GEO Edition 4 cloud properties

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VARIOUS TOPICS ADDRESSED SINCE LAST CERES STM

- Formalize the output product file format.

- Calibration

- Provide SARB group few months of test dataset
  - Iterate with TISA/SARB based on test results

Output GEO pixel netcdf file format finalized:

- Variable names and fill-values changed to be CERES dataset compliant

- Add another phase id to indicate which pixels have been cleaned

- Variable added to indicate dataset is cleaned / not cleaned.

- Output dataset will have all required input channels and calibration information.
  - Reprocessing will run using cleaned output file. Bad scan lines will not be processed

- Retrieved pixel skin temperature product no longer an independent post retrieval process and now part of the retrieval process
  - **faster processing**

Processed Datasets

- Provided TISA and SARB group Jan 2010 (*GOES-11, GOES-12,MET-9, MTSAT-1*), July 2004 (*GOES-10, GOES-12, Met-8, GOES-9*) and Apr 2008 (*GOES-11, GOES-12, Met-9, MTSAT-1*) using algorithm as originally formulated

- Additionally analyzed a year (2008) of GEO using algorithm as originally formulated

CALIBRATION

- Visible 0.63-µm calibration updated with sensor specific response function correction (*from Doelling's calibration group*)

- MTSAT-1R requires preprocessing to apply PSF1 correction
  1) download the data at 4-km resolution (increases the download time)
  2) apply correction and then sub-sample

- Initial studies show that 3.9-µm is stable on GOES-12
  - Cross-calibrate other GEO to GOES-12

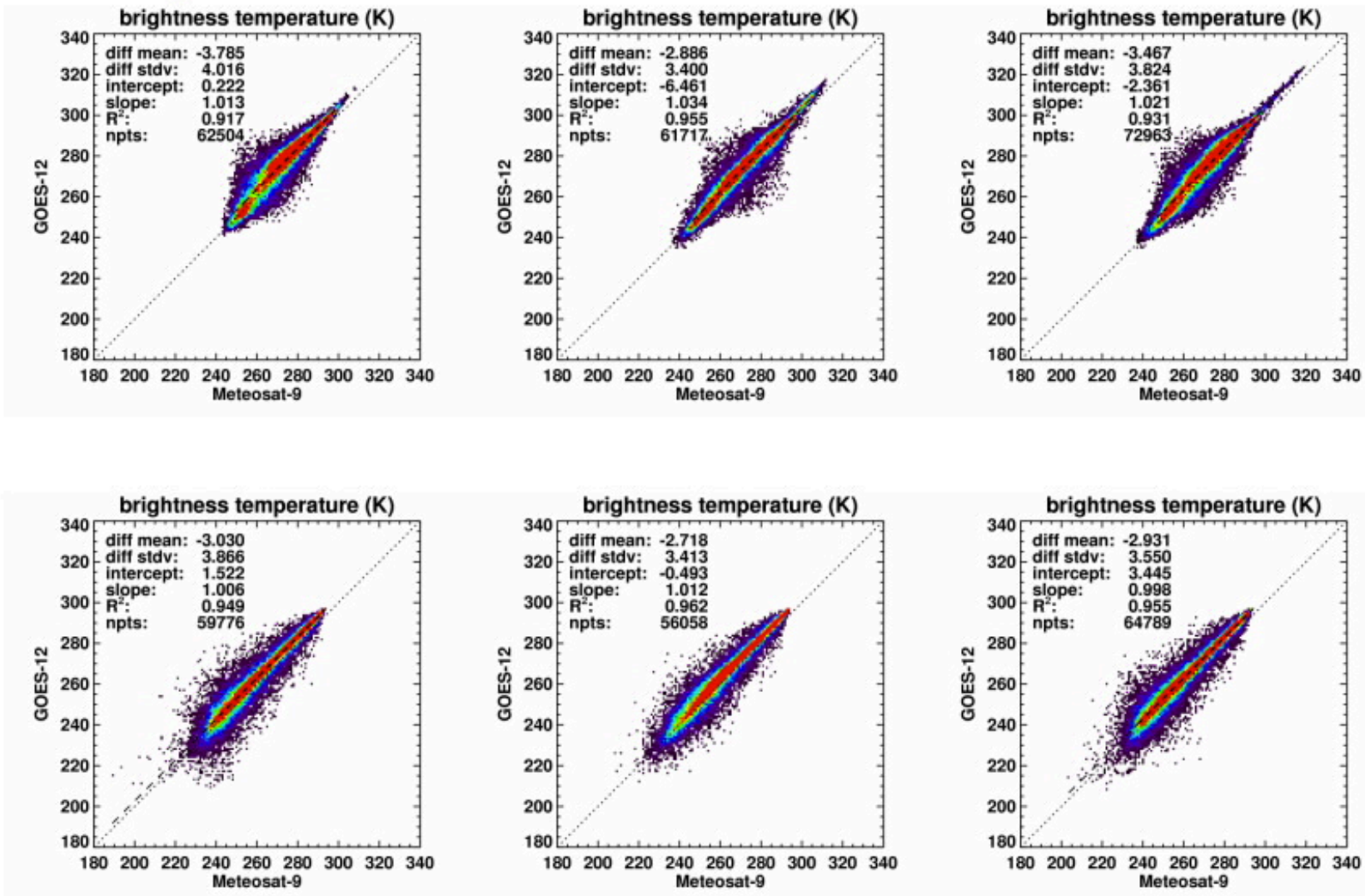
- Transfer calibration from common satellite to periods when GOES-12 not active
  - e.g., for Jul 2004, use GOES-10 vs GOES-12 to transfer cross calibration to GOES-10 vs GOES-9

T3.9, Meteosat-9/GOES-12

Apr 2008 | Jan 2010 | 2008, every 7 days

day

night

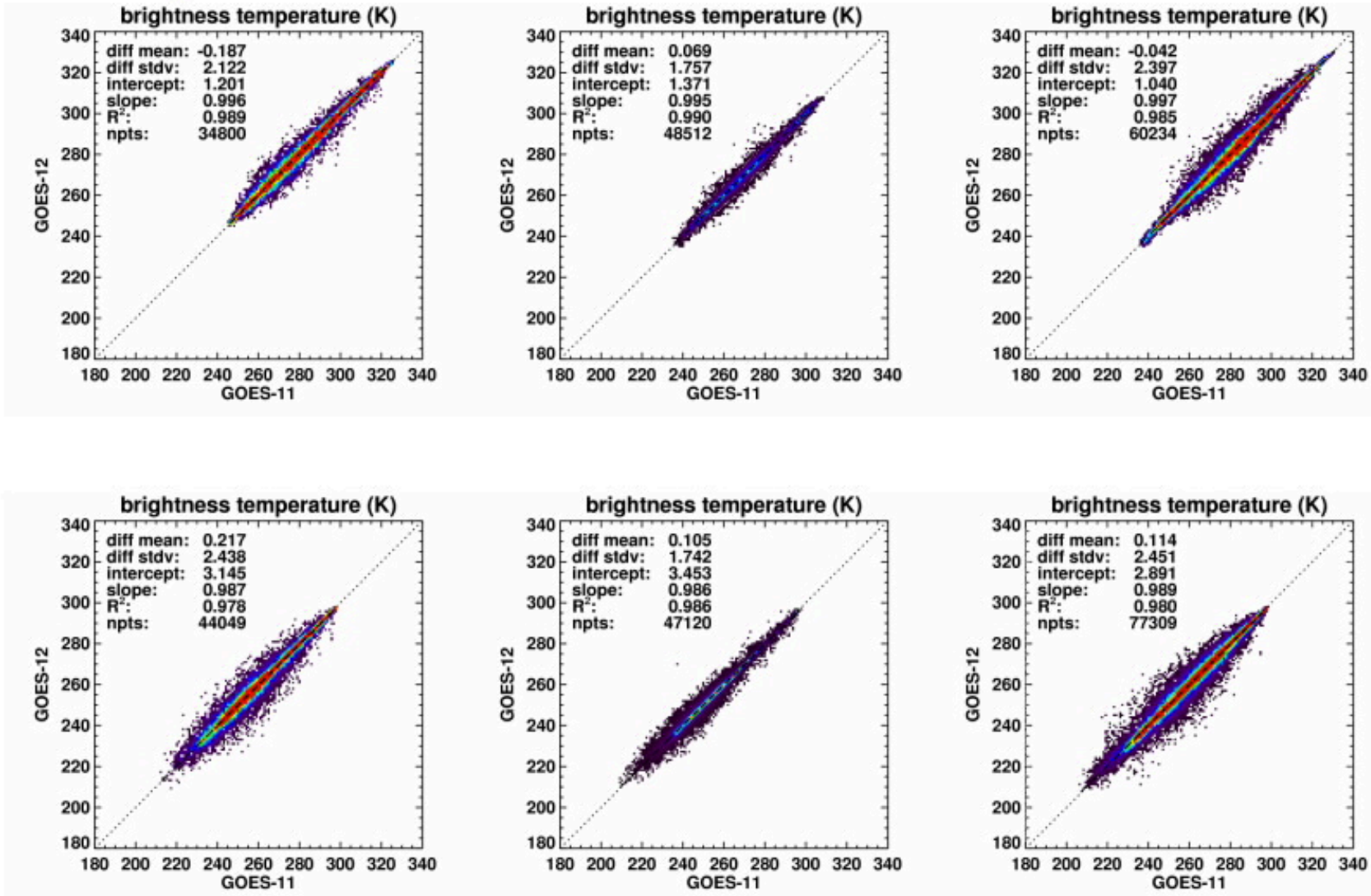


T3.9, GOES-11/GOES-12

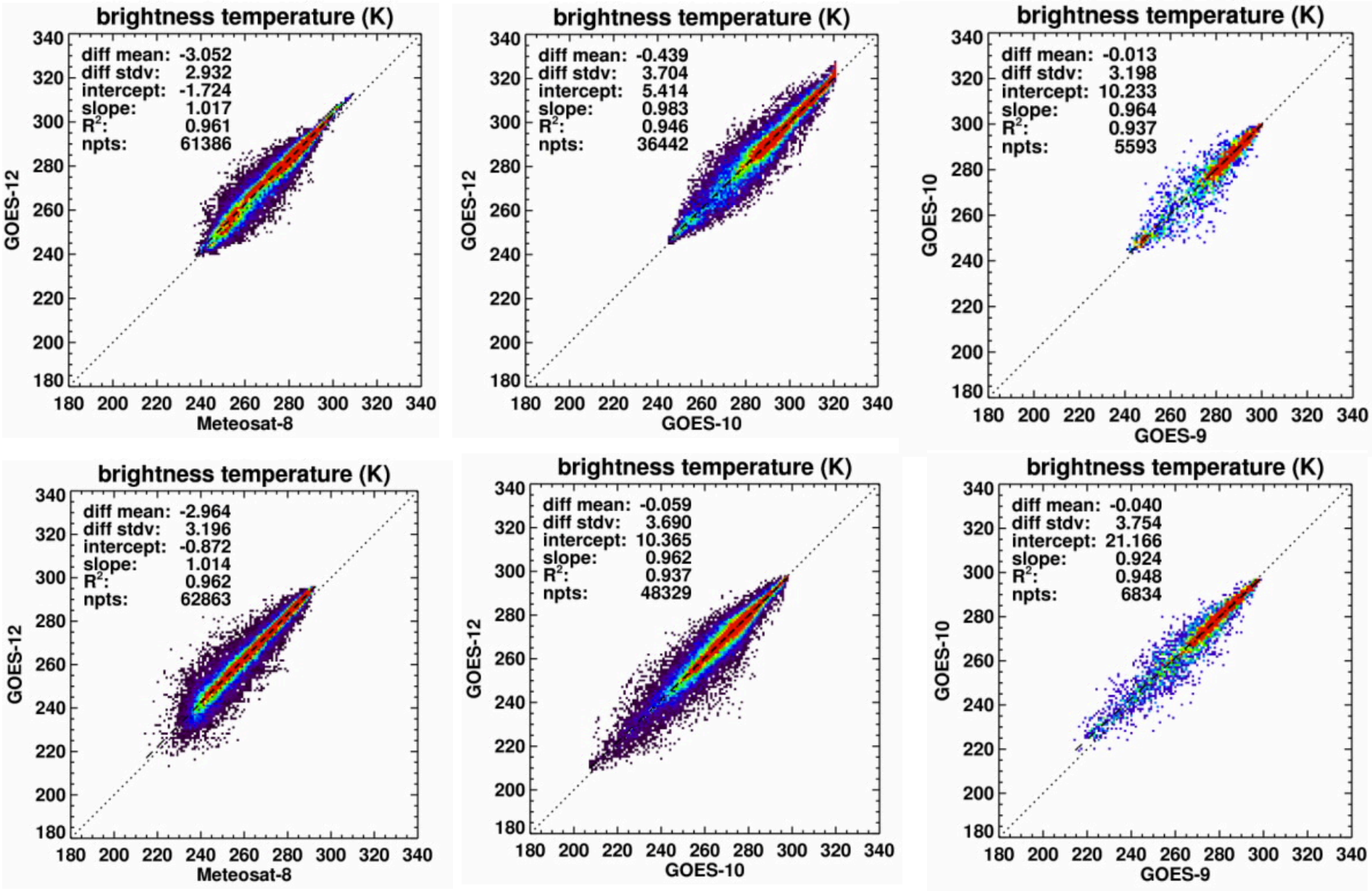
Apr 2008 | Jan 2010 | 2008, every 7 days

day

night



T3.9 Jul 2004


brightness temperature (K)
diff mean: -3.052
diff stdv: 2.932
intercept: -1.724
slope: 1.017
R²: 0.961
npts: 61386
GOES-12
Meteosat-8
brightness temperature (K)
diff mean: -0.439
diff stdv: 3.704
intercept: 5.414
slope: 0.983
R²: 0.946
npts: 36442
GOES-12
GOES-10
brightness temperature (K)
diff mean: -0.013
diff stdv: 3.198
intercept: 10.233
slope: 0.964
R²: 0.937
npts: 5593
GOES-10
GOES-9
brightness temperature (K)
diff mean: -2.964
diff stdv: 3.196
intercept: -0.872
slope: 1.014
R²: 0.962
npts: 62863
GOES-12
Meteosat-8
brightness temperature (K)
diff mean: -0.059
diff stdv: 3.690
intercept: 10.365
slope: 0.962
R²: 0.937
npts: 48329
GOES-12
GOES-10
brightness temperature (K)
diff mean: -0.040
diff stdv: 3.754
intercept: 21.166
slope: 0.924
R²: 0.948
npts: 6834
GOES-10
GOES-9

Iteration with TISA & SARB

- Using Jan 2010 GEO cloud dataset, test runs with SARB group revealed decrease in OLR, but good agreement in SW at TOA computed using GEO data and observed from CERES

  - cloud tops too high in all cases for GOES-12 and MET-9, CO2 flag on.

    Met-9: has both 12 and 13.3 µm (CO2) channel

    GOES-12: has 13.3 µm and at night 13.3 used as 12 µm

    GOES-11 & MTSAT-1R: no 13. µm

- Reprocessed Jan 2010 with CO2 flag turned off for day and night on Met-9 and GOES-12. Additionally on GOES-12 at night used a 2-chan (3.9 & 11) algorithm.

  GOES-11: Ver 1 & Ver 2: no change, basic VISST (day) and SIST (night)

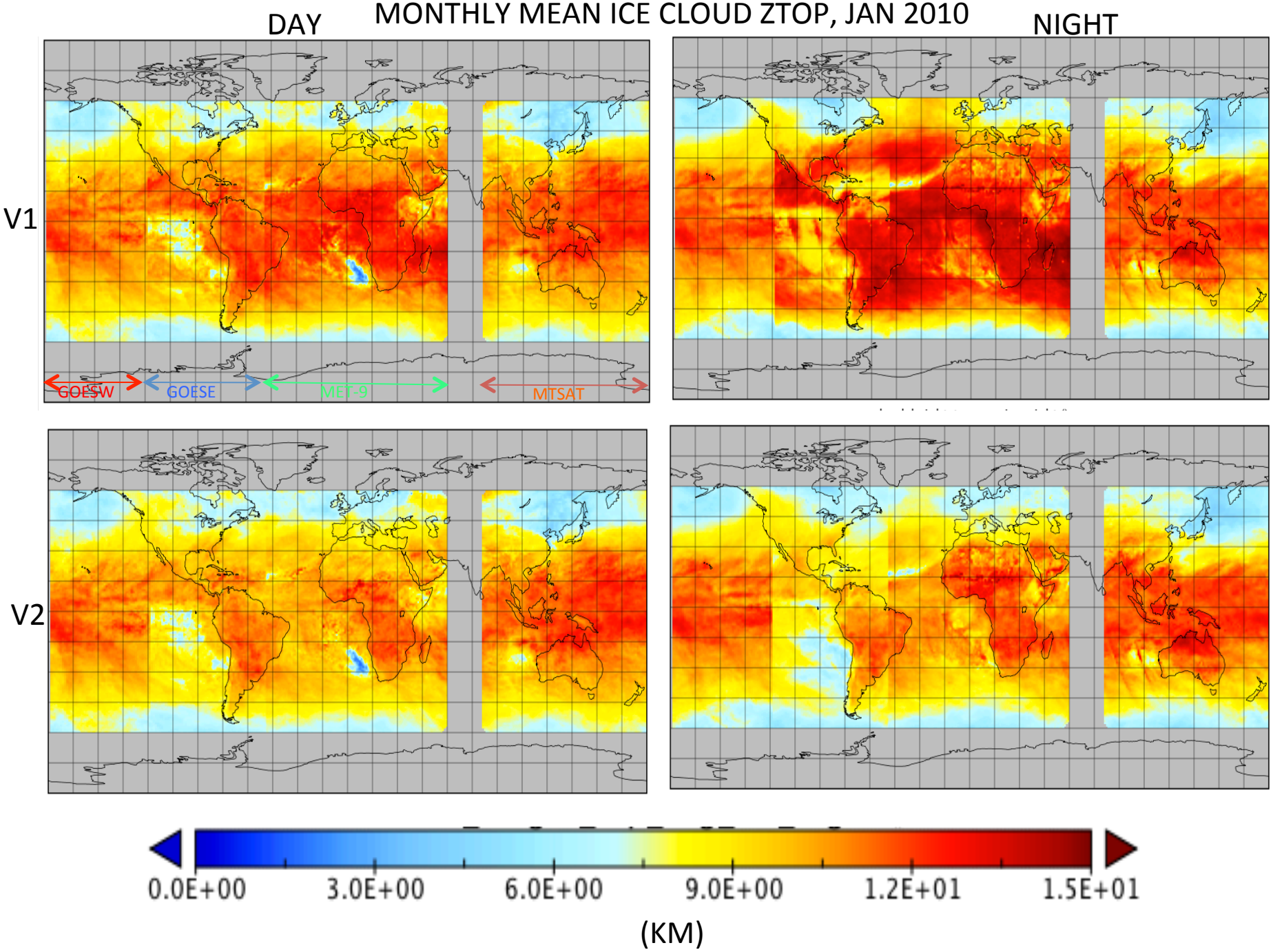
  MTSAT-1R: Ver 1 & Ver 2: no change, basic VISST (day) and SIST (night)

  MET9 : Ver 1 – CO2 FLAG ON Day & Night V2: CO2 FLAG OFF Day & Night.

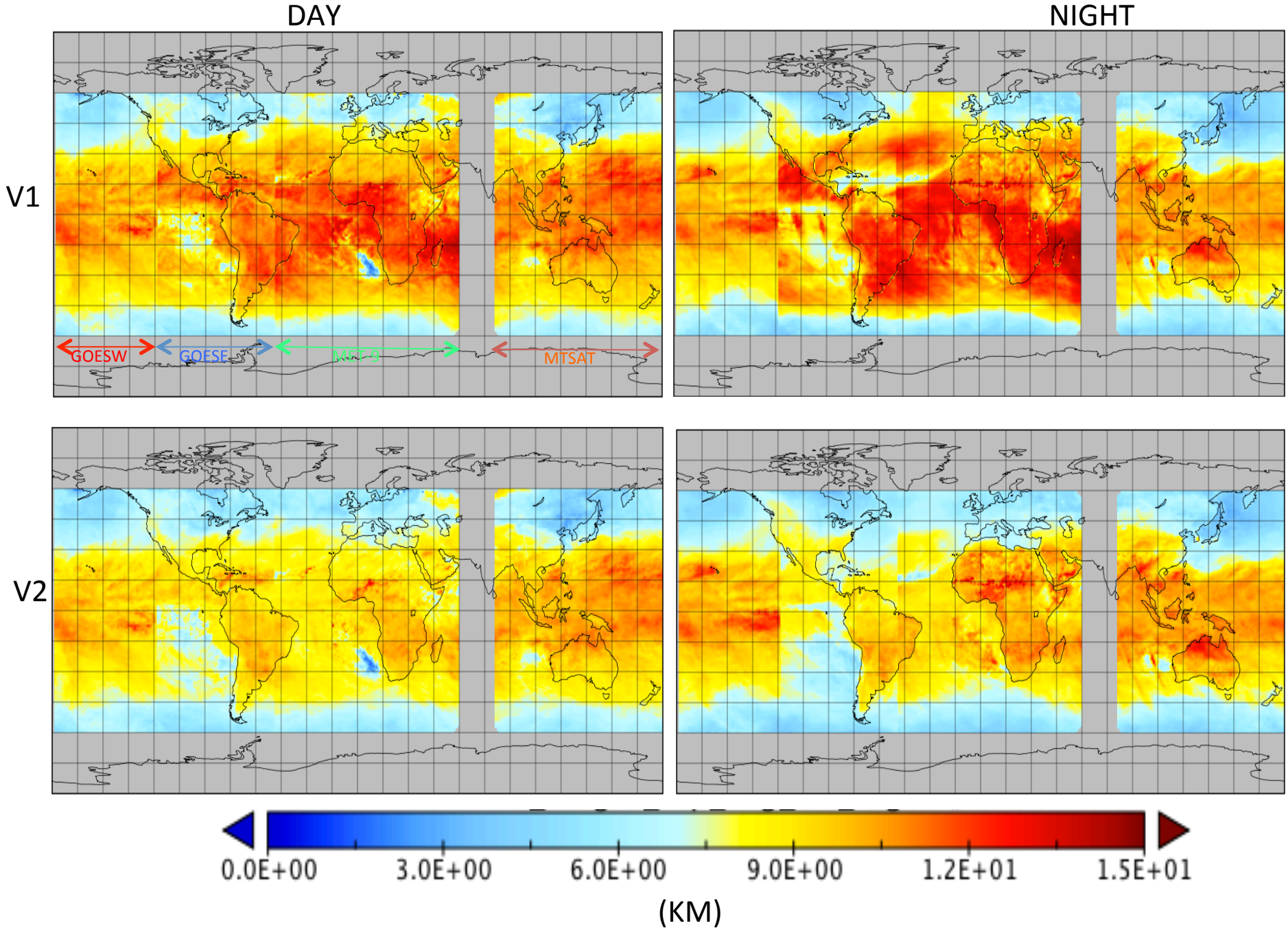
GOES-12: Ver1: CO2 FLAG ON & 13.3 USED AS 12 µm.

Ver 2: CO2 FLAG OFF AND 2-CHAN USED (3.9 & 11 µm)

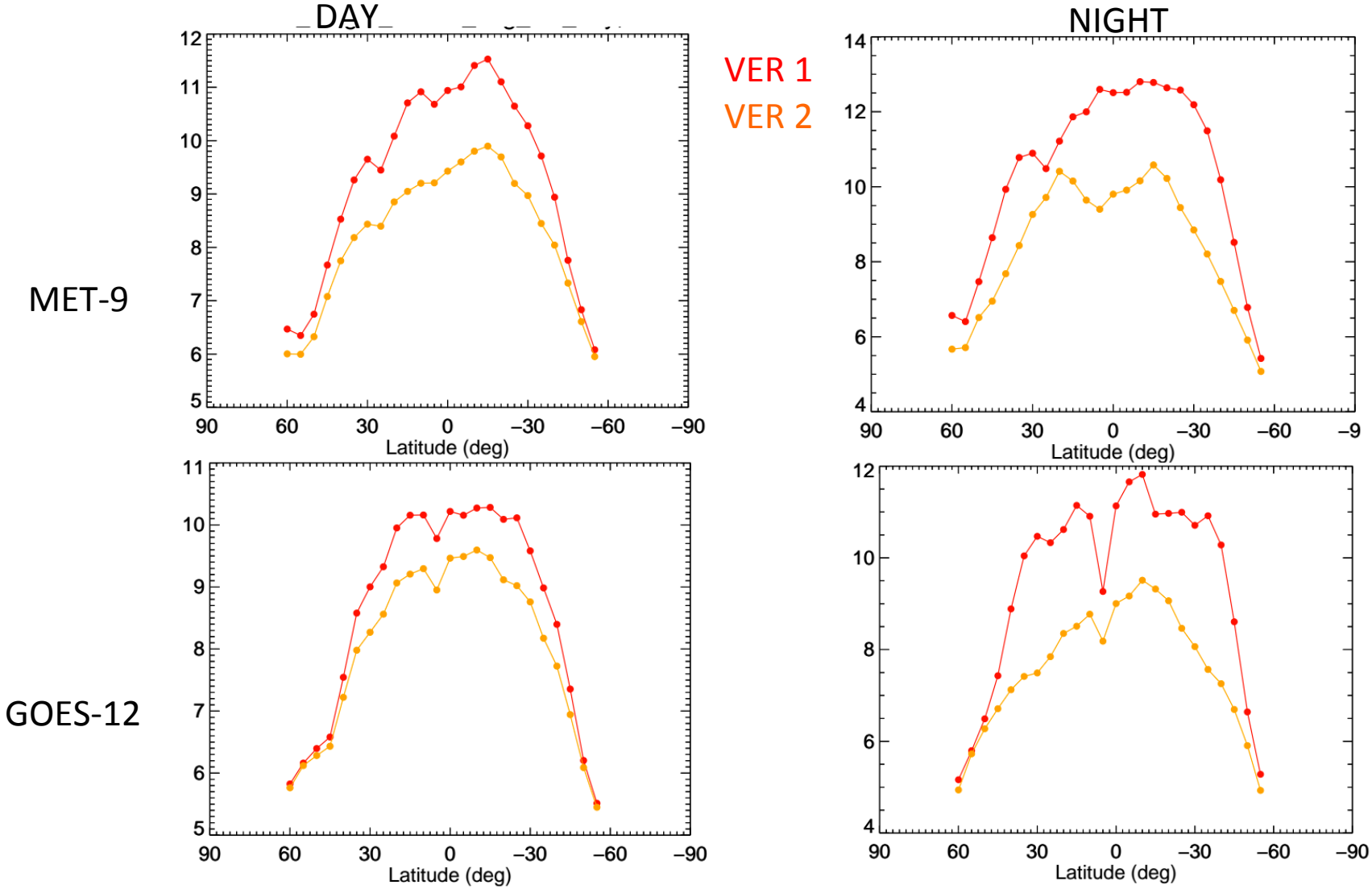
MONTHLY MEAN ICE CLOUD ZTOP, JAN 2010



MONTHLY MEAN ICE CLOUD EFFECTIVE HEIGHT, JAN 2010

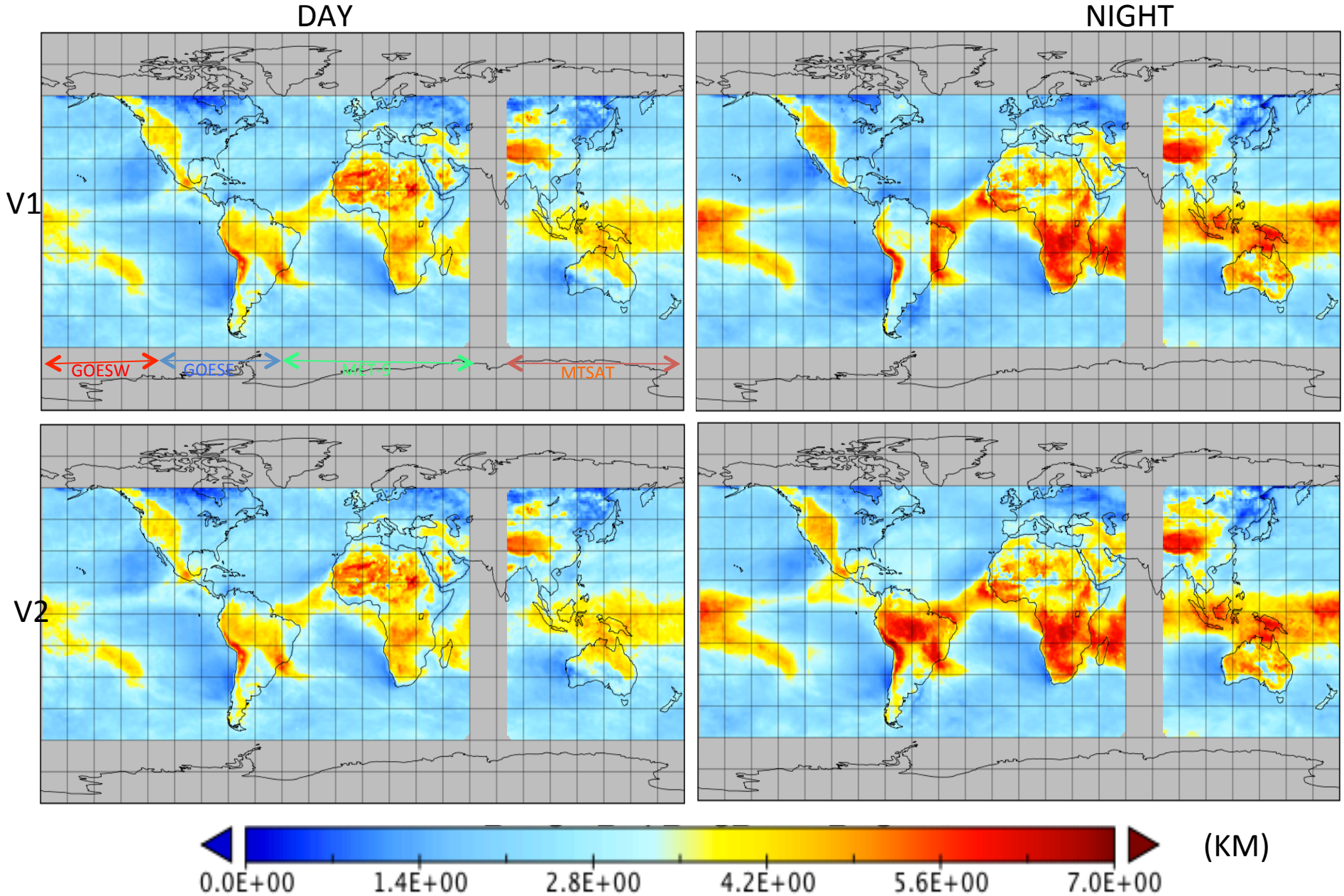


ZONAL MEANS Cloud Effective Height, Ice Clouds



	DAY		NIGHT	
	VER 1	VER 2	VER 1	VER 2
MET-9	8.3	7.3	9.4	7.6
GOES-12	7.7	7.2	8.5	6.9

MONTHLY MEAN WATER CLOUD EFFECTIVE HEIGHT, JAN 2010



diff in water Zeff hgt at night over the goes-12 domain is the effect of 13.3 um used as 12 um

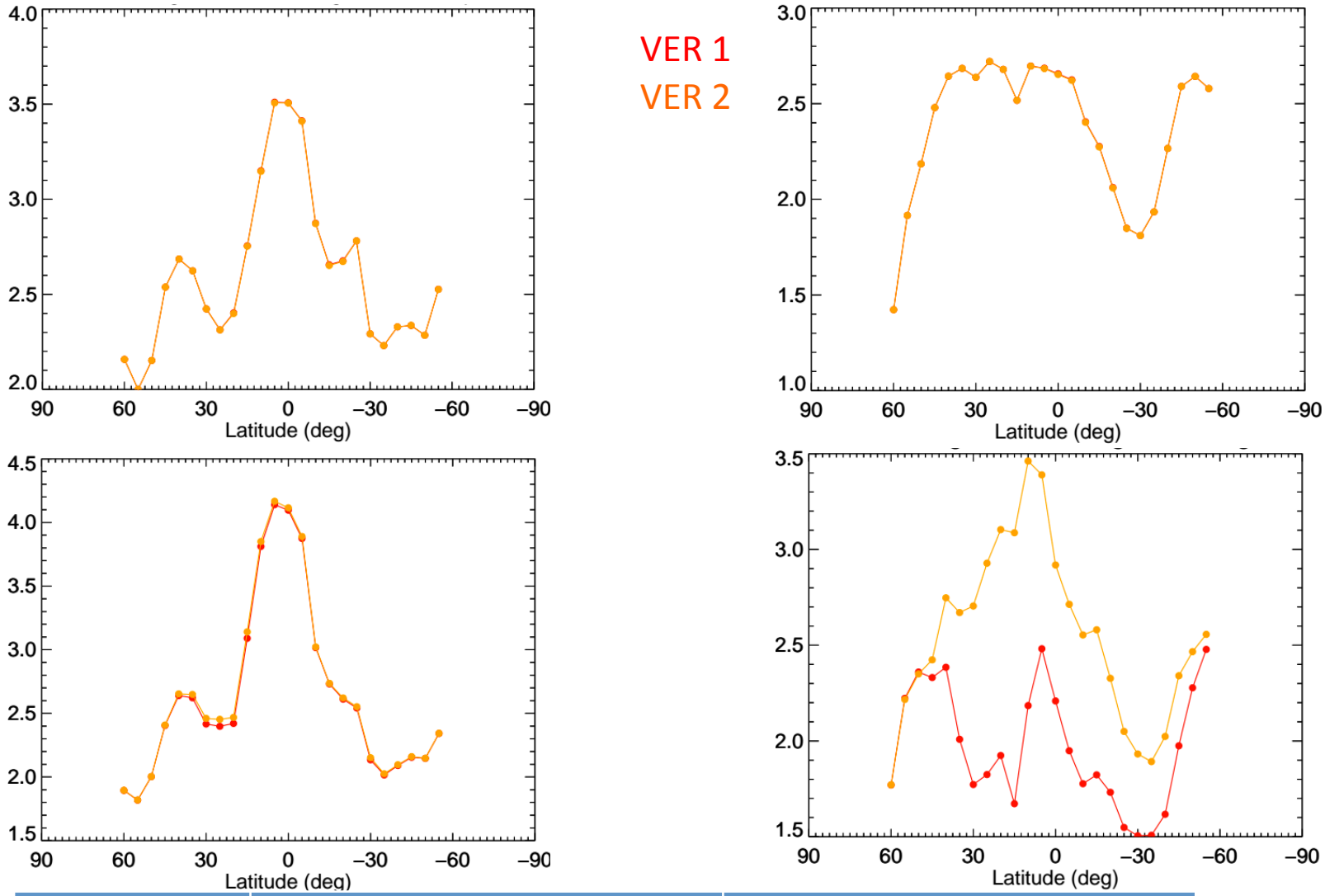
Cloud Effective Height, Water Clouds

DAY NIGHT

VER 1
VER 2

MET-9

GOES-12



	DAY		NIGHT	
	VER 1	VER 2	VER 1	VER 2
MET-9	2.3	2.3	2.4	2.4
GOES-12	2.1	2.1	1.7	2.3

SUMMARY

- Output file format finalized.

- Performed cross-calibration of 3.9 μm channel on GOES-12 with other GOES and MET satellites.

- Ver 1 cloud tops too high in all cases, but have better agreement with CALYPSO
    - SARB using CloudSat-based IWC profiles, so cloud radiating center very close to top (we suspect)
    - recommend using cloud effective height, not top for all clouds
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- CO_2 effective heights still too high
    - run Meteosat with no CO_2 => good results with OLR comparisons
    - run GOES (12,13,15) with no CO_2 during the day/night and 2-channel retrieval (3.9μm, 11 μm) at night
    - good consistency during day, maybe too low at night

FUTURE WORK

- provide TISA and SARB group with April 2008 GEO data with Ver 2 for testing

- process all months of GOES-11, GOES-12, MET-9 and MTSAT-1R once Apr, 2008 testing is successful
    - represents about 52% off the data.

MONTHS FOR EACH GEO 2000-2012

GOES-EAST	MONTHS
GOES-8	39
GOES-12	84
GOES-13	33

GOES-WEST	MONTHS
GOES-10	78
GOES-11	65
GOES-15	13

EURO-AFRICA	MONTHS
MET-8	37
MET-9	69

W.PACIFIC	MONTHS
GOES-9	26
MTSAT-1B	60
MTSAT-2B	30

- process another month/year after consultations with TISA/SARG group to test other satellites.

- update retrieval code to accept output netcdf product file as input for satellite data.