe ~ 2×10^{12} *(Morgan Hollis, 13 October 2016, "A universe of two trillion galaxies", Royal Astronomical Society)*
  - trees on Earth ~ 3.04×10^{12} *(Jonathan Amos, 3 September 2015, "Earth's trees number is three trillion", BBC)*
  - fish in the ocean ~ 3.5×10^{12}



OBSERVATION DENSITY

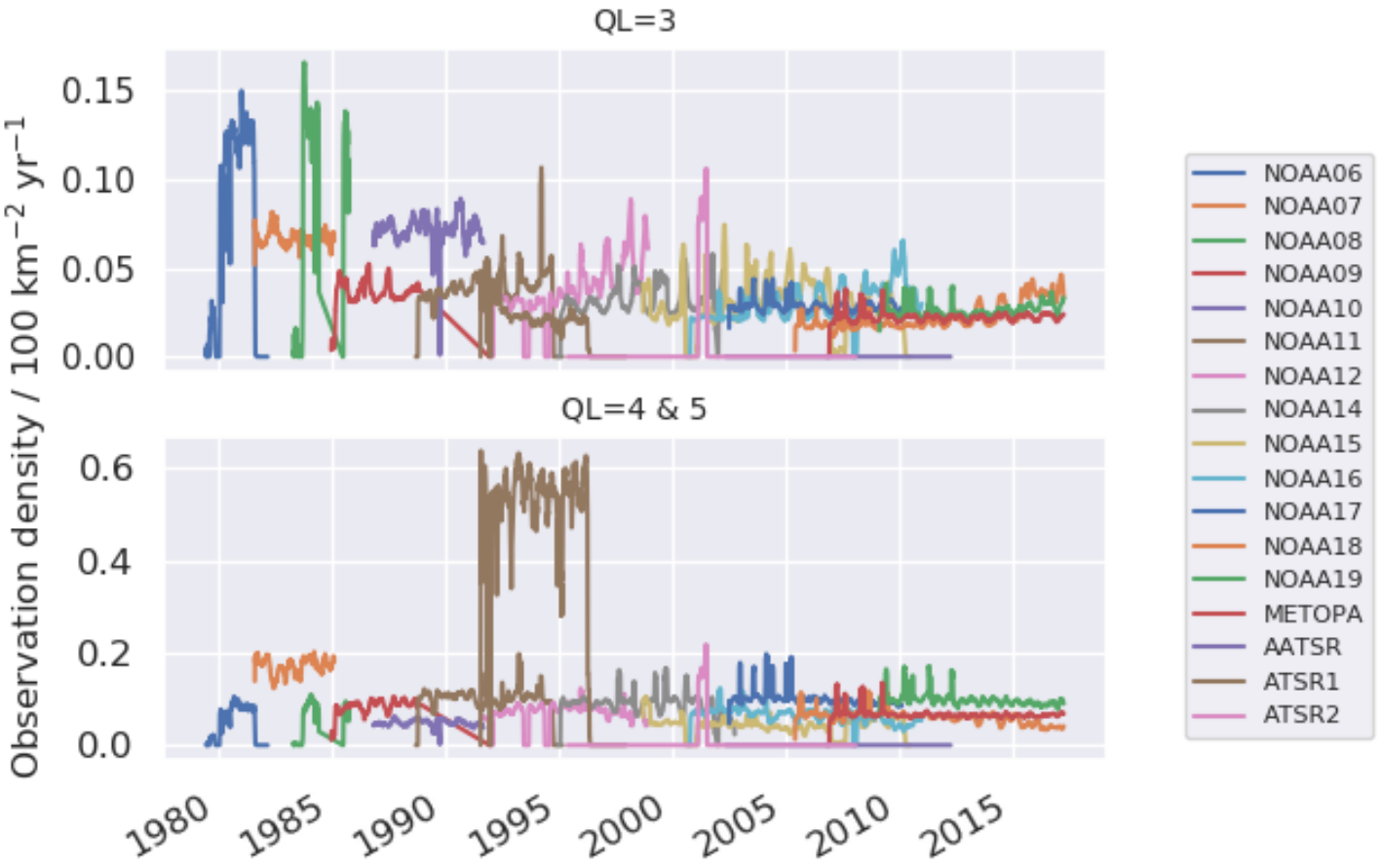
- We're after a single number – how many SST measurements do we have per unit area per year? We use units of km^{-2} yr^{-1}



- The global peak is at 300±1K
- There is a long tail from 270-290K
- The maximum is at 304K

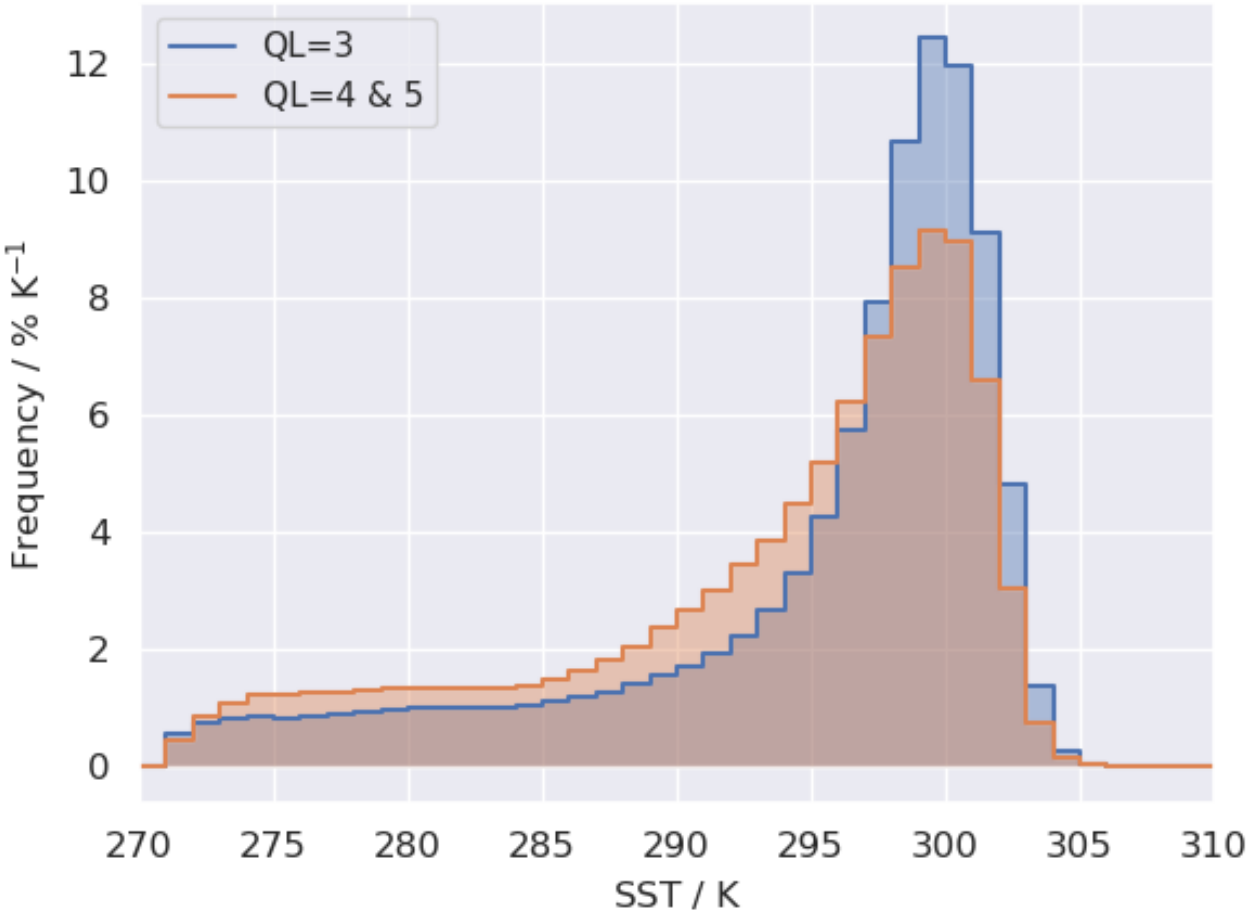
OBSERVATION DENSITY

- For individual sensors it makes more sense to use units of 100 km^{-2} yr^{-1}



HISTOGRAMS

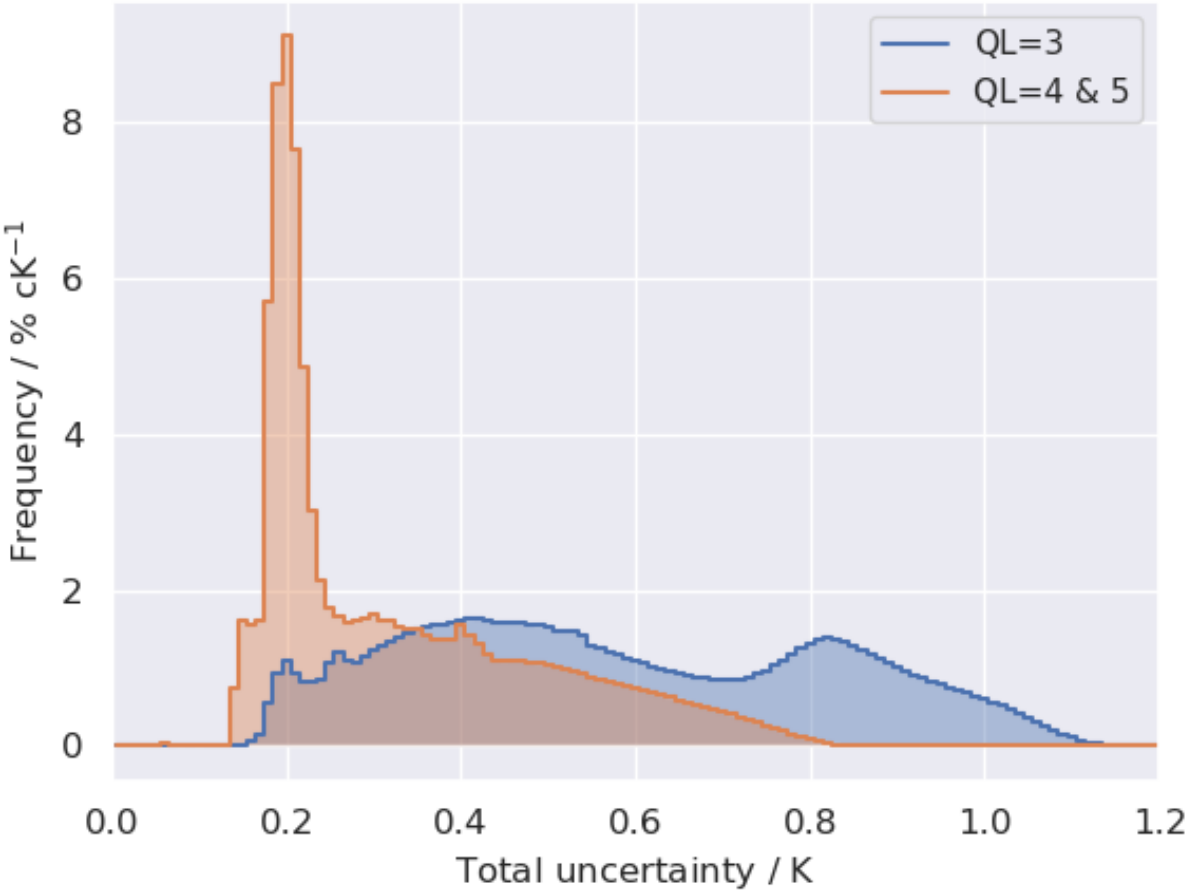
- Binning the SSTs [270,310 step=1K]:



- The global peak is at 300±1K
- There is a long tail from 270-290K
- The maximum is at 304K

HISTOGRAMS

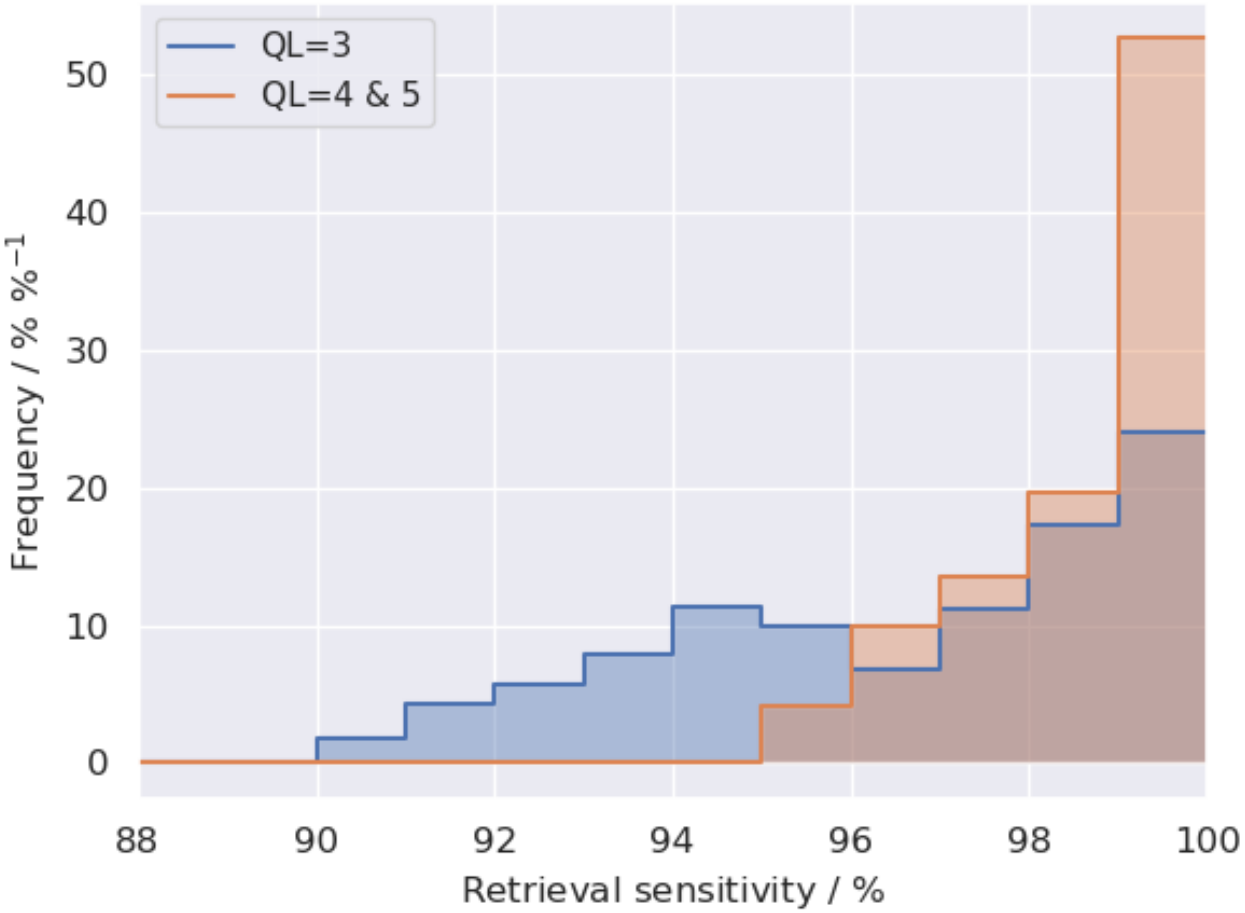
- Binning the total uncertainty [0,4 step=0.01K]:



- At QL=3, there are 2 broad peaks ~ 0.4±0.2K and 0.8±0.2K
- At QL=4&5, there is a narrow peak at 0.2±0.04K
- ~1.2K is an approximate upper limit

HISTOGRAMS

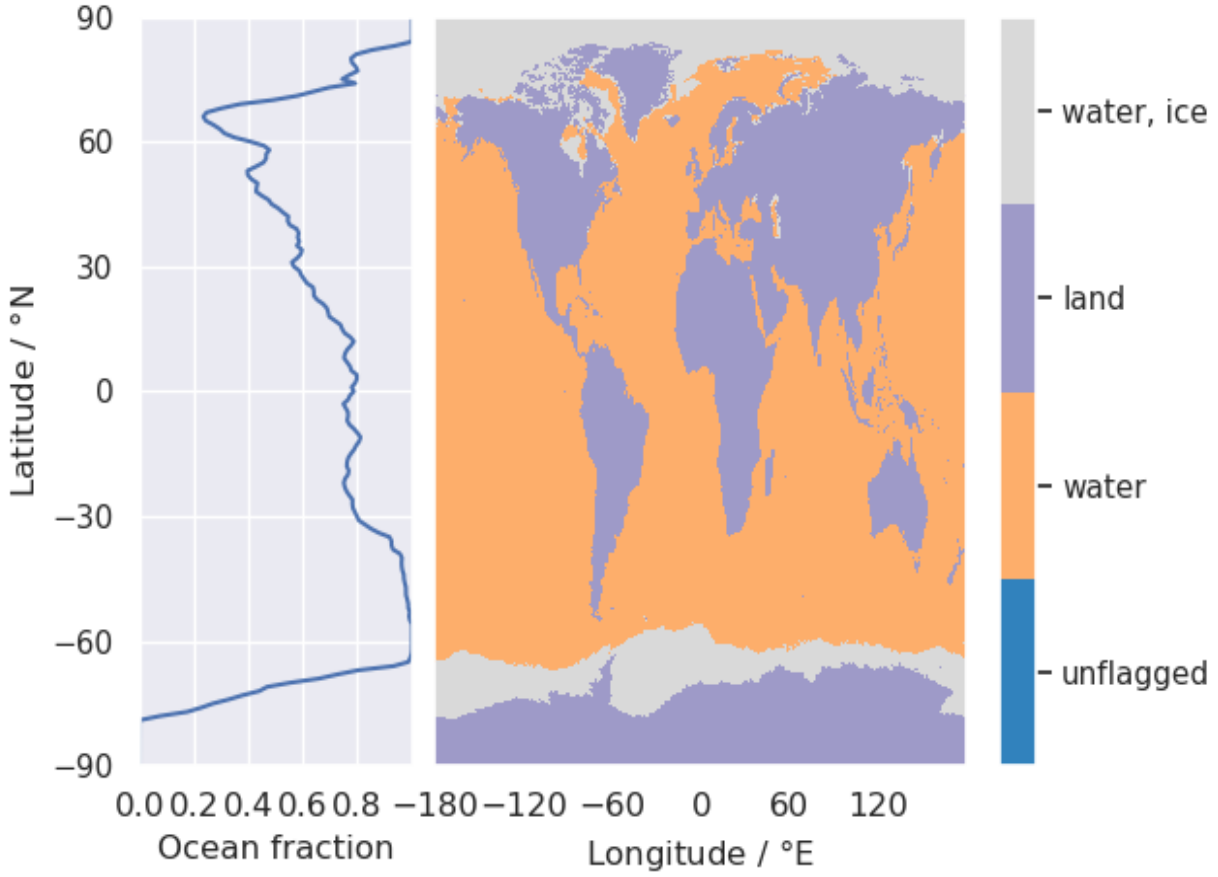
- Binning the retrieval sensitivity [0,100 step=1%]:



- At QL=3, there are 2 broad peaks ~ 95% and 100% > 90%
- At QL=4&5, there is a single peak at 100% > 95%
- Note the units

LATITUDINAL VARIATION

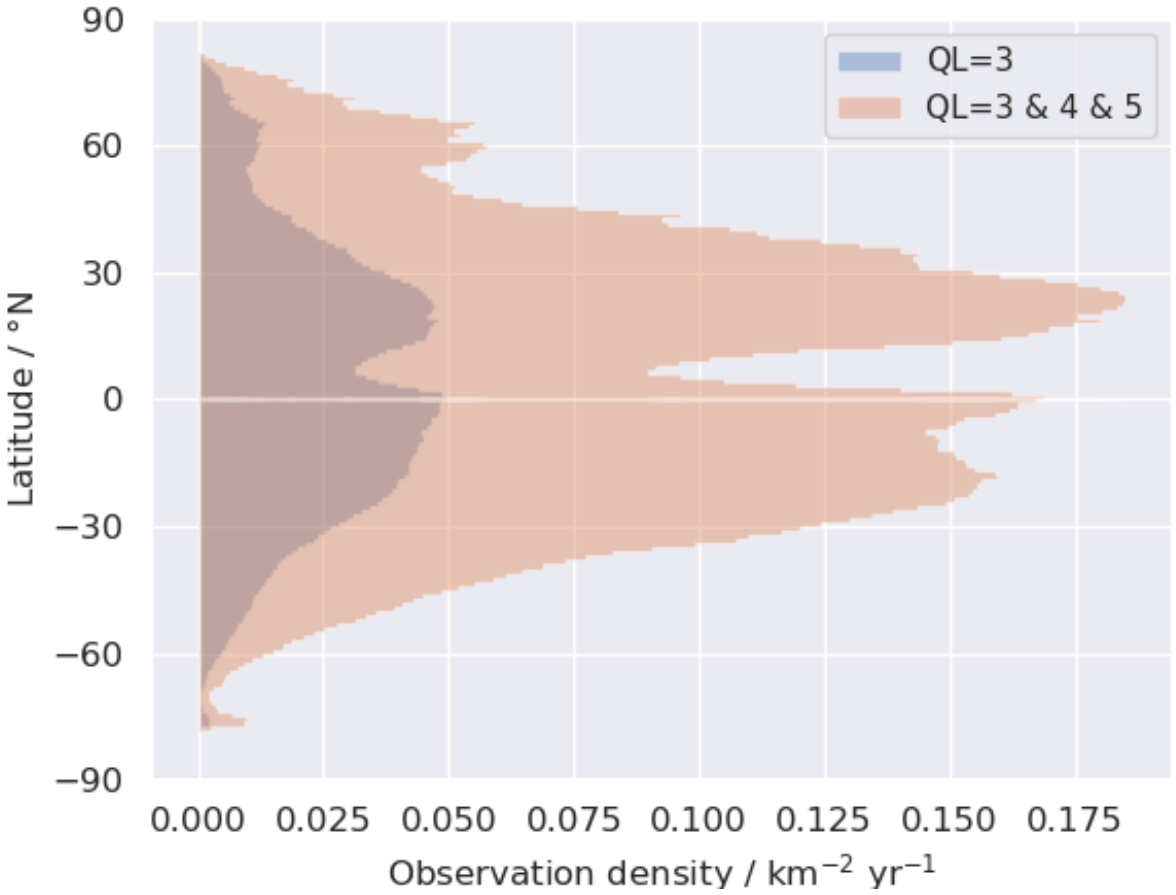
- Ocean fraction binned in 1 degree latitudinal bands



- Obtained from OSTIA L4
- Re-gridded from 0.025 to 1 degree

LATITUDINAL VARIATION

- Ocean fraction binned in 1 degree latitudinal bands



➢Dip at 5 °N likely to be due to clouds and/or aerosol

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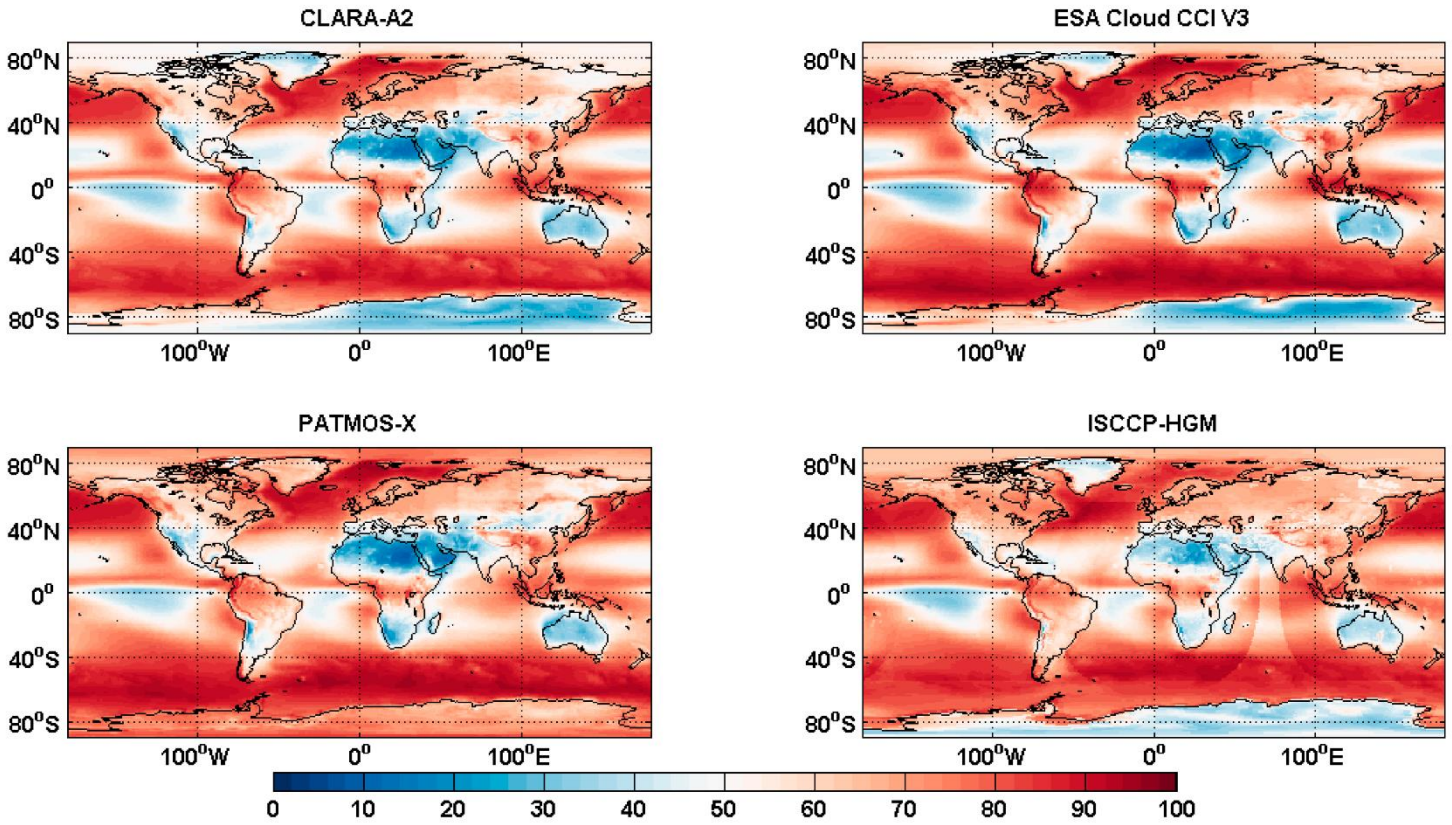
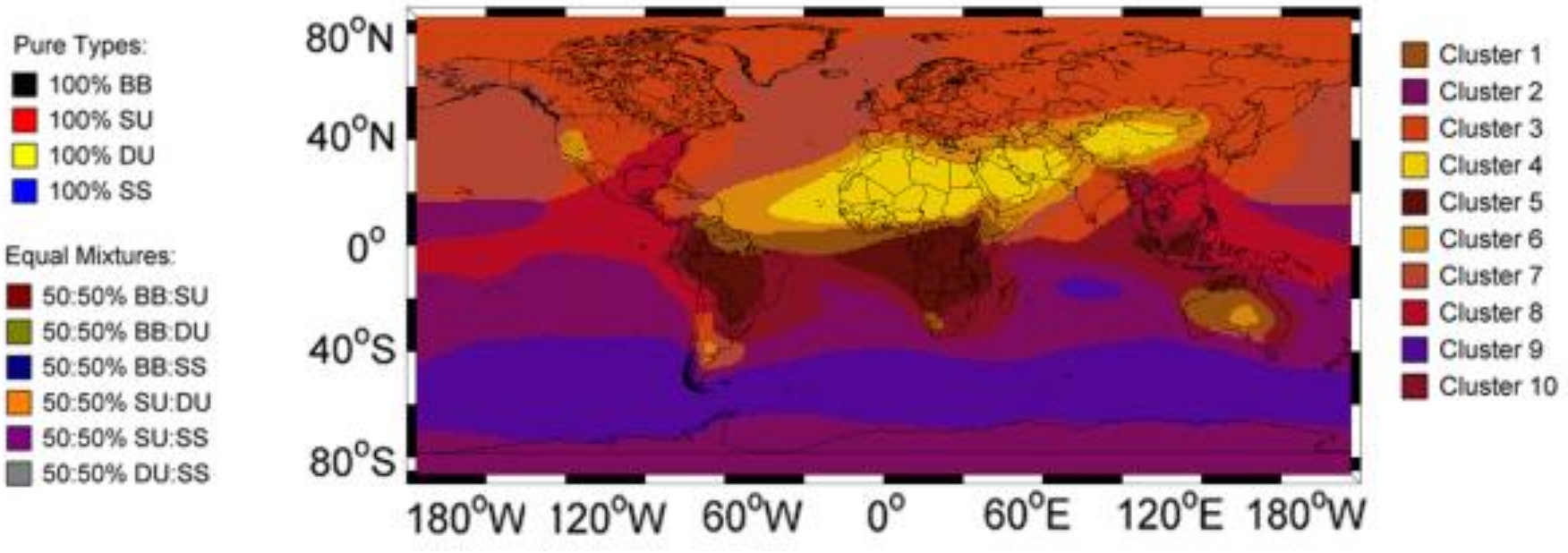
EQUATORIAL CLOUD



Karlsson, K. G., & Devasthale, A. (2018). Inter-Comparison and Evaluation of the Four Longest Satellite-Derived Cloud Climate Data Records: CLARA-A2, ESA Cloud CCI V3, ISCCP-HGM, and PATMOS-x. Remote Sensing, 10(10), 1567.

EQUATORIAL AEROSOL

- Cluster analysis of GOCART GCM data:



Taylor, M., Kazadzis, S., Amiridis, V., & Kahn, R. A. (2015). Global aerosol mixtures and their multiyear and seasonal characteristics. Atmospheric environment, 116, 112-129.