

land surface
temperature
cci

RESULTS OF THE LST_CCI VALIDATION ANALYSIS

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KIT

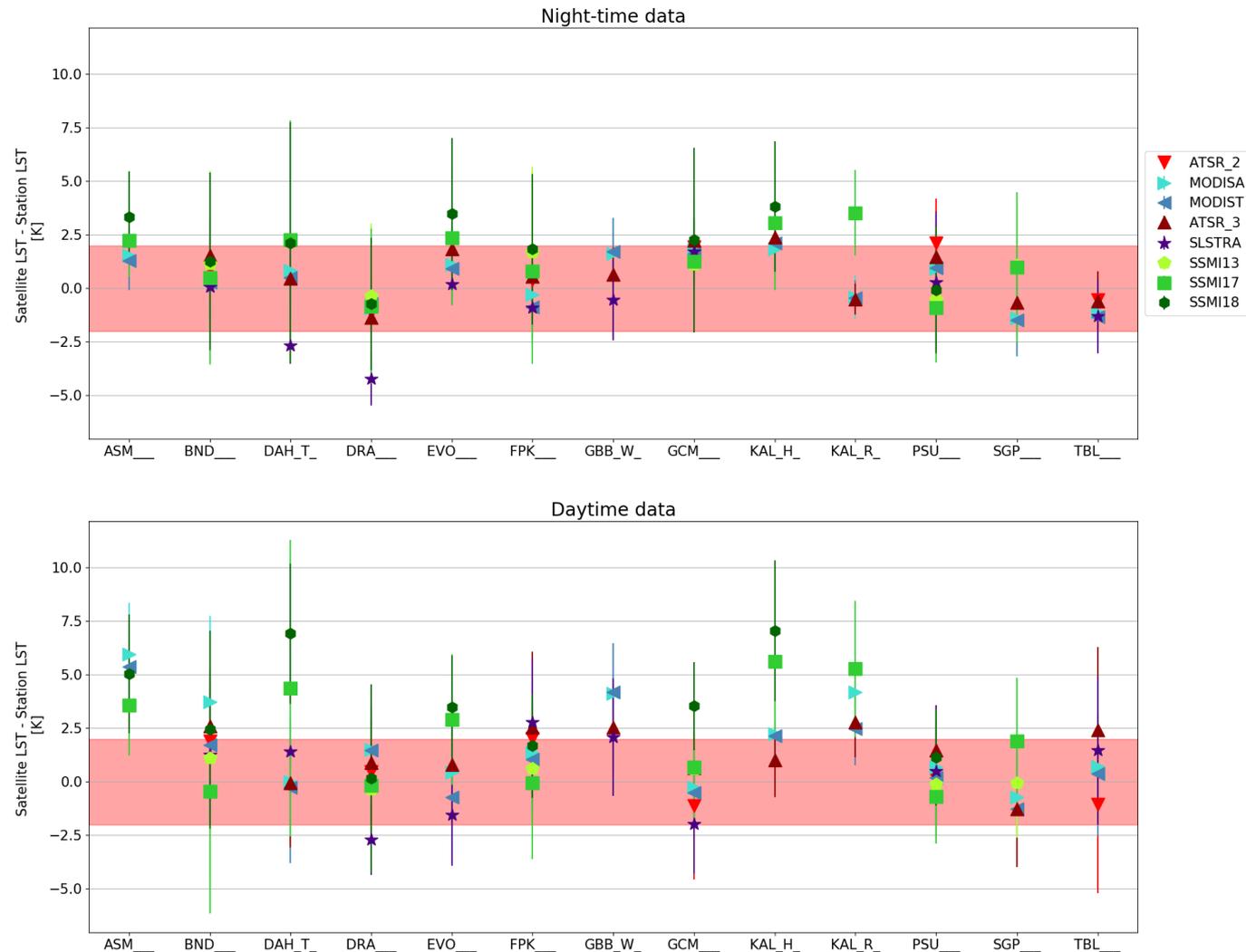


- **Information on quality of data products developed in LST_cci is gained through validation**
- **Validation team at KIT works independent of data producers**
- **Validation work is split in two parts:**
 - In situ validation against point measurements at globally distributed, ground based stations
 - Satellite satellite intercomparisons over large areas (continents)

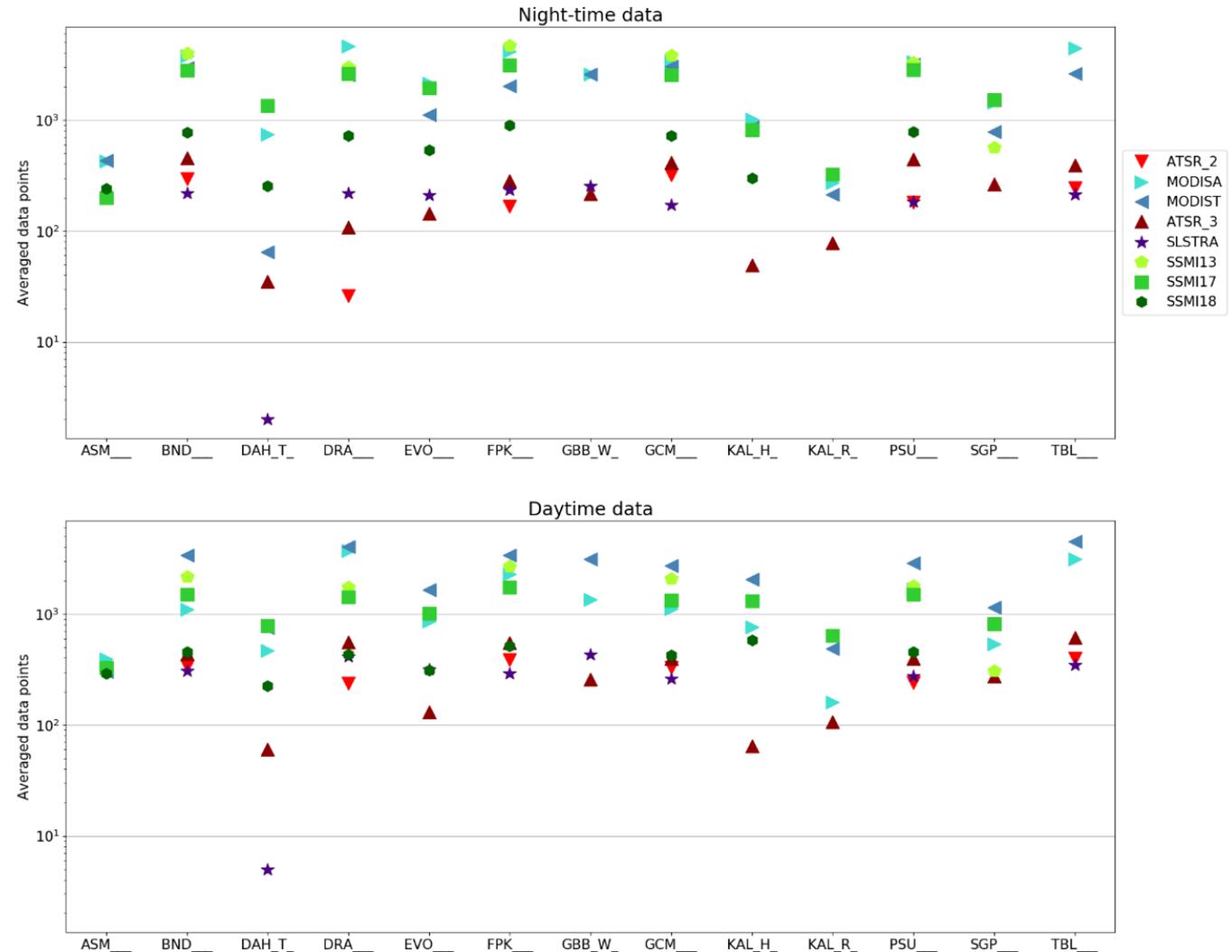
- **9 analysed LST_cci data sets**
 - Infrared data sets: Aqua-MODIS (MODISA), Terra-MODIS (MODIST), ATSR-2 (ATSR_2) , AATSR (ATSR_3), and SLSTR-A (SLSTRA)
 - Microwave data sets: SSMI-13, SSMI-17, SSMI-18
- **over 13 stations distributed worldwide from KIT, SURFRAD, ARM, OzFlux networks**
- **covering different land covers, regions, and elevation heights**
- **for time periods ranging from 1995 - 2018**



- **Bias: median(satellite LST – in situ LST)**
- **IR products are performing well for most stations**
- **Night-time bias smaller, large differences in daytime bias**
- **MW data sets: investigate larger area than IR data sets**
- **SLSTRA: poorer cloud clearing originating from an operational cloud mask**
- **ASM station: problematic during day**



- SSI sensors: deviate LST also during cloudy conditions
- MODISA and MODIST: largest investigated time period
- Low number of SLSTRA data points over DAH_T_: small temporal overlap



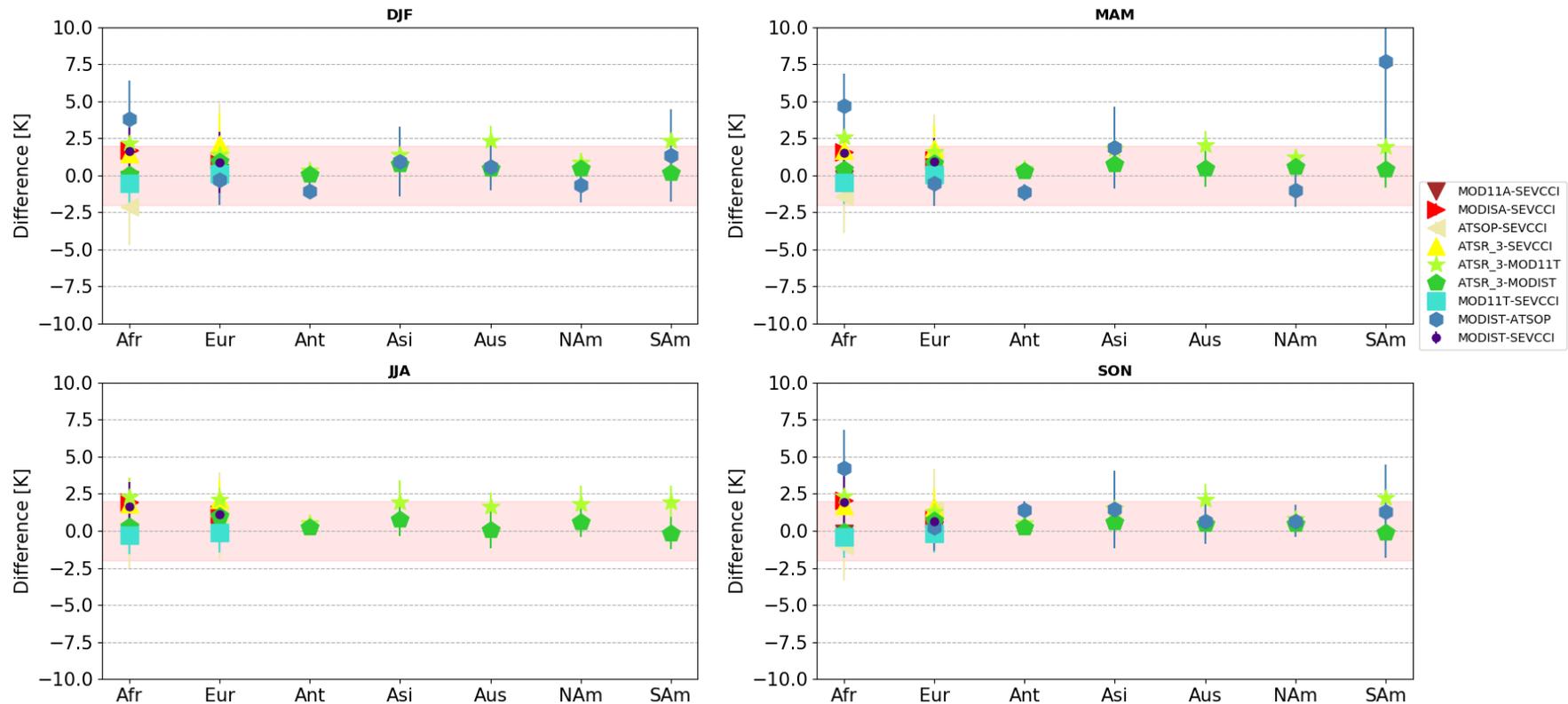


- 9 satellite - satellite pairs are intercompared from 2008 – 2010

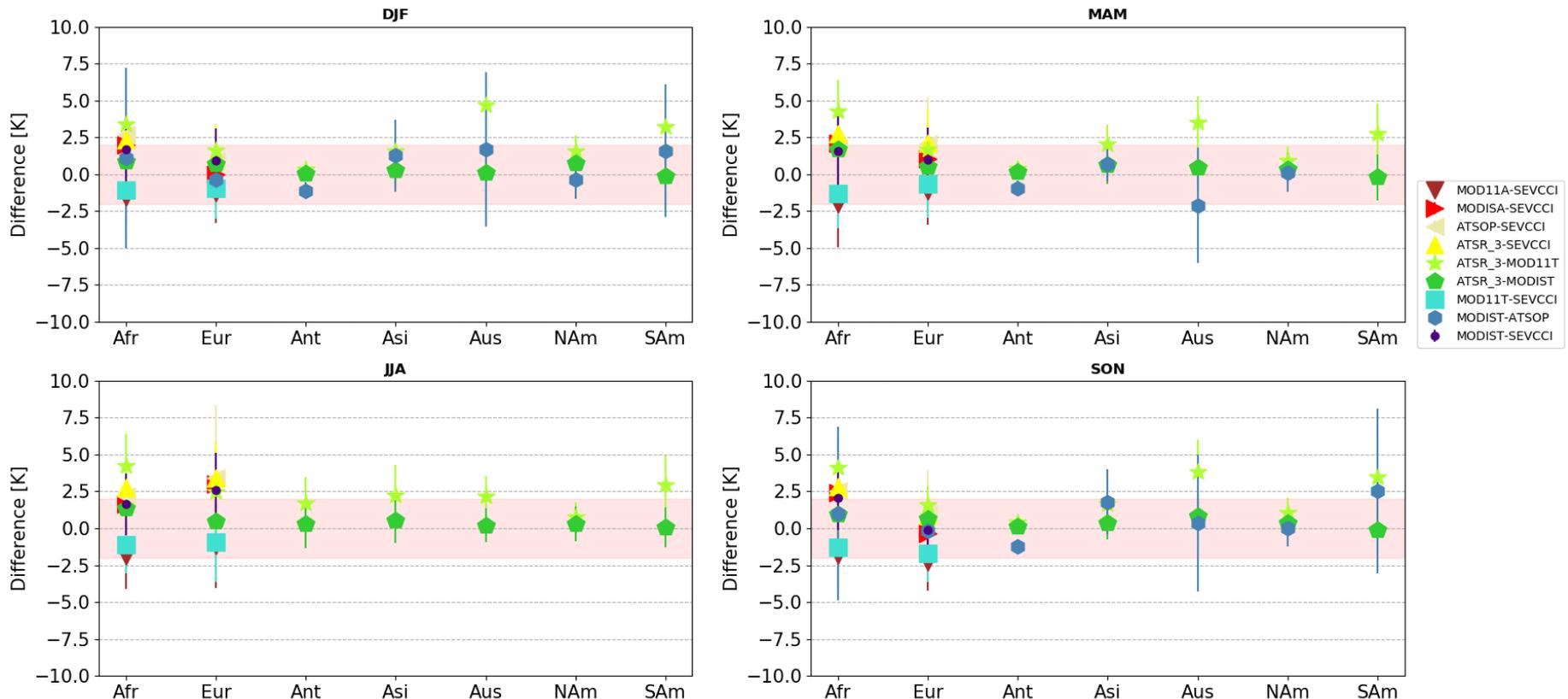
| | Africa | Antarctica | Asia | Australia | Europe | North America | South America |
|-----------------|--------|--------------|--------------|--------------|--------|---------------|---------------|
| MOD11A - SEVCCI | Green | Light Orange | Light Orange | Light Orange | Green | Light Orange | Light Orange |
| MODISA - SEVCCI | Green | Light Orange | Light Orange | Light Orange | Green | Light Orange | Light Orange |
| ATSOP - SEVCCI | Green | Light Orange | Light Orange | Light Orange | Green | Light Orange | Light Orange |
| ATSR_3 - SEVCCI | Green | Light Orange | Light Orange | Light Orange | Green | Light Orange | Light Orange |
| ATSR_3 - MOD11T | Green | Green | Green | Green | Green | Green | Green |
| ATSR_3 - MODIST | Green | Green | Green | Green | Green | Green | Green |
| MOD11T - SEVCCI | Green | Light Orange | Light Orange | Light Orange | Green | Light Orange | Light Orange |
| MODIST - ATSOP | Green | Green | Green | Green | Green | Green | Green |
| MODIST - SEVCCI | Green | Light Orange | Light Orange | Light Orange | Green | Light Orange | Light Orange |

SEVCCI: LST_cci SEVIRI product
 MOD11A: operational Aqua-MODIS product
 MOD11T: operational Terra-MODIS product
 ATSOP: operational AATSR LST product

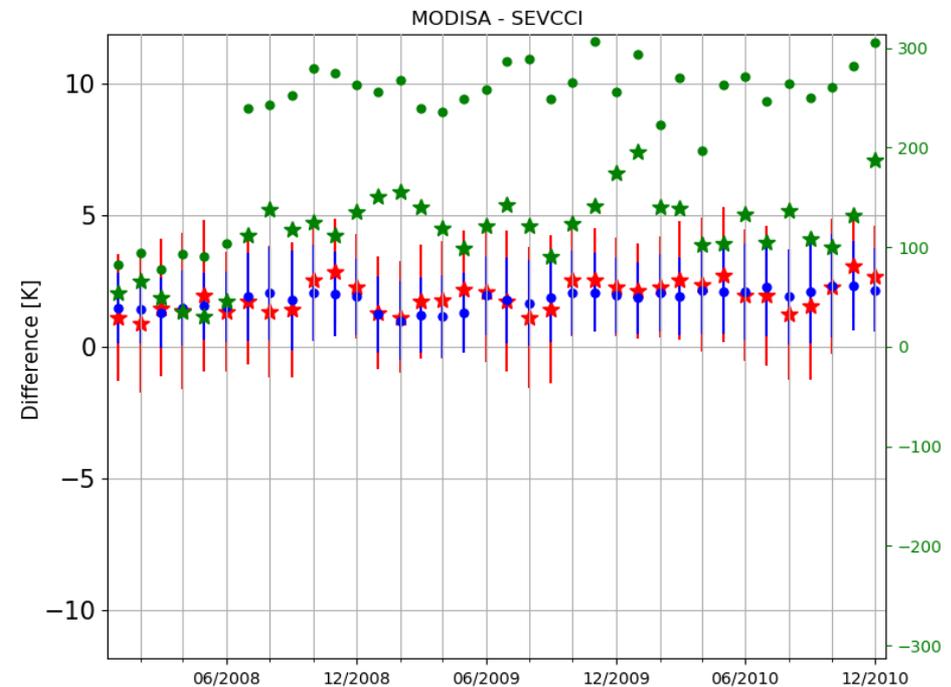
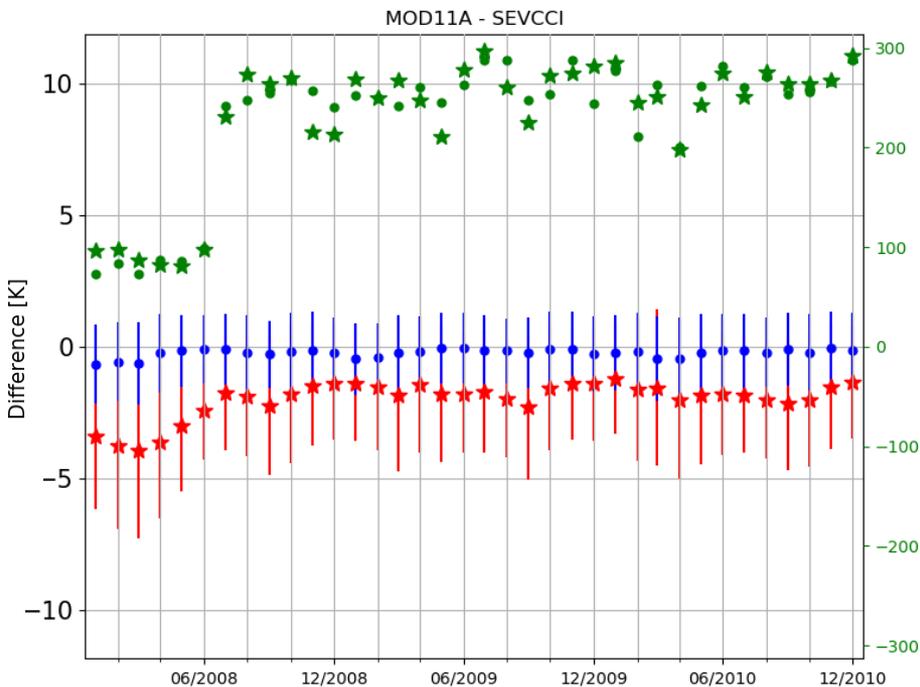
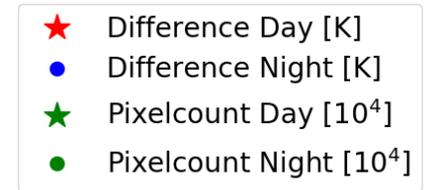
- In general good agreement
- MODIST – ATSOP: only few matches leading to larger differences



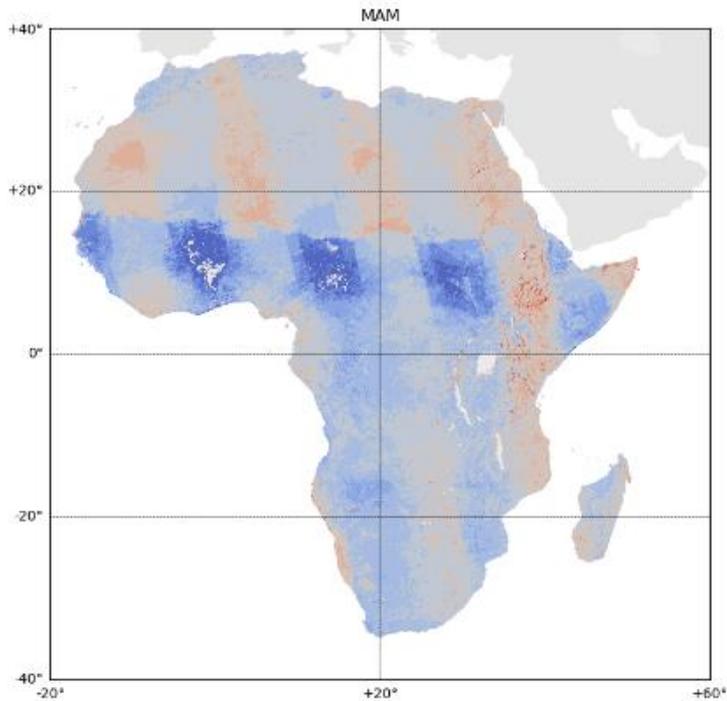
- Larger differences than during night
- ATSR_3 – MOD11T high differences, MOD11T – SEVCCI low differences:
low MOD11T LST values



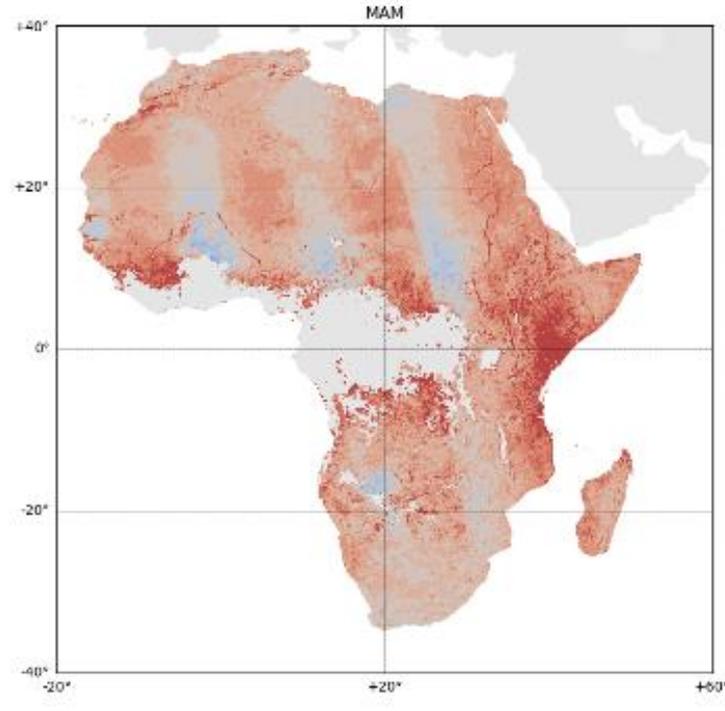
- **Monthly median(satellite1 LST – satellite2 LST)**
 - MOD11A – SEVCCI: larger negative differences during day
 - MODISA – SEVCCI: less data points during day



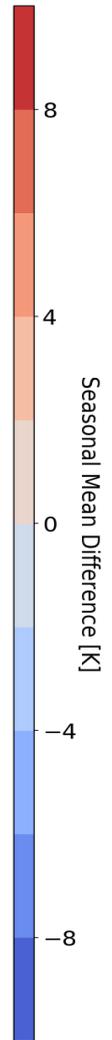
- Seasonal daytime mean (satellite 1 LST – satellite 2 LST) per pixel for MAM (March, April, May)
 - MOD11A – SEVCCI: Largest negative differences around 10° N
 - MODISA – SEVCCI: Largest positive differences around 0° N (due to small sampling size or cloud contamination)



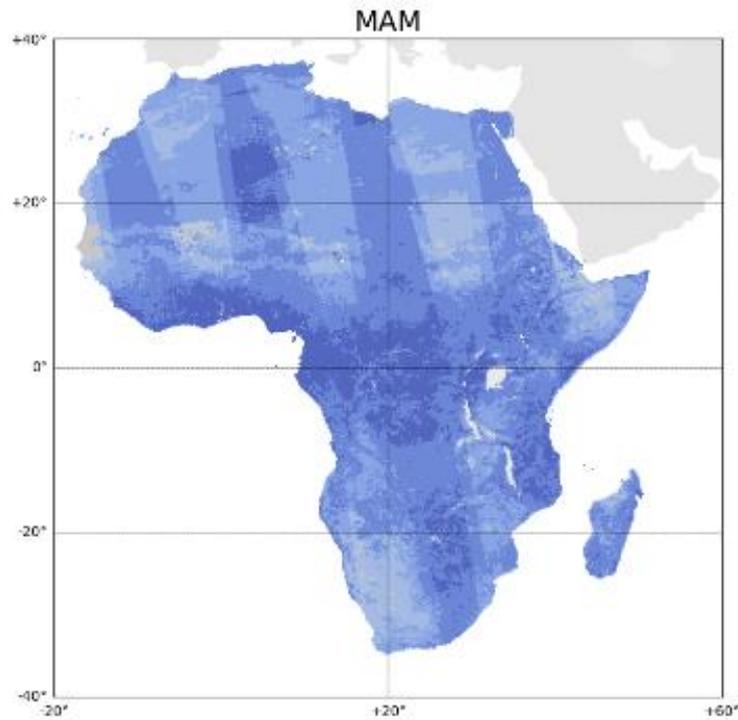
MOD11A - SEVCCI



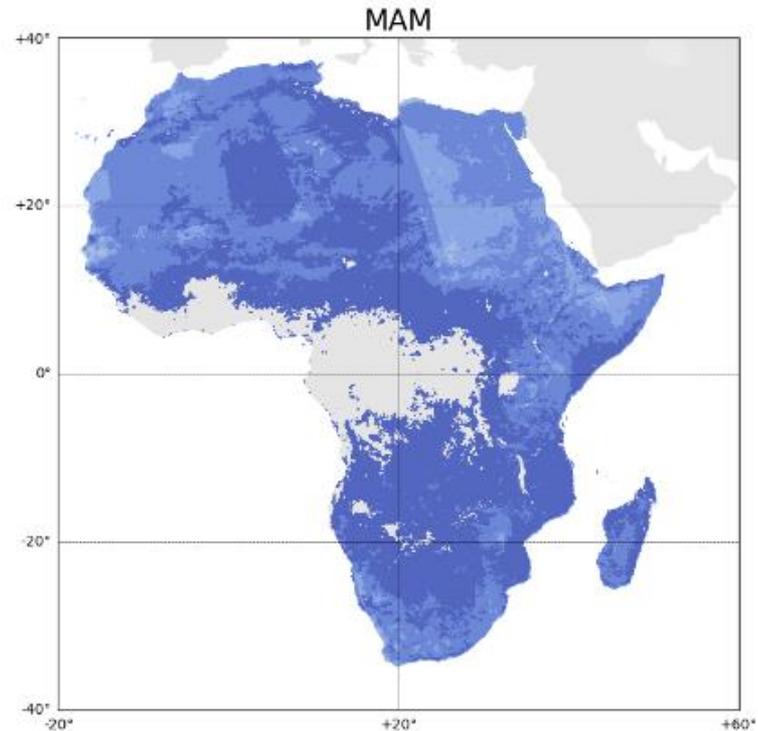
MODISA - SEVCCI



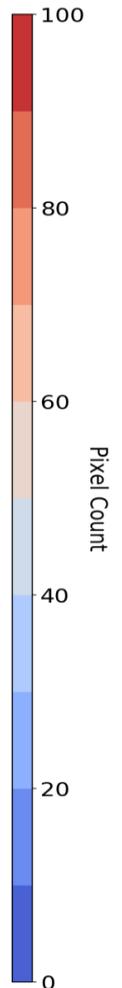
- Seasonal daytime count of matches per pixel for MAM
 - Few matches around equator



MOD11A - SEVCCI



MODISA - SEVCCI



- **In Situ Validation results:**
 - LST_cci products perform well, with larger variations in bias during day
 - Recommendations for improvements of data products were given to data producers

- **Intercomparison results:**
 - In general differences between data pairs are in an acceptable range
 - LST_cci products are more comparable with each other than with the operational products
 - Analysis of elevation classes, land cover classes, satellite angles (not shown) gives further insights in the results