RADAGAST: measured and calculated divergences over Niamey

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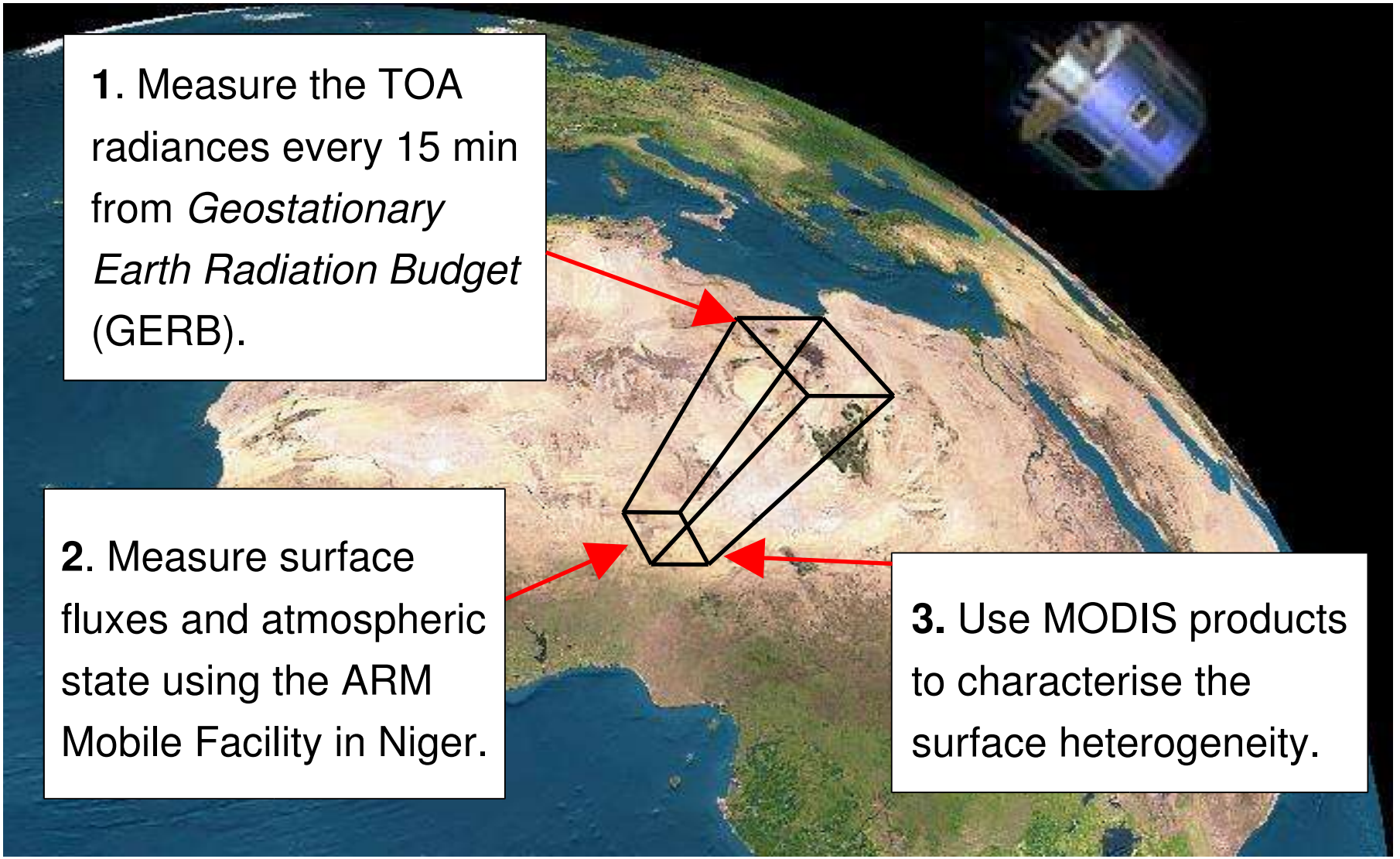
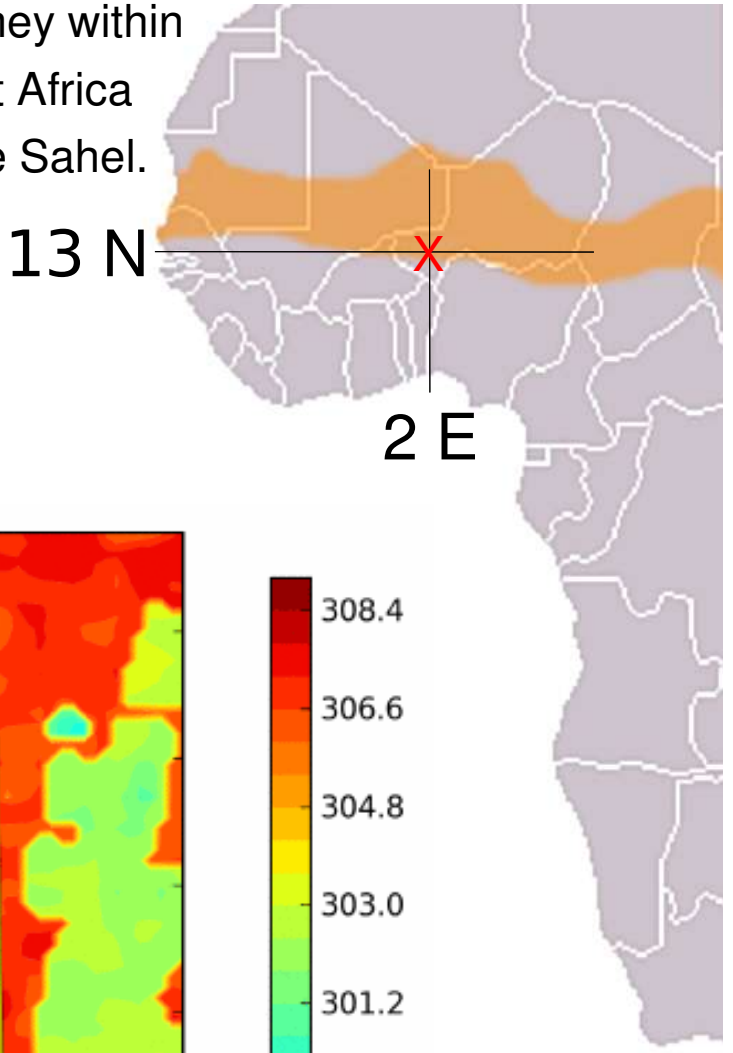
Philosophy

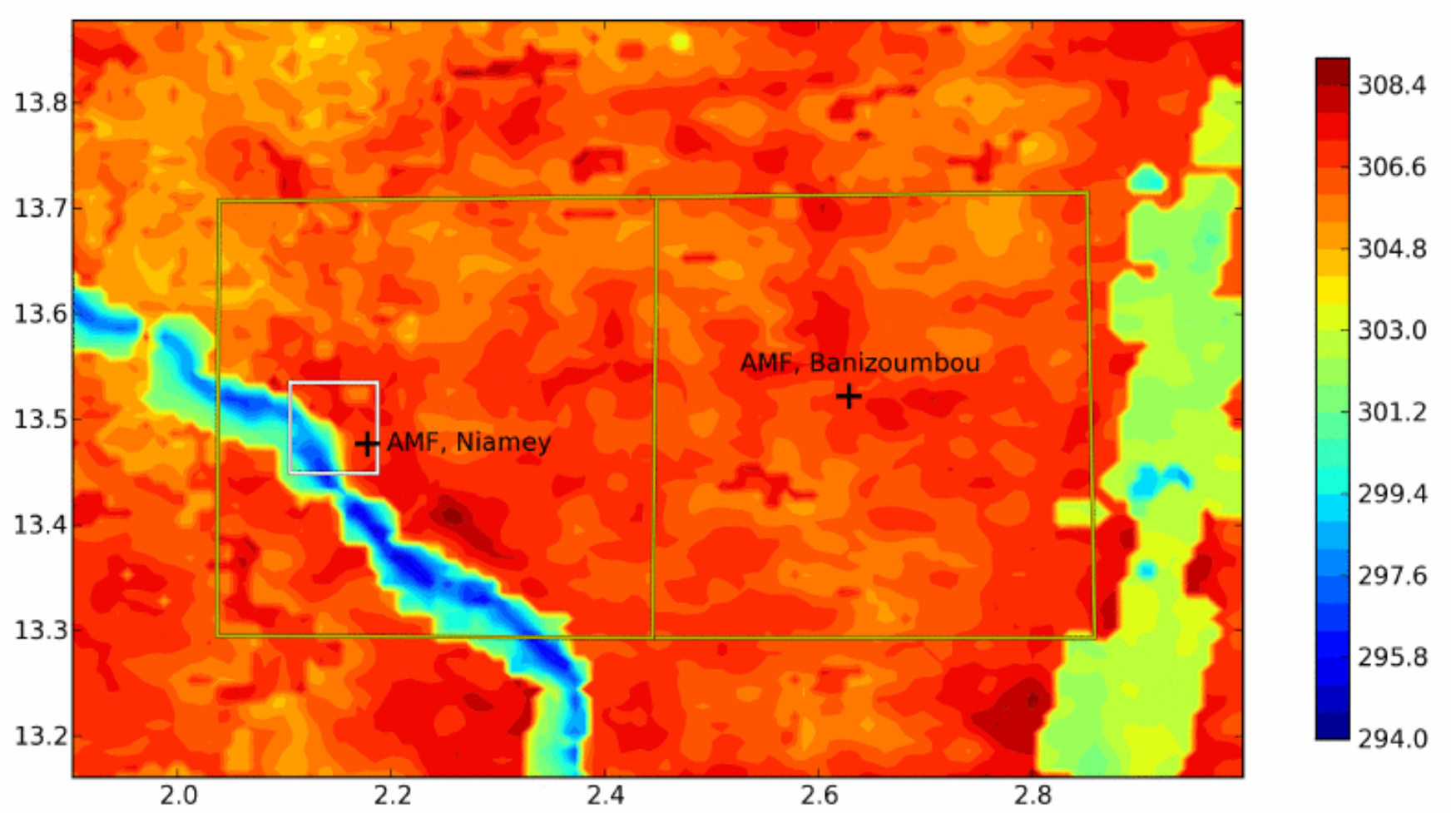


- Edwards-Slingo RT code used to calculate consistent flux components.
- Or, use measurements to calculate divergences (see White et al.)

Methodology

- Deployment of AMF to Niger from 12/2005 to 01/ 2007.
- GERB-2 present aboard Meteosat-8.
- Will concentrate on Nov-Dec 2006.

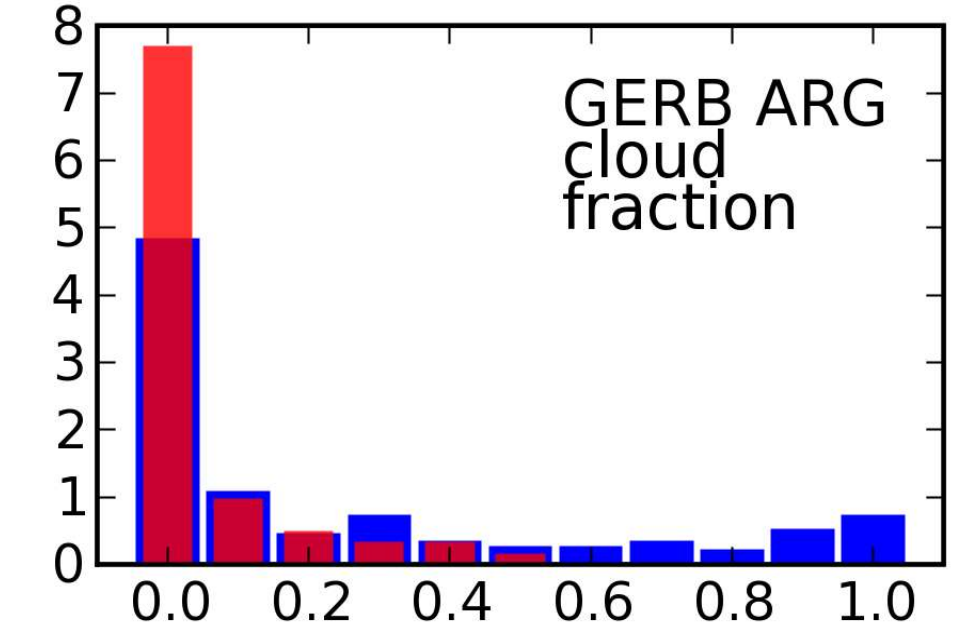


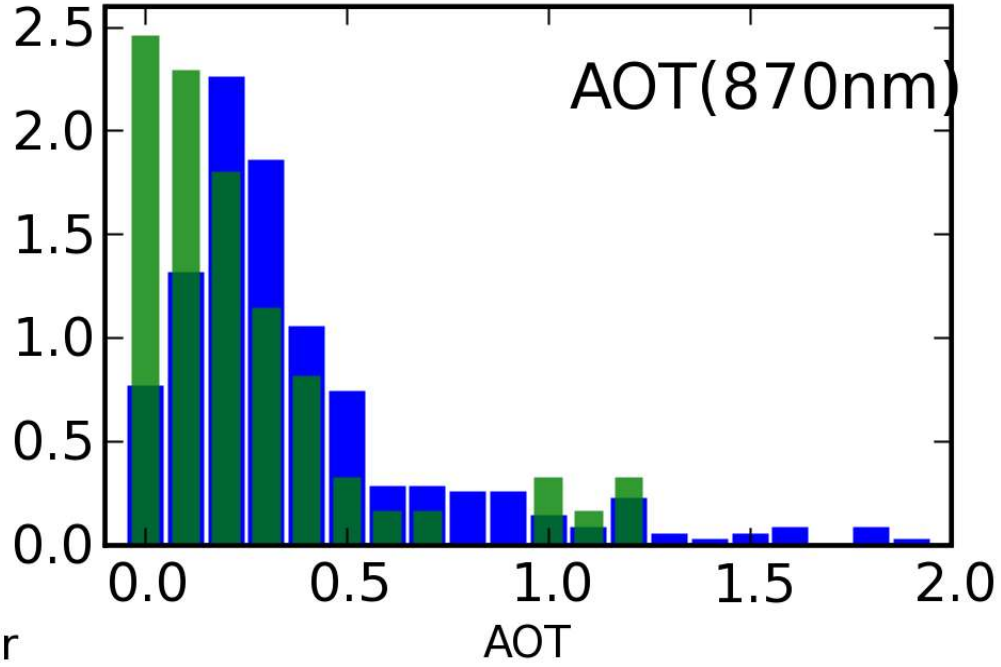


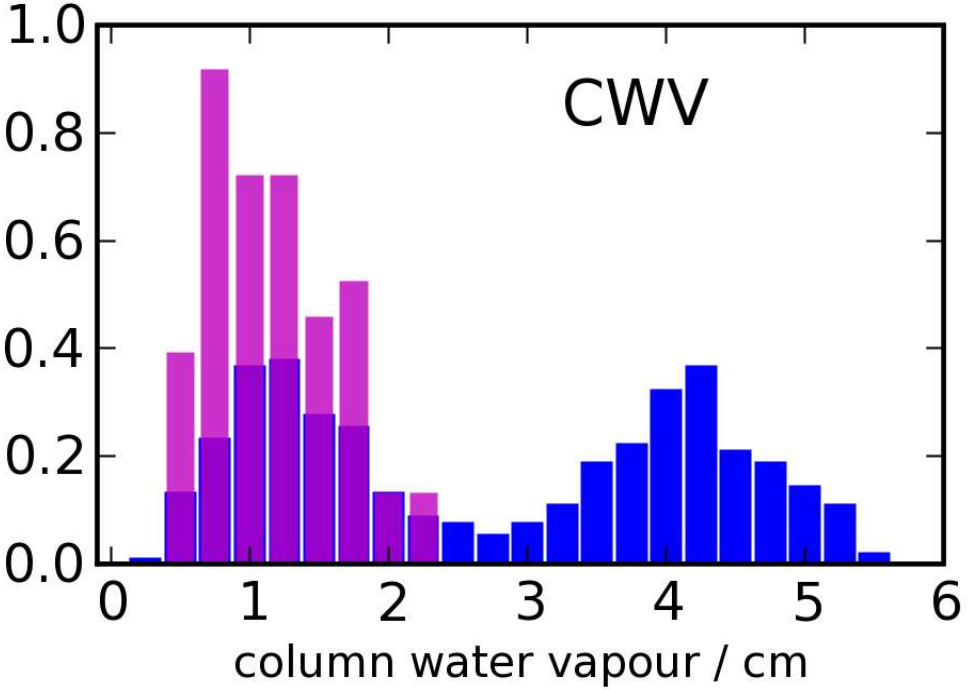
Retrieved LST from MODIS, late 2006 ~12h

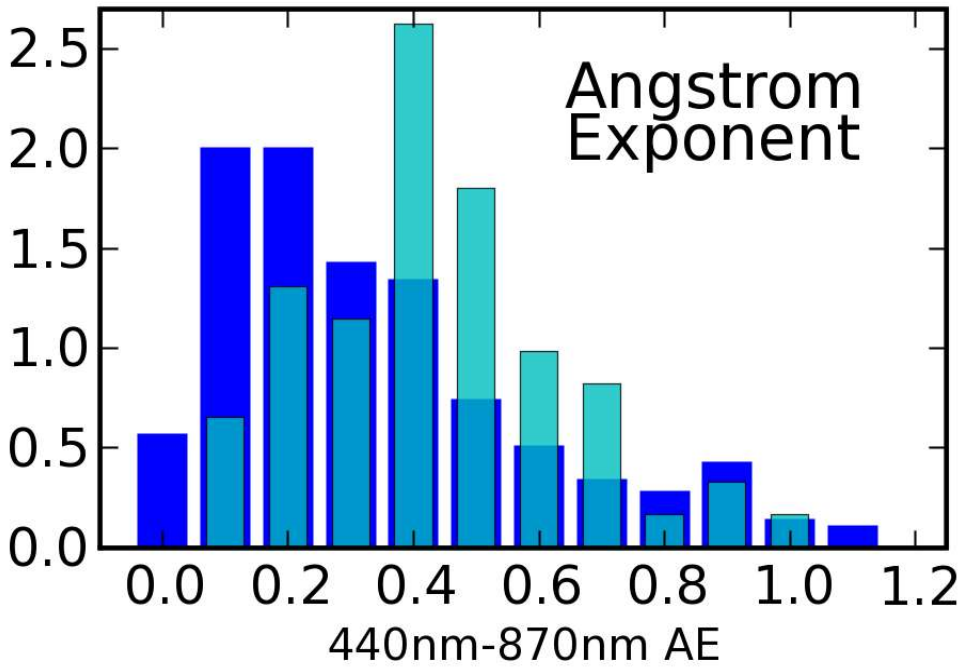
Chronology

Restrict calculations to Nov-Dec because of favourable conditions.









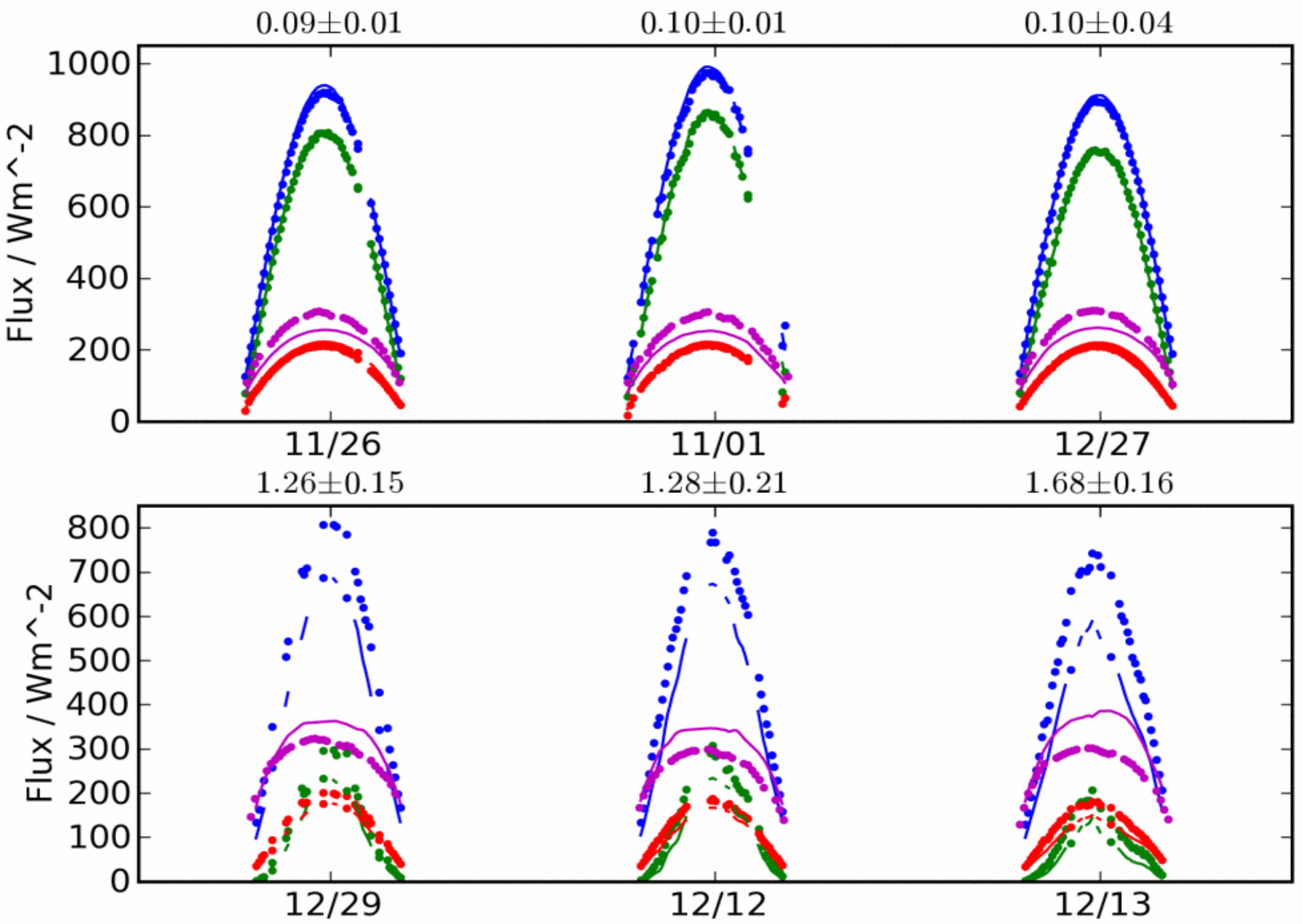
Shortwave calculations overview

- DABEX aerosol properties with 6 spectral bands,
  - Aerosol is 'dust' — ignore AE changes.
  - Fixed vertical distribution, analytic function.
- Scale aerosol MMR from AERONET (Niamey),
  - V2 direct sun, only use 500nm AOT.
- Satellite cloud mask and times of AERONET retrievals; defines cloud-free times,
  - Analogous to joint TOA *and* surface cloud filtering.
- High time resolution via merged profile,
  - c.f. ARM VAP but home-made.
  - Fit of theoretical albedo function to AMF-derived albedo.

- TOA restrictions,
  - Erroneous sun-glint data removal — 'hole' near LST noon.
  - High SZA, ≥80˚, data is removed.
- Issues with MODIS albedo analysis — ignored here.

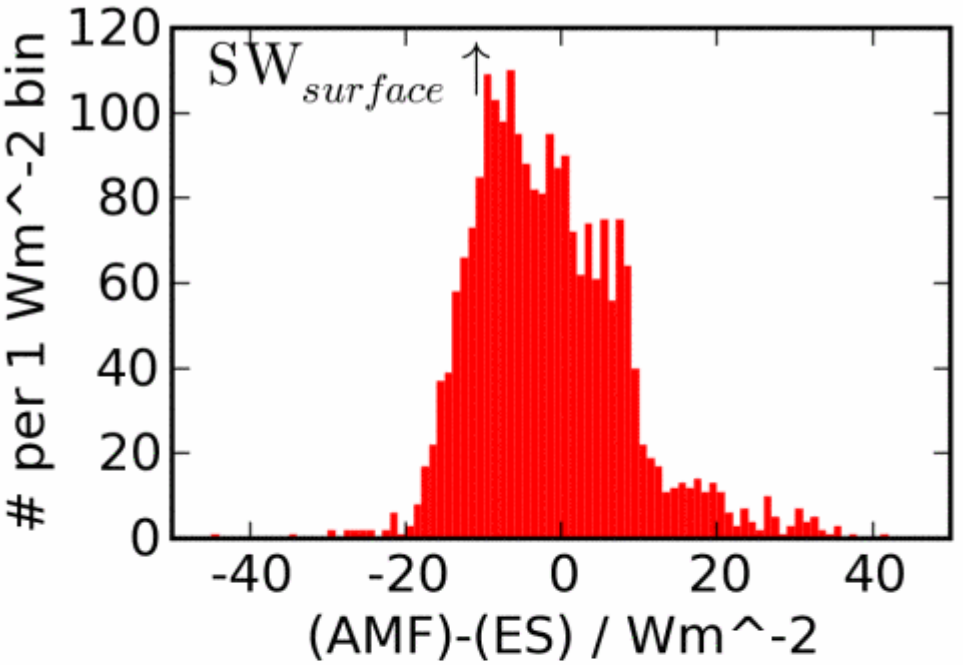
Shortwave calculations examples

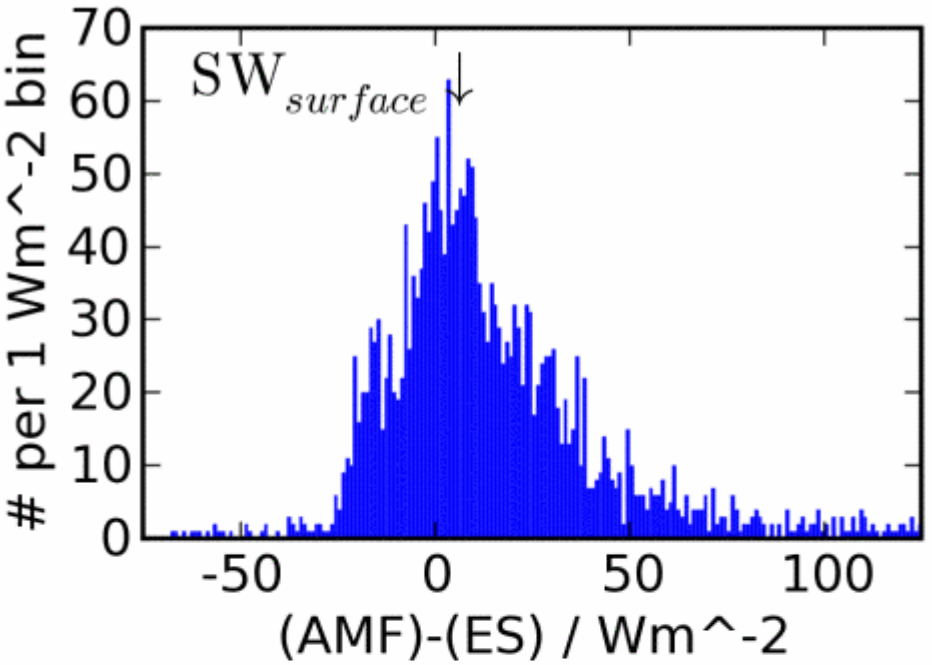
Low & high AOT, 500nm

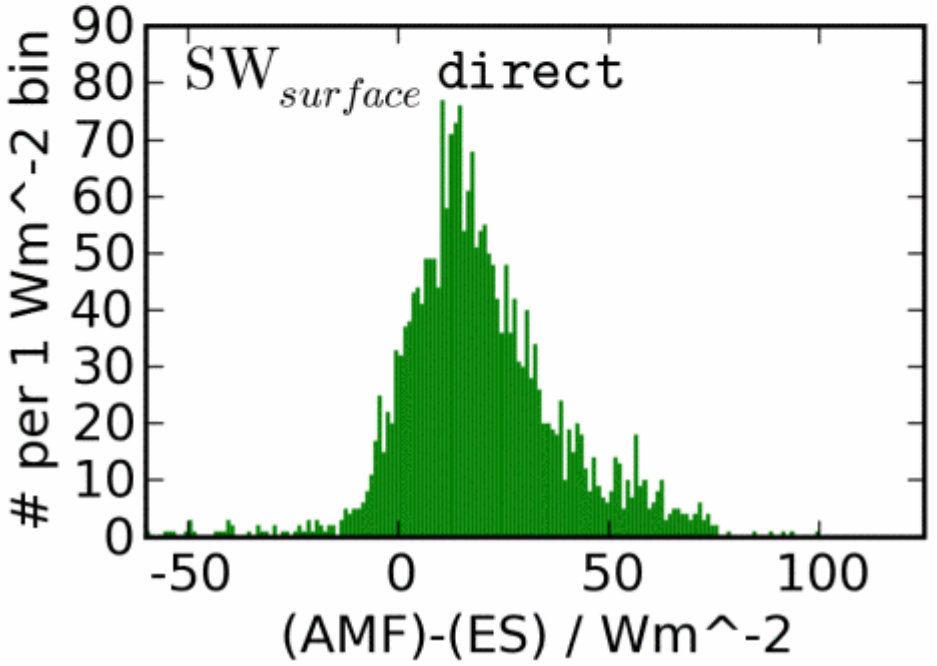


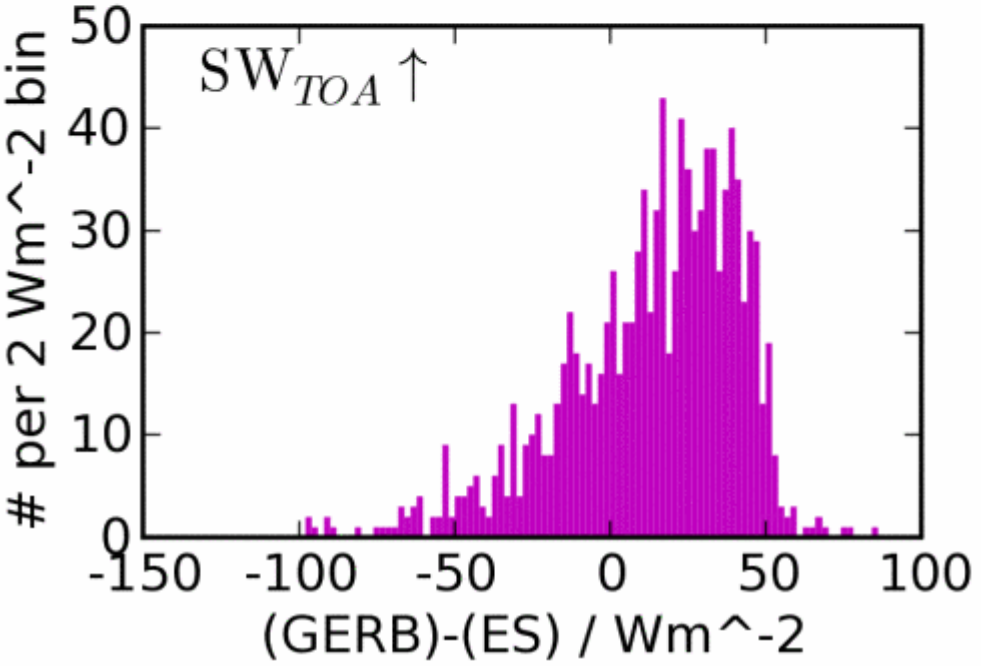
Shortwave calculations summary

~2400 unique times

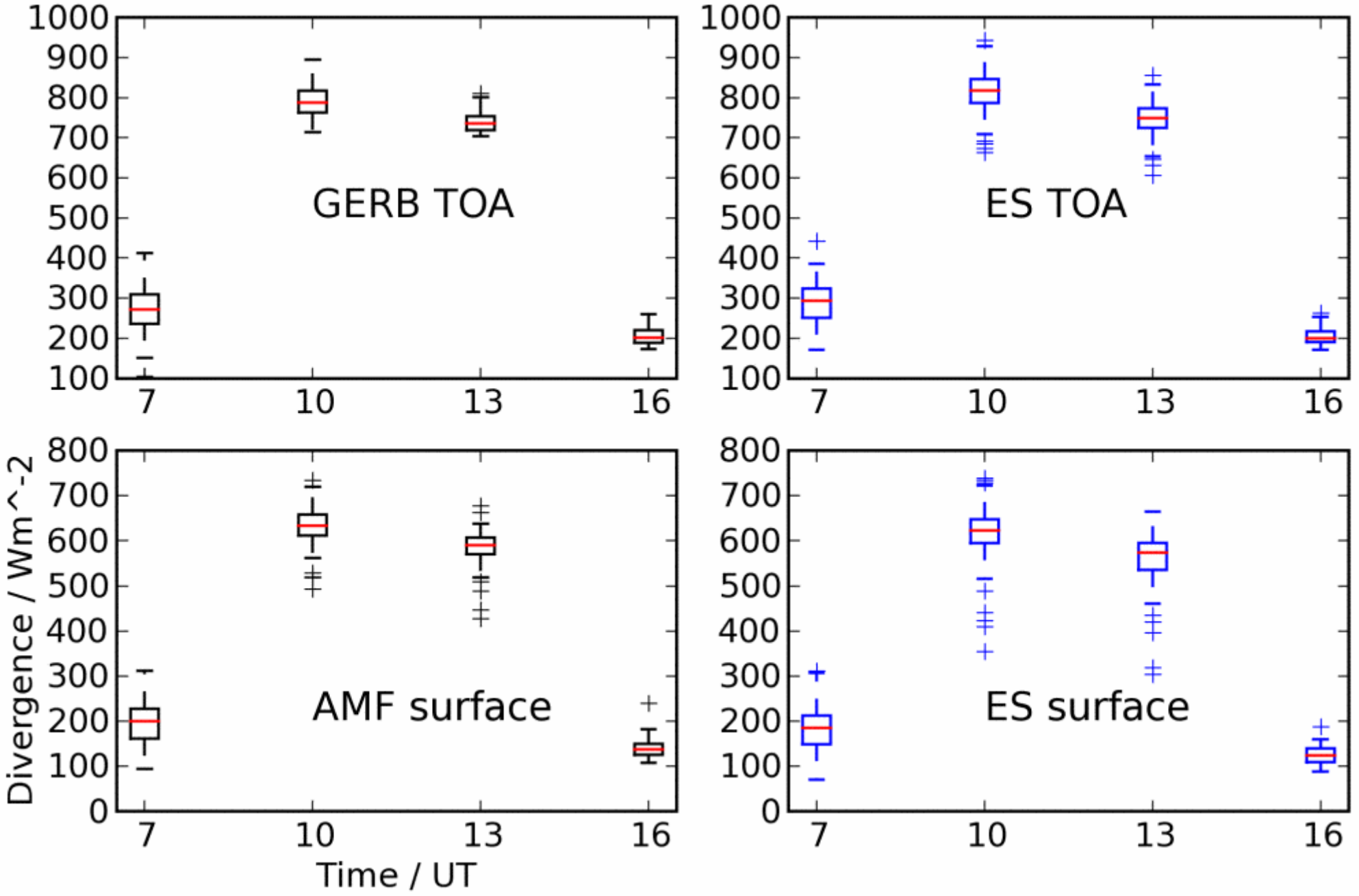






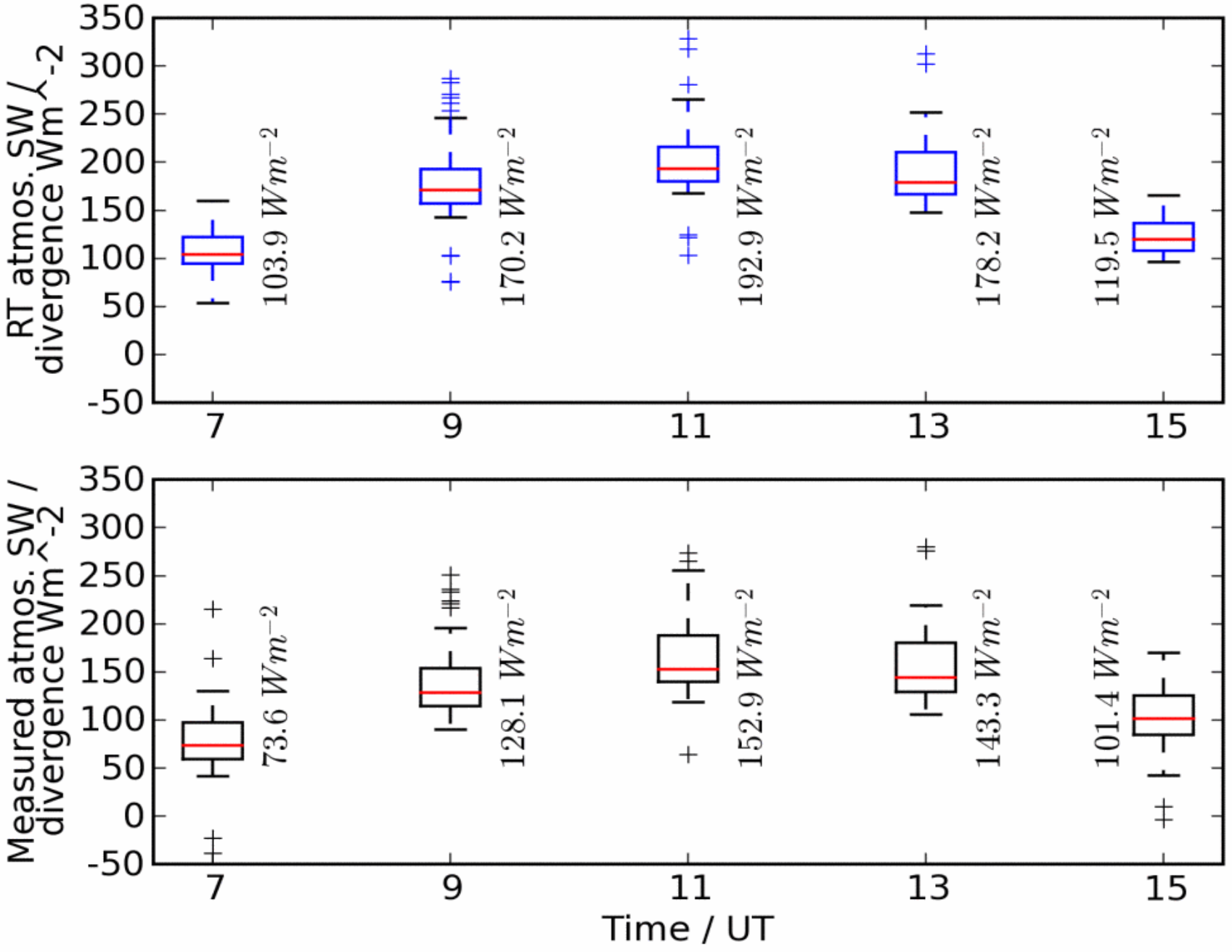


Shortwave divergences 1/2



Shortwave divergences 2/2

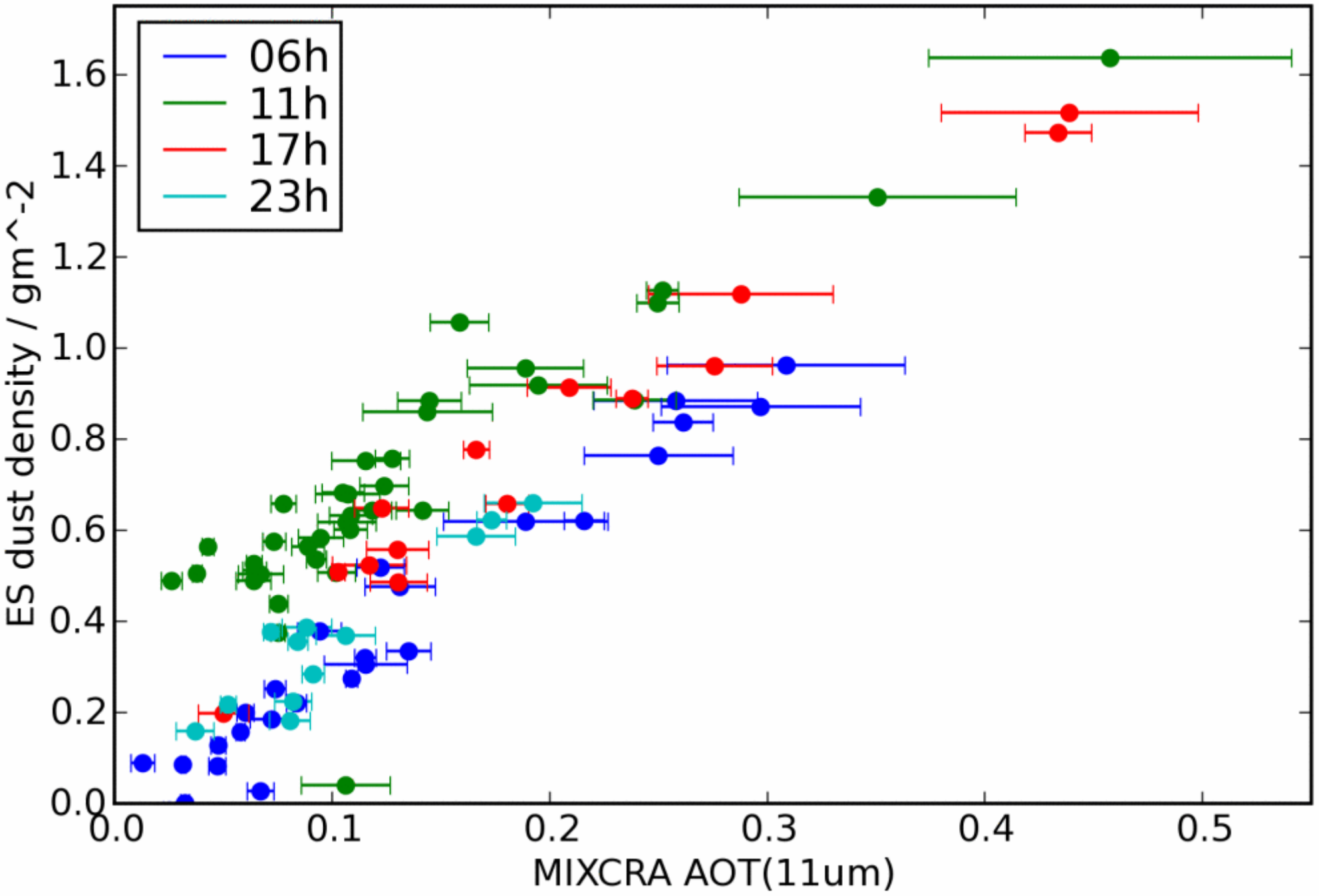
Atmosphere divergence. Blue is calculated and black from data.



Longwave overview

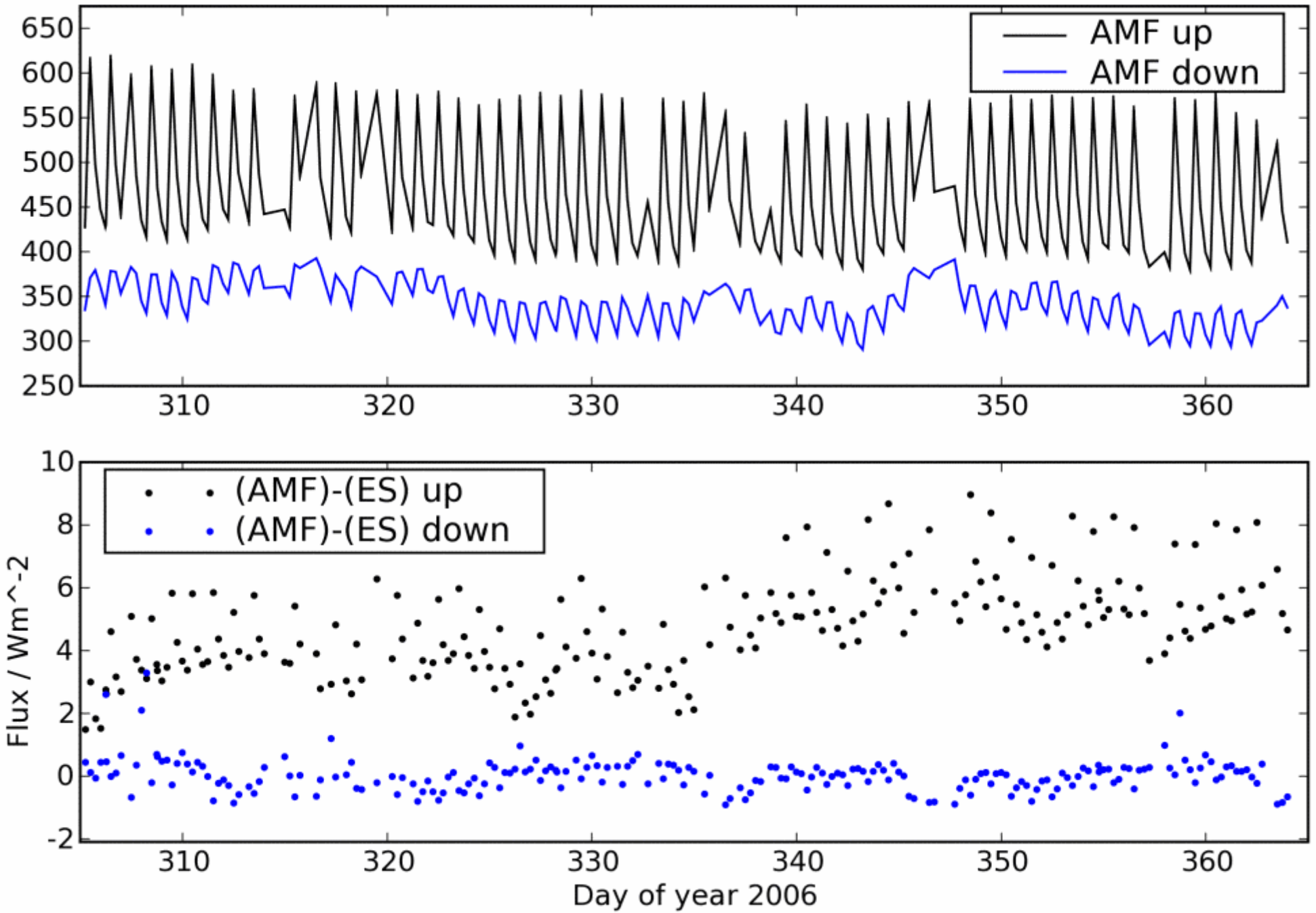
- WMO-based aerosol properties in 9 spectral bands,
  - Aerosol only 'dust', less problematic c.f. SW.
  - Same vertical distribution as SW.
- Derive aerosol loading via direct effect,
  - *Consequence*: downwelling surface LW flux **forced** to equal AMF obs.
    - Will return to this point.
- Only use sonde data for profile,
  - Limited to 06 UT, 11 UT, 17 UT and 23 UT (approx).
  - MODIS retrieval used to scale surface temperature.
  - MODIS-derived emissivity is 0.93±0.01.
- Comparisons with radiances and fluxes.

Aerosol loading comparison



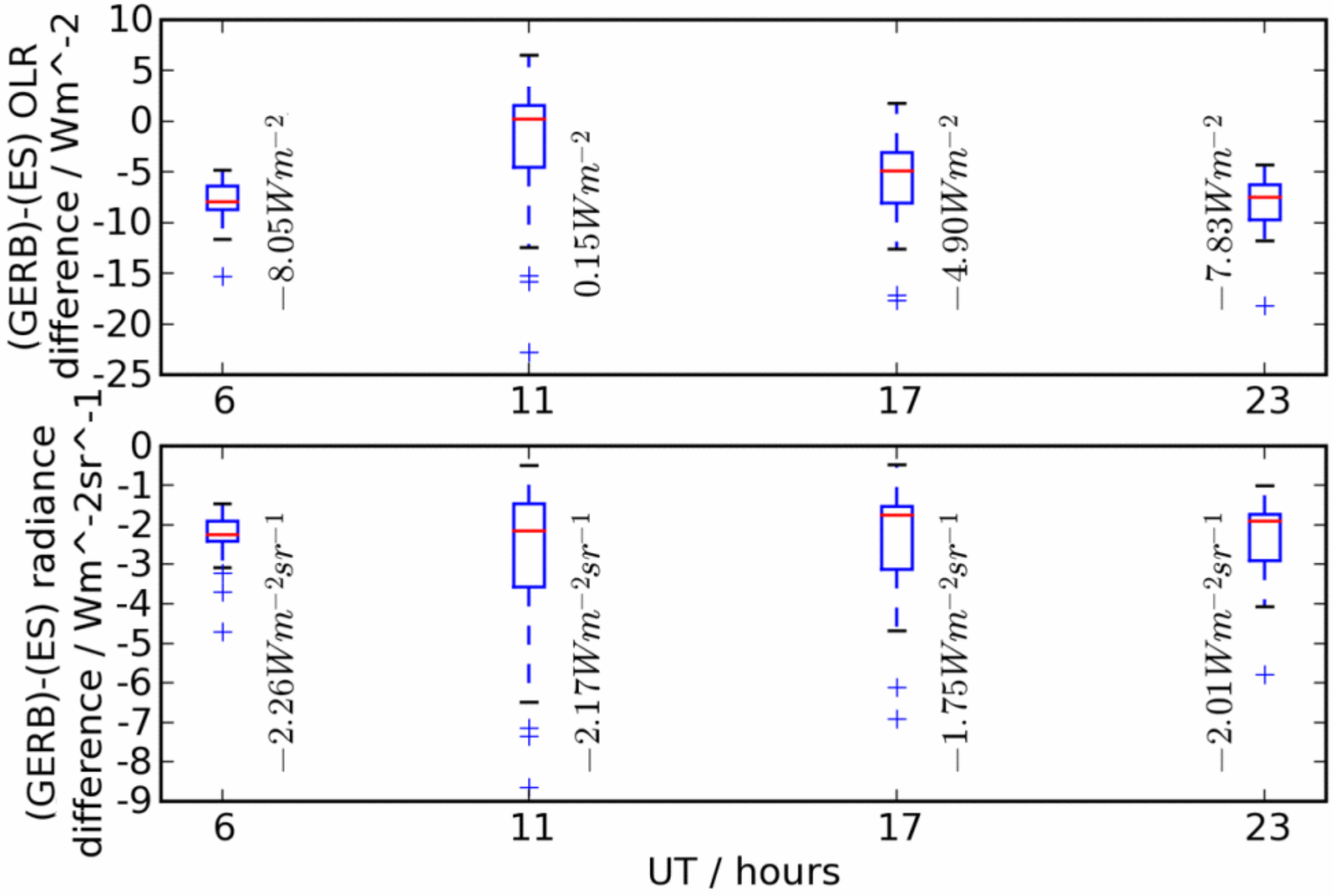
Longwave calculations summary 1/2

Surface fluxes

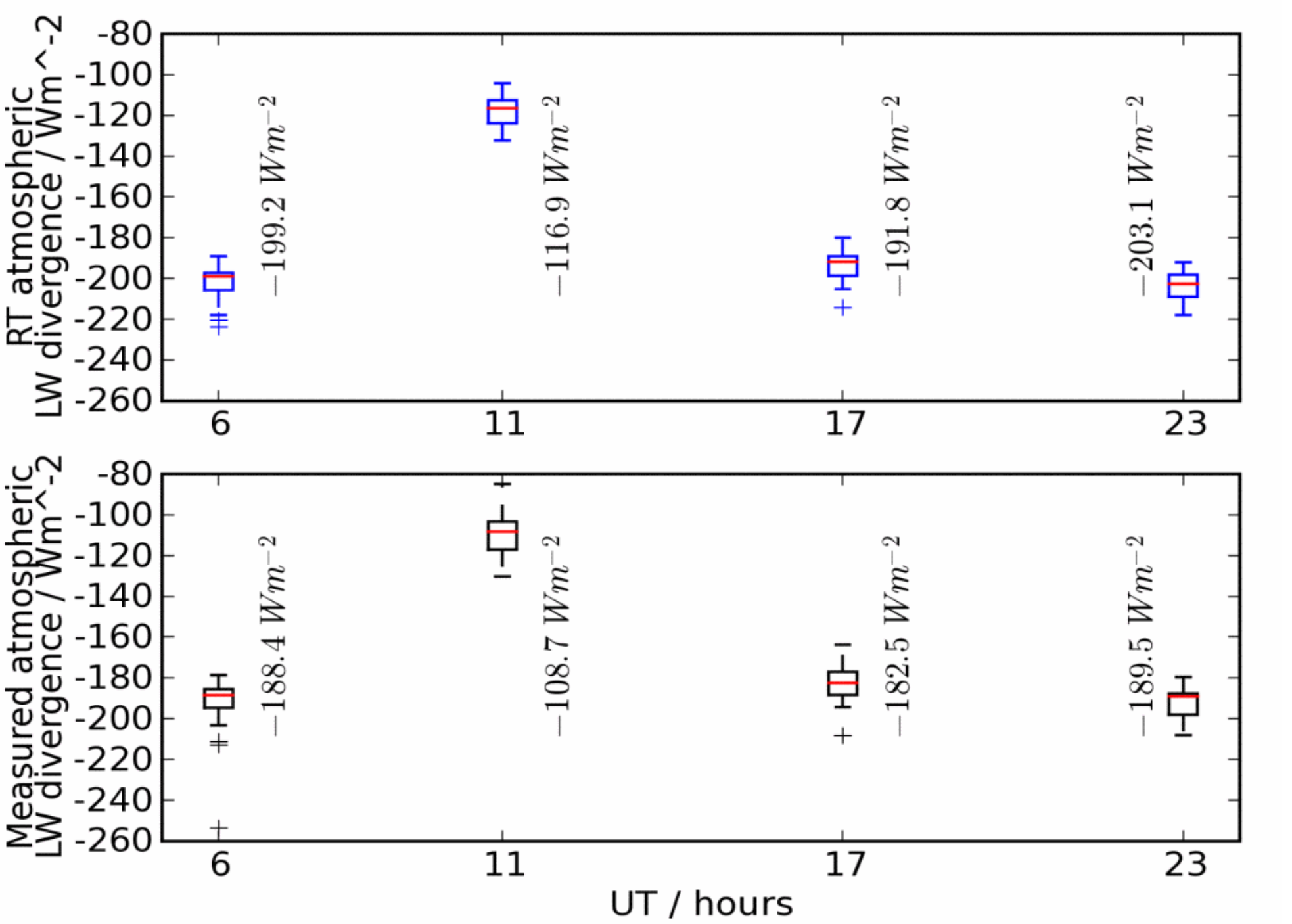


Longwave calculations summary 2/2

TOA radiation



Longwave divergences

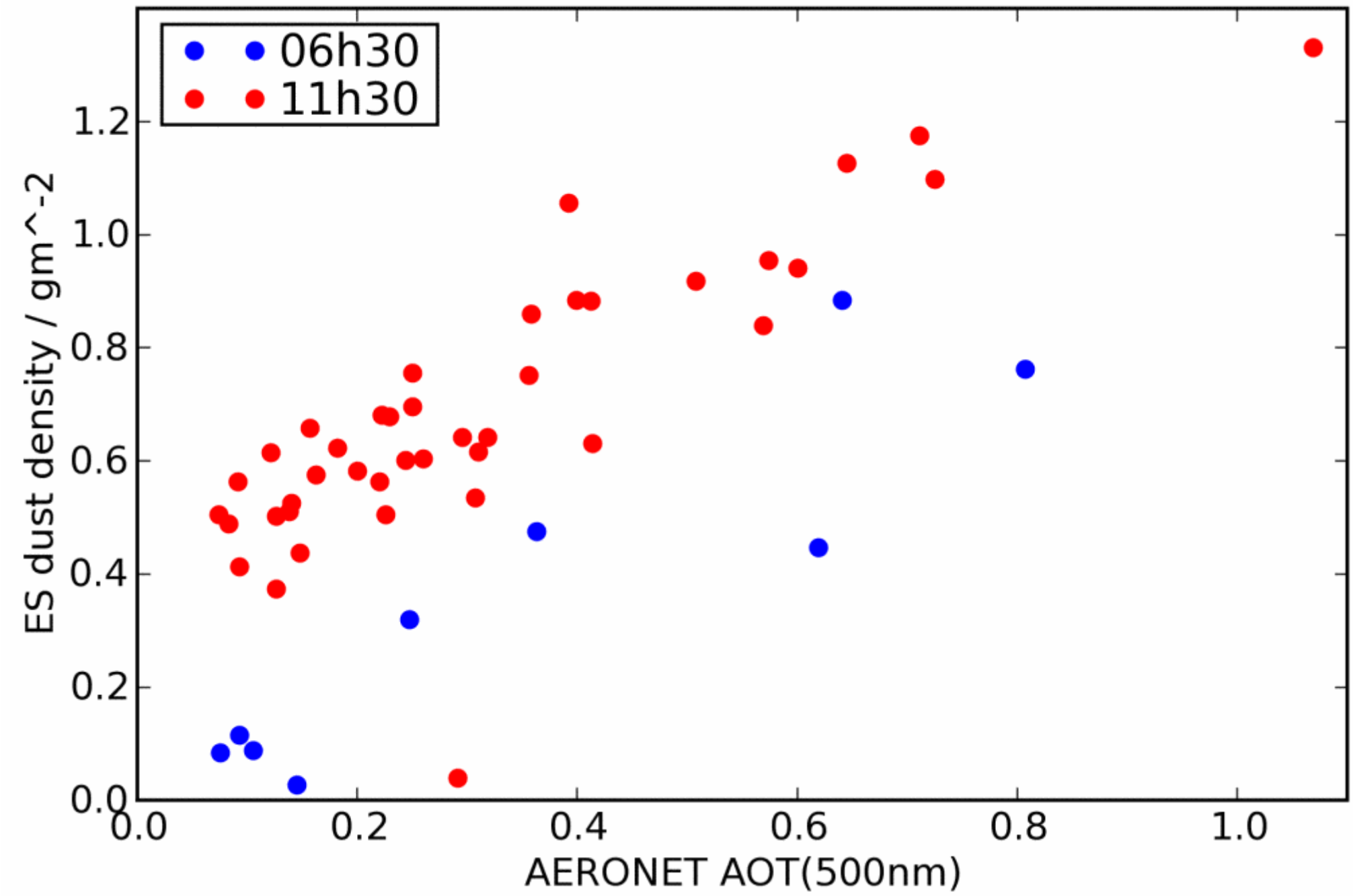


Summary

- Independent RT calculations made in SW and LW,
  - High time resolution for SW, more limited for LW.
- Issues with modelling given variations in aerosol loading,
  - SW; largest anomalies are TOA fluxes.
  - LW; again anomalies with GERB TOA fluxes,
    - But radiances work better.
    - Diagnoses of radiance-to-flux conversion errors?
- Got estimates of SW and LW divergences,
  - *BUT* aerosol loadings not consistent between wavebands.
  - Total estimate can be seen on poster (Bharmal et al.).
- *Future work,*
  - *Understand biases at TOA.*
  - *Move LW calculations to merged profile c.f. SW.*
  - *Apply consistent aerosol loadings between SW and LW.*


MIND THE GAP

Longwave vs. shortwave aerosol loading



MODIS albedo vs. AMF albedo

Blue is MODIS
Red is AMF