

Quest: Quantitative Evaluation of Regional Precipitation Forecasts Using Multi-Dimensional Remote Sensing Observations

LME and LMK Long Term Evaluation with MSG SEVIRI

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## overview

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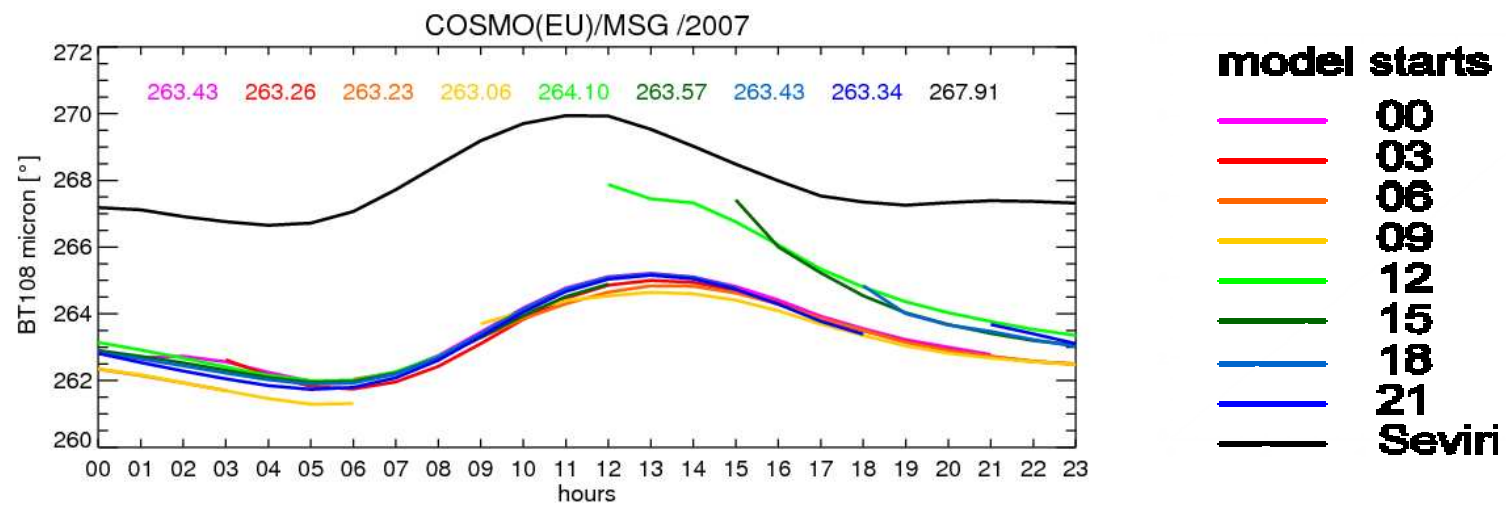
1. Long term evaluation of LMK/LME brightness temperatures (BT)
  - 2007-2008
  - BT 108 (cloud and surface pressure detection)
  - BT 062 (water vapor absorption higher troposphere)
  - Threshold based comparison 2008
    1. BT108 (non threshold)
    2. BT108 lower 260 K (cloud case)
    3. BT108 greater 260 K (cloud free)
2. Case study: Cloud Mask March / July 2007
  - LMK/LME cloud mask via MSG retrieval
    1. cloud free 12.03.2007
    2. cloudy 01.07.2007
3. Cloudtracking June 2008
4. Summery

**satellite** 

MSG ~ 5km; 15min

- cloud mask
- cloud top pressure CTP
- IR brightness temperature BT
- integrated water vapor

# 1. LTE LMK / LME - MSG year 2007-2008



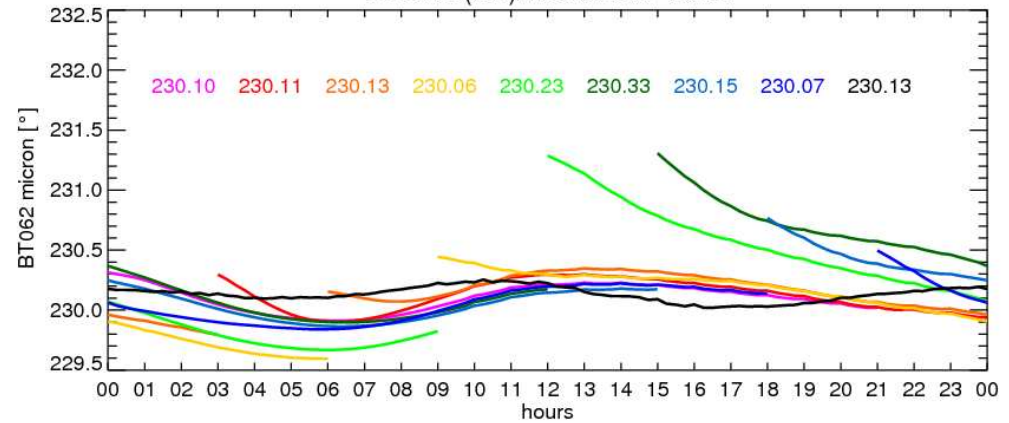
# LMK LTE BT diurnal cycle 2007-2008

Mean values in K:

BT	LMK	MSG	Bias	Rmse
IR108	261,8	265,8	-3,9	15,6
IR062	230,1	230,1	0	3,4
IR039	163,2	269,0	-5,7	15,5

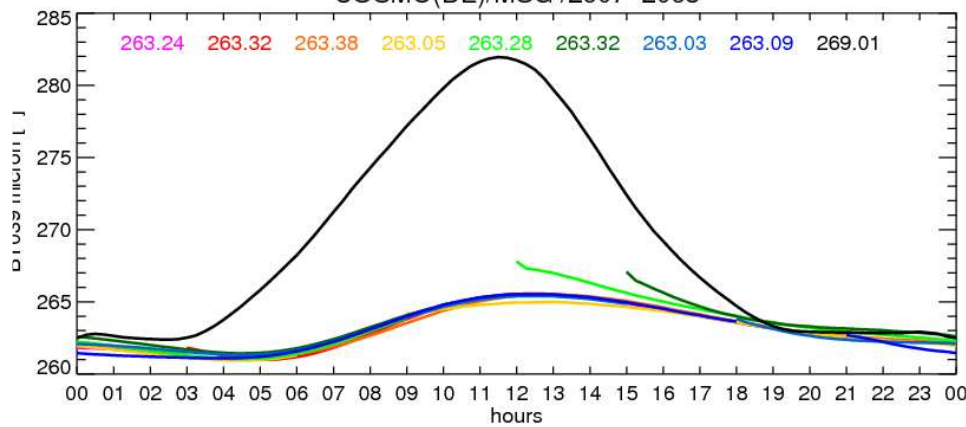
## IR 6,2 $\mu\text{m}$

COSMO(DE)/MSG /2007-2008



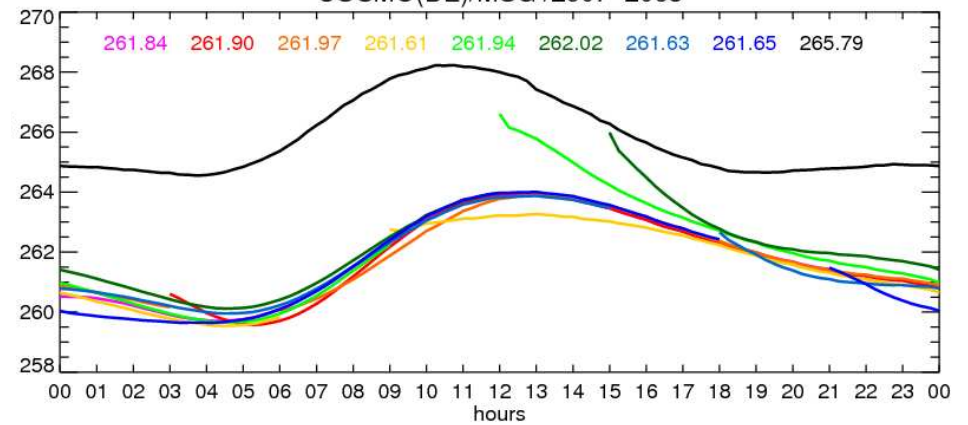
## IR3,9 $\mu\text{m}$

COSMO(DE)/MSG /2007-2008



## IR10,8 $\mu\text{m}$

COSMO(DE)/MSG /2007-2008

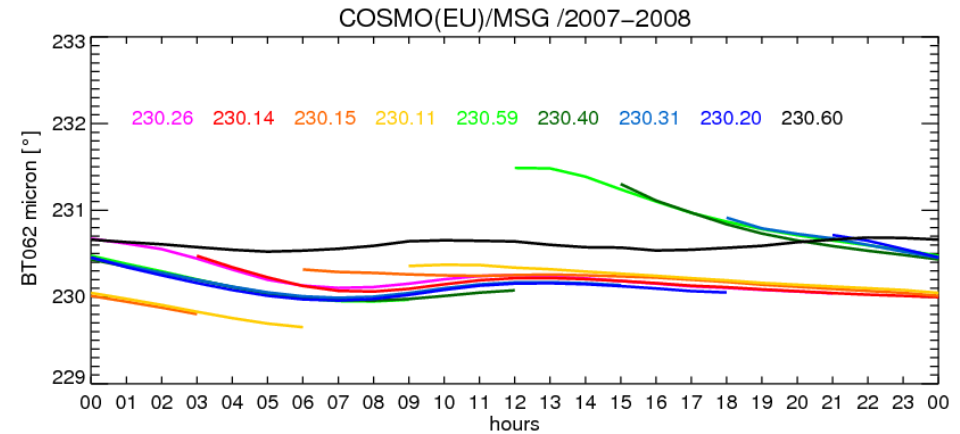


# LME LTE BT diurnal cycle 2007-2008

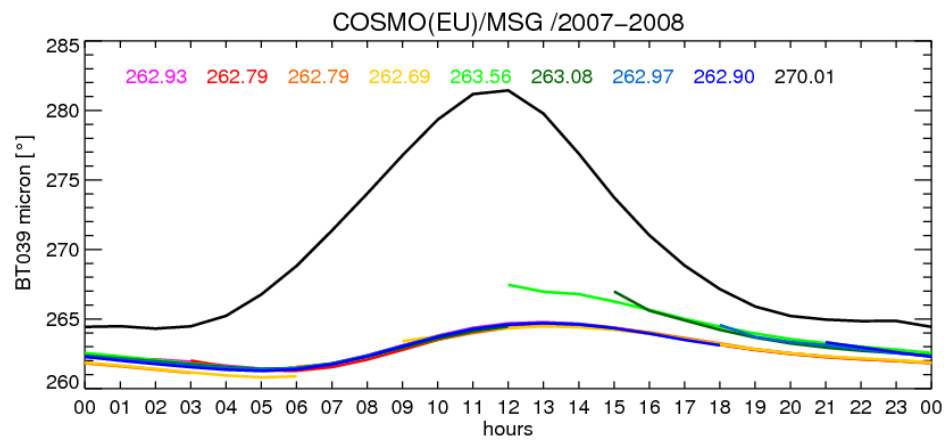
Mean values in K:

BT	LME	MSG	Bias	Rmse
IR108	261,4	267,6	-6,1	17,4
IR062	230,3	230,6	-0,3	3,8
IR039	263	270,0	-7	17,1

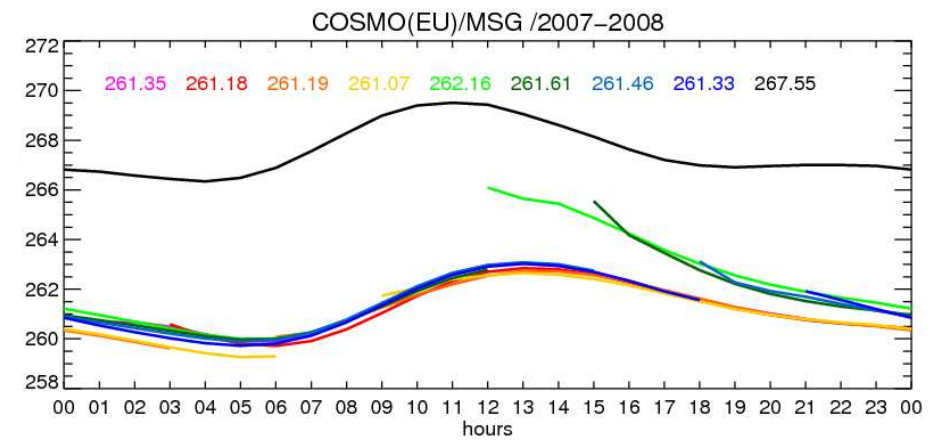
## IR 6,2 $\mu\text{m}$



## IR 3,9 $\mu\text{m}$



## IR10,8 $\mu\text{m}$

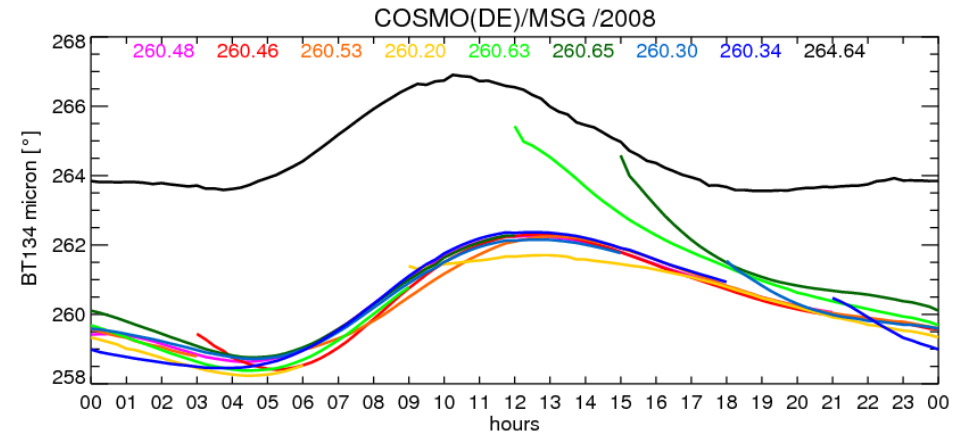


# threshold based evaluation BT 108 LMK 2008

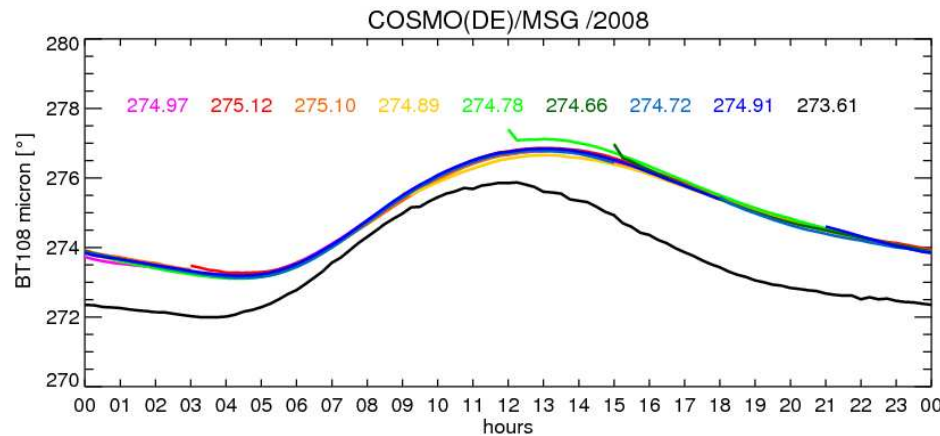
BT108 threshold : 260 K

BT	LMK	MSG	Bias	Rmse
A :	260,2	264,6	-4,3	16,1
B :	239,5	246,3	-7,5	14,5
C :	274,6	273,6	1,0	6,6

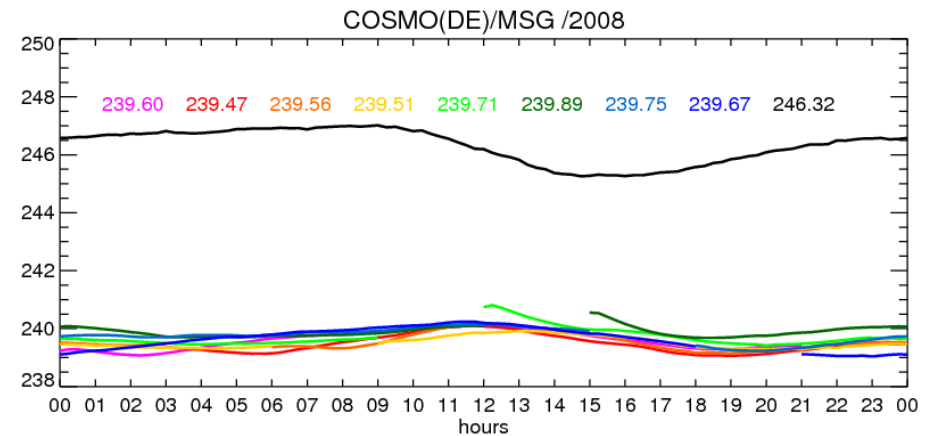
A : no threshold



C : values greater than 260 K



B : values lower than 260 K

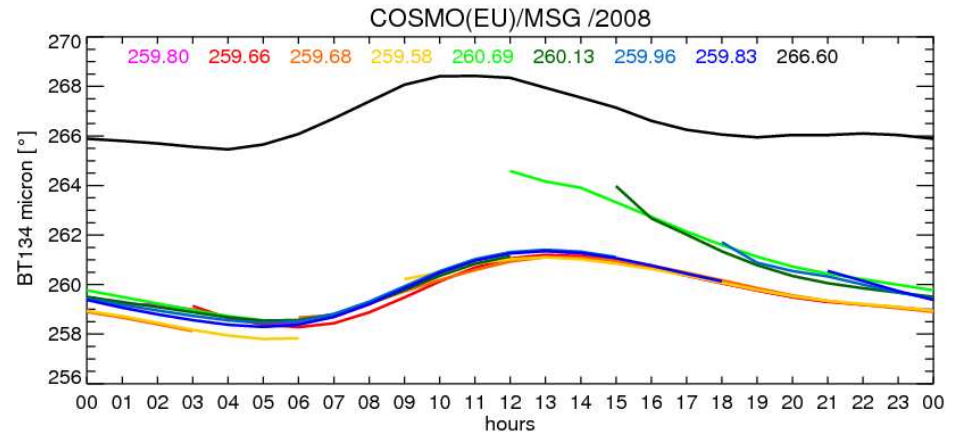


# threshold based evaluation BT 108 LME 2008

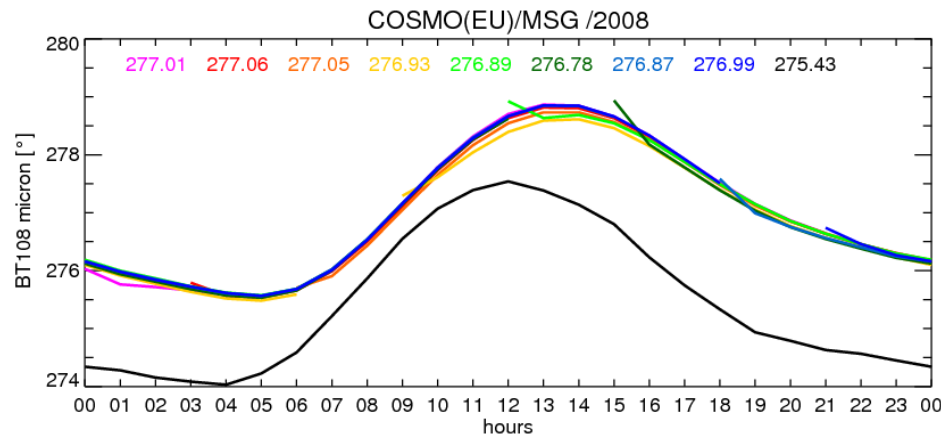
BT108 threshold : 260 K

BT	LME	MSG	Bias	Rmse
A :	260	266,6	-6,4	17,7
B :	236,7	245,1	-10,2	16,3
C :	277,4	275,4	0,8	6,8

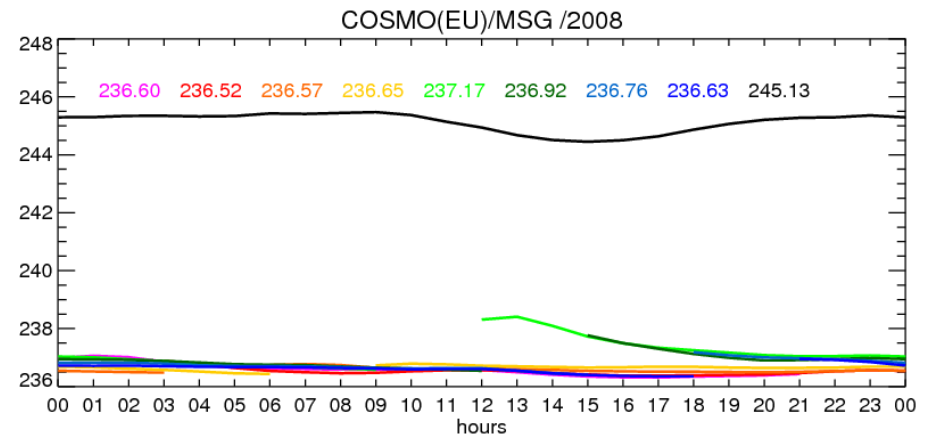
A : no threshold



C : values greater than 260 K



B : values lower than 260 K

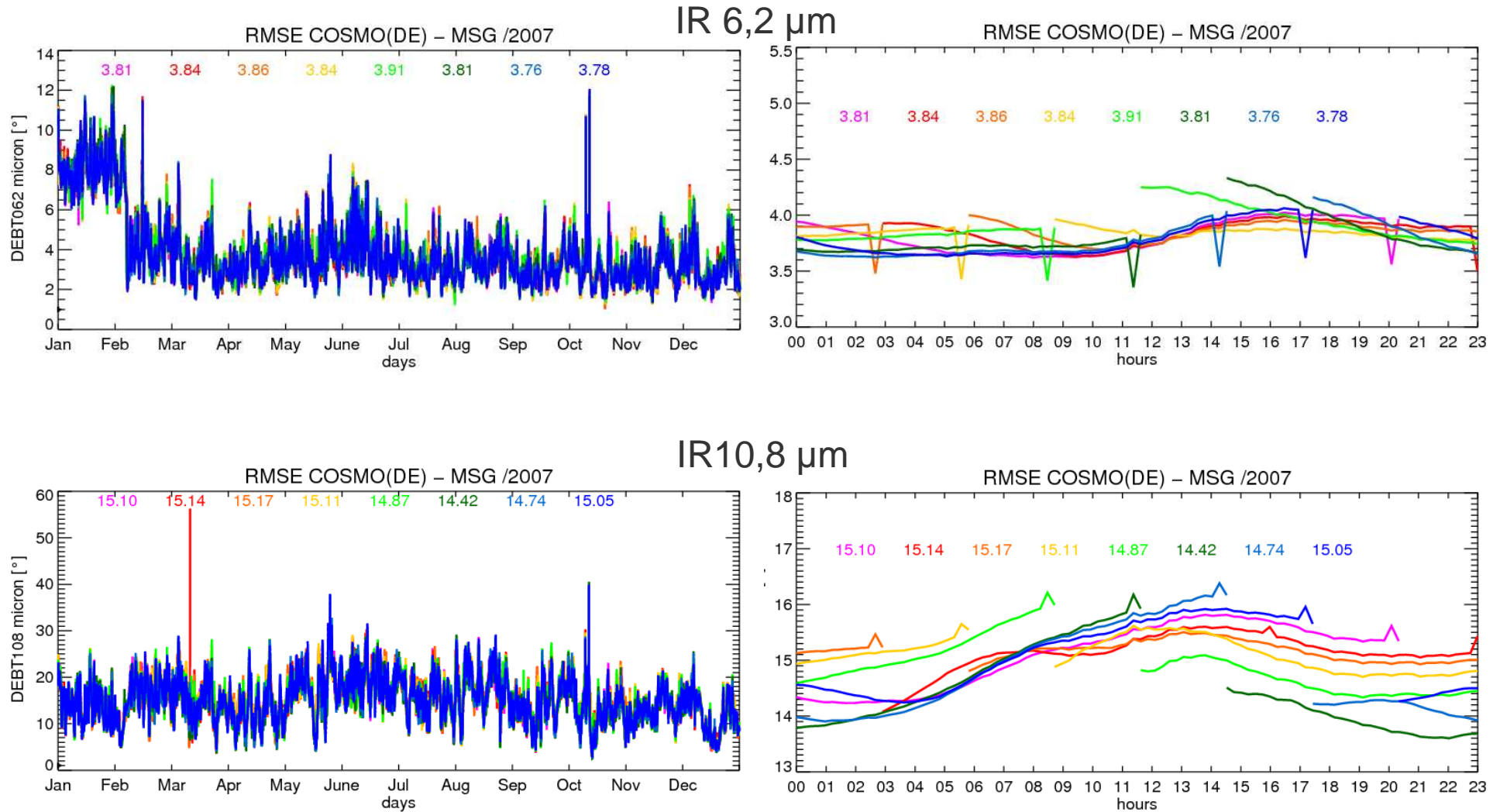


## LMK/LME mean values 2007-2008

BT	LMK/LME	MSG	Bias	RMSE
IR134	246,9 +- 0,2 246,6 +- 0,5	248,9 250,0	-2,0 +- 0,2 -3,4 +- 0,6	10,0 +- 0,1 11,2 +- 0,2
IR120	261,0 +- 0,2 260,6 +- 0,8	264,9 266,6	-3,8 +- 0,4 -5,9 +- 0,9	15,4 +- 0,2 17,2 +- 0,3
IR108	261,8 +- 0,2 261,4 +- 0,7	265,8 267,6	-3,9 +- 0,4 -6,1 +- 0,9	15,6 +- 0,3 17,4 +- 0,4
IR097	237,2 +- 0,2 237,3 +- 0,3	241,9 243,0	-4,6 +- 0,2 -5,7 +- 0,4	8,8 +- 0,1 10,0 +- 0,2
IR087	260,9 +- 0,2 260,6 +- 0,7	263,8 265,5	-2,8 +- 0,4 -4,8 +- 0,8	14,4 +- 0,2 16,0 +- 0,3
WV073	243,2 +- 0,3 243,0 +- 0,5	246,2 246,9	-2,9 +- 0,2 -3,9 +- 0,5	7,6 +- 0,1 8,6 +- 0,2
WV062	230,1 +- 0,2 230,3 +- 0,3	230,1 230,6	0,0 +- 0,2 -0,3 +- 0,3	3,4 +- 0,1 3,8 +- 0,03
IR039	263,2 +- 0,2 263,0 +- 0,6	269,0 270,0	-5,7 +- 1,5 -7,0 +- 1,5	15,5 +- 0,6 17,1 +- 0,6



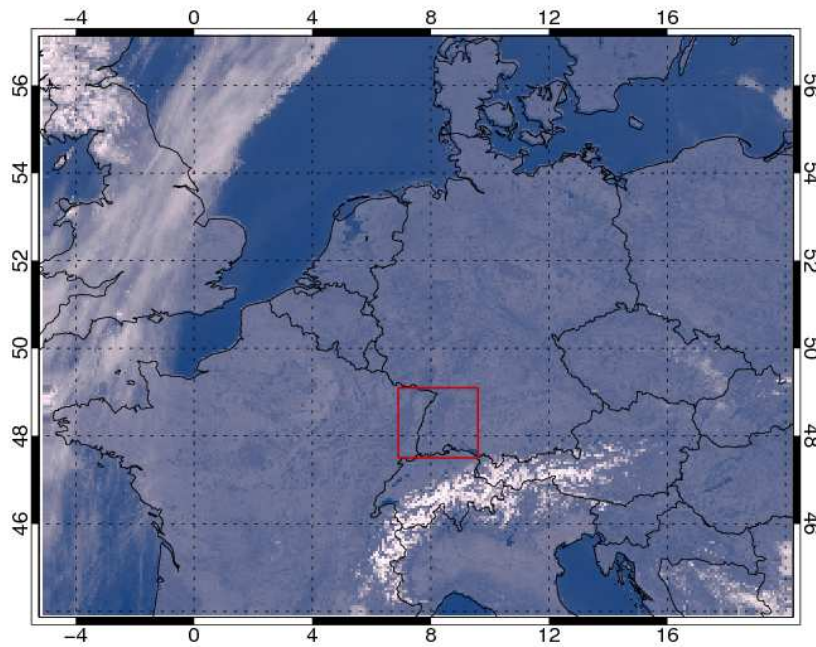
# LMK long term BT cycle 2007 RMSE



# Cases

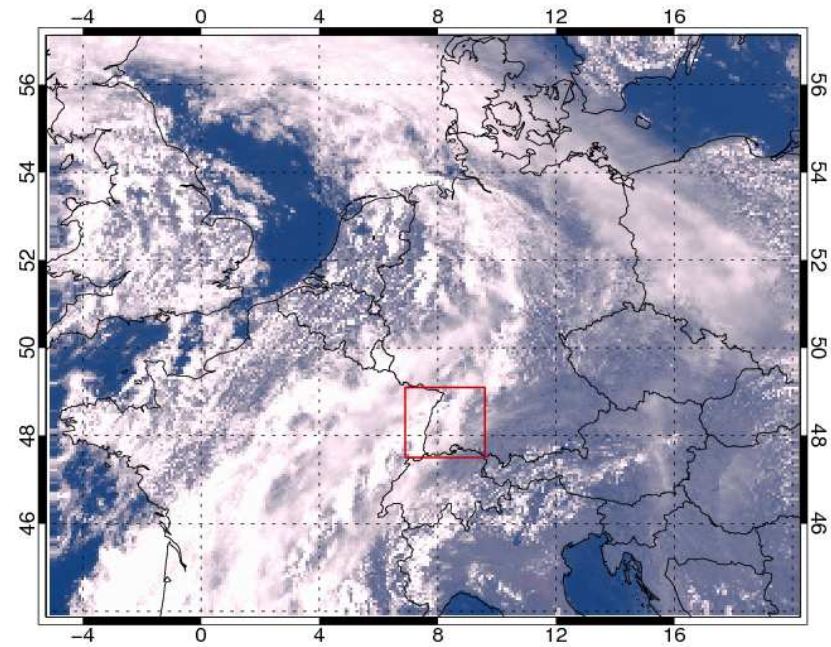
## 2. Case Studies

12/03/2007



cloudfree

01/07/2007

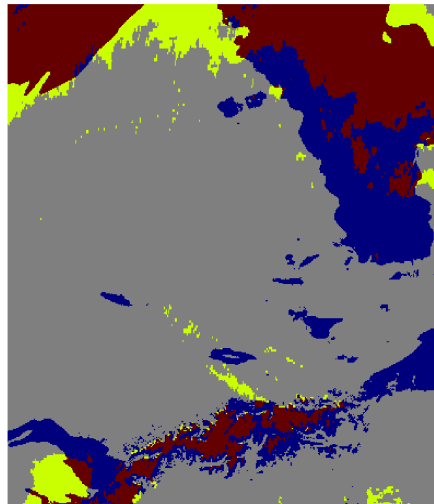


cloudy / convective

## MSG cloud mask retrieval

- MSG cloud mask retrieval
  - channels at night : IR134, IR120, IR108, IR087, IR039
  - during day plus visible channels (not available for LMK/LME)
- > no additional Input of MSG at night necessary
  
- introducing a threshold : if probability of cloud equal or higher 90 %
  - > pixel cloudy

-> overlap



cloud?  
LMK/MSG

no/no

yes/no

no/yes

yes/yes

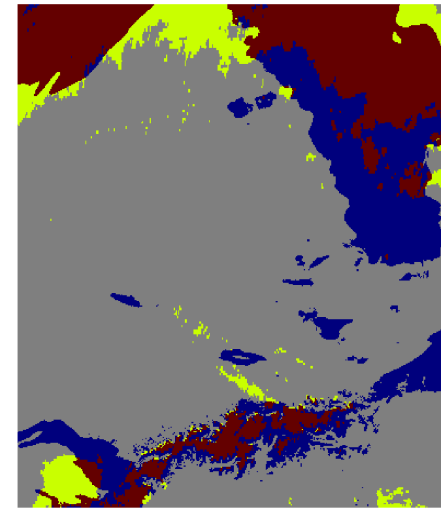
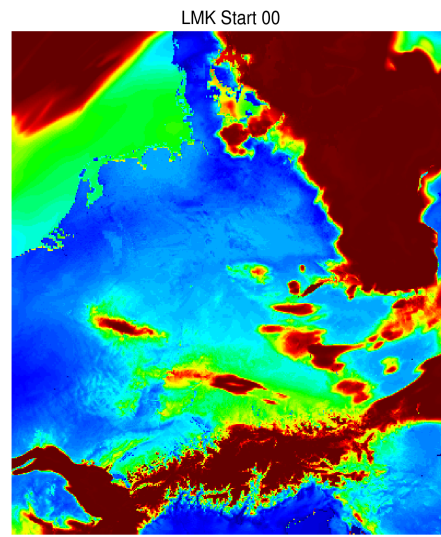
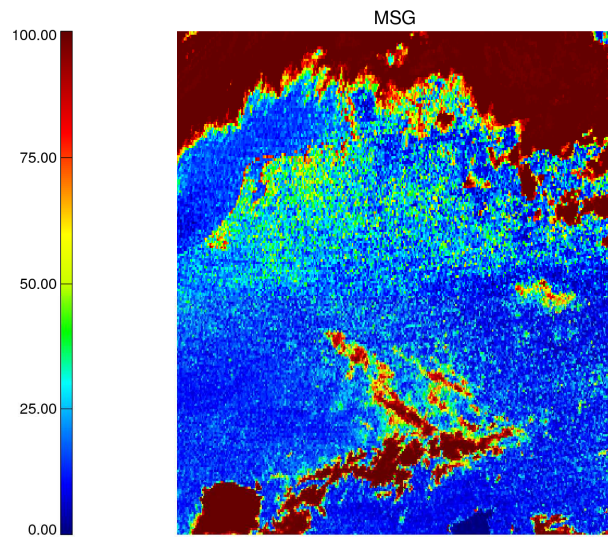
12/03/2007 LMK

MSG

LMK 00

overlap

cloud?  
LMK/MSG



no/no

yes/no

no/yes

yes/yes

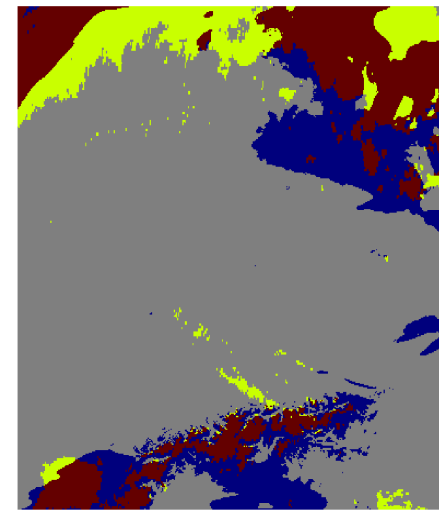
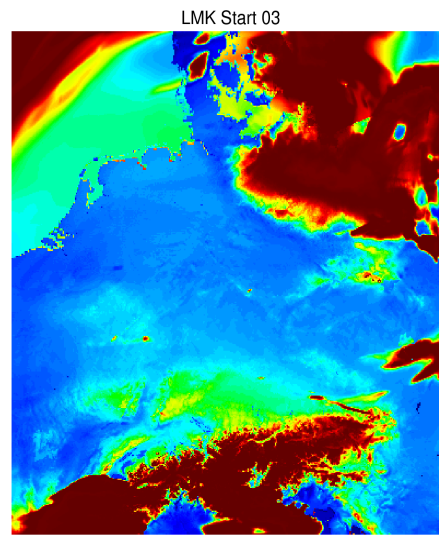
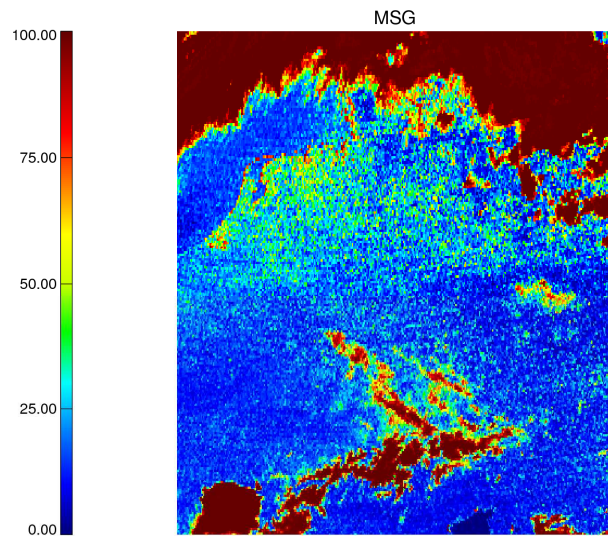
12/03/2007 LMK

MSG

LMK 03

overlap

cloud?  
LMK/MSG



no/no

yes/no

no/yes

yes/yes

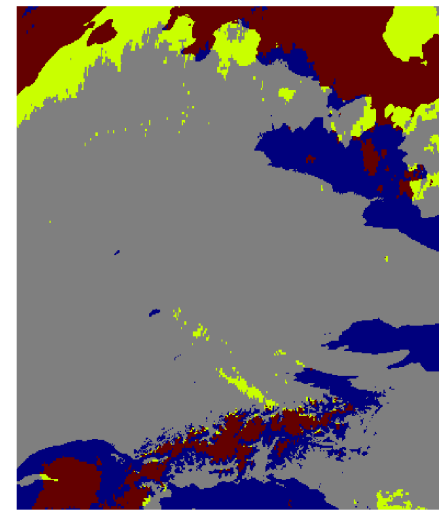
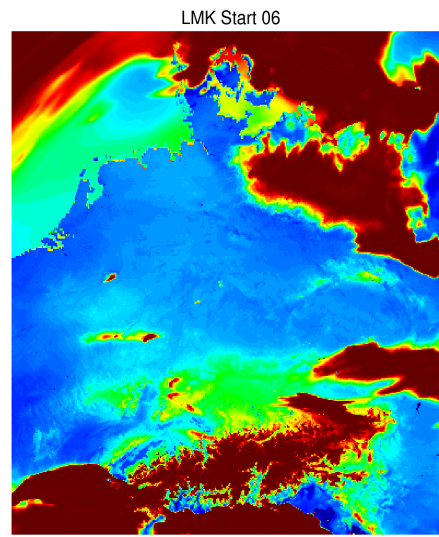
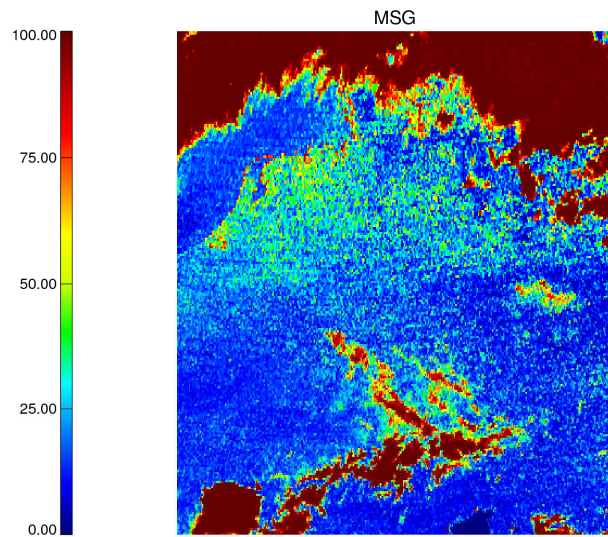
12/03/2007 LMK

MSG

LMK 06

overlap

cloud?  
LMK/MSG



no/no

yes/no

no/yes

yes/yes

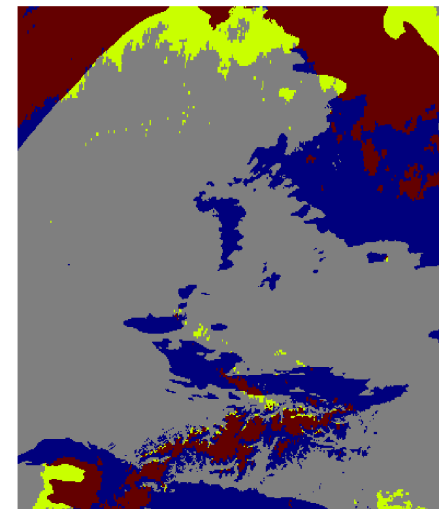
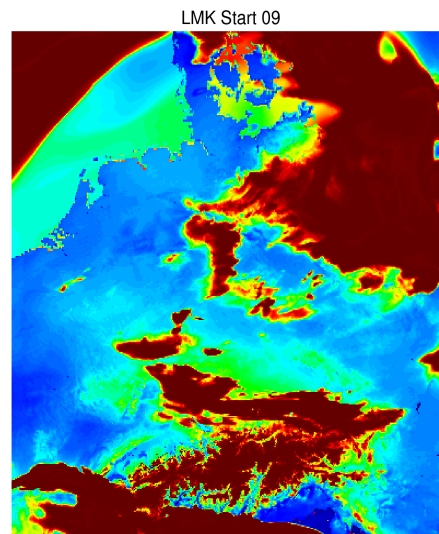
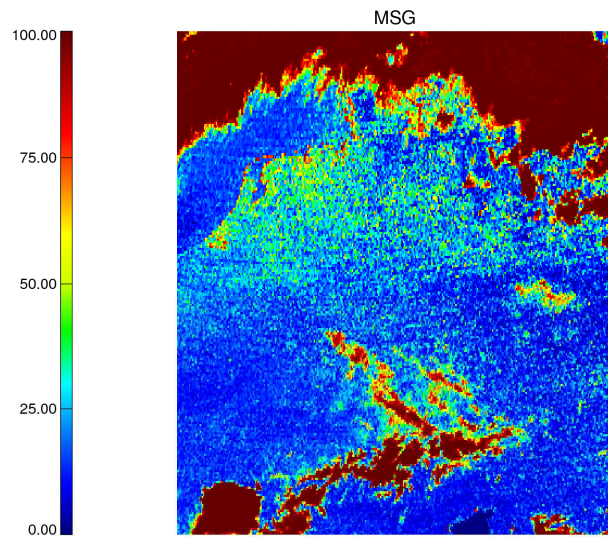
12/03/2007 LMK

MSG

LMK 09

overlap

cloud?  
LMK/MSG



no/no

yes/no

no/yes

yes/yes

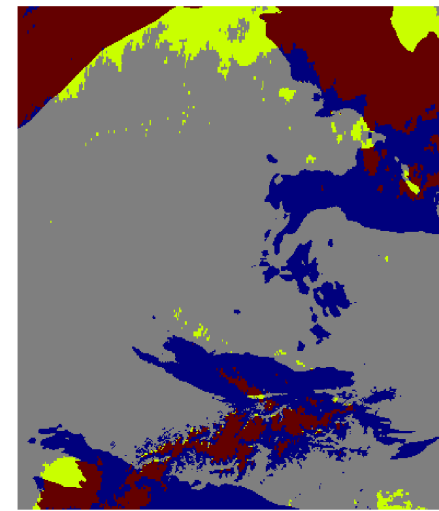
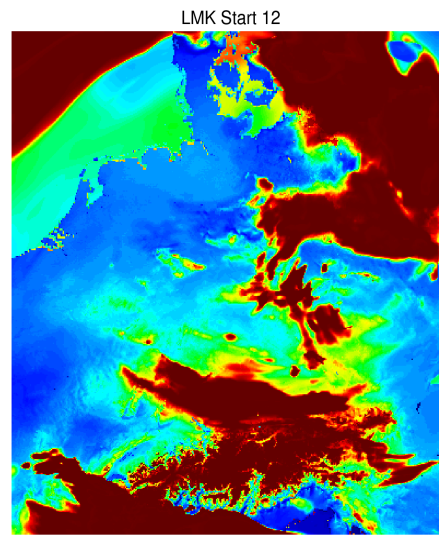
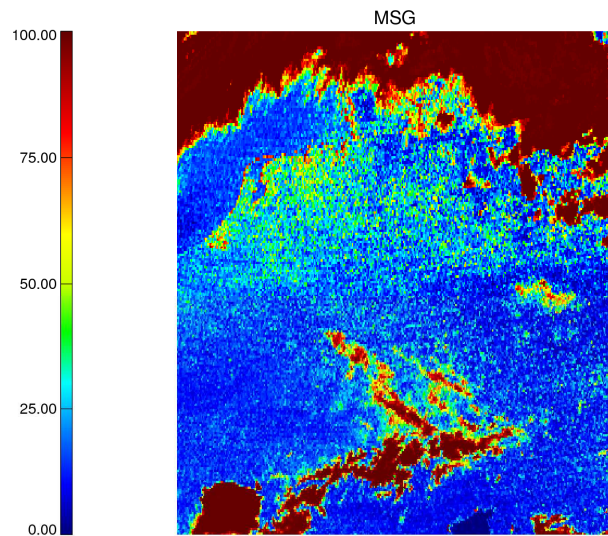
12/03/2007 LMK

MSG

LMK 12

overlap

cloud?  
LMK/MSG



no/no

yes/no

no/yes

yes/yes



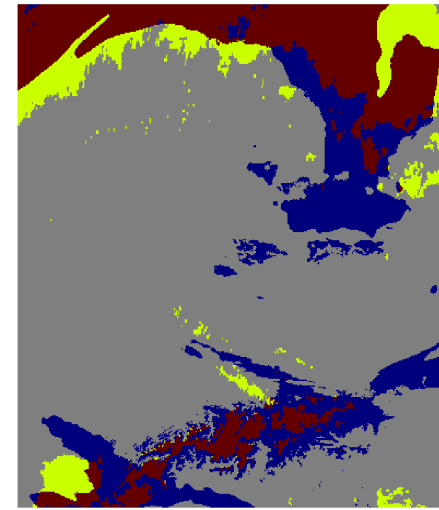
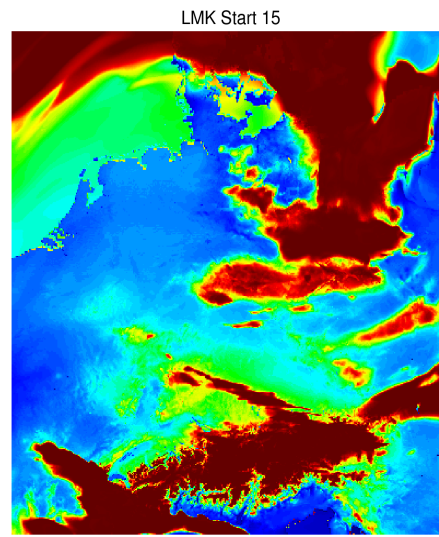
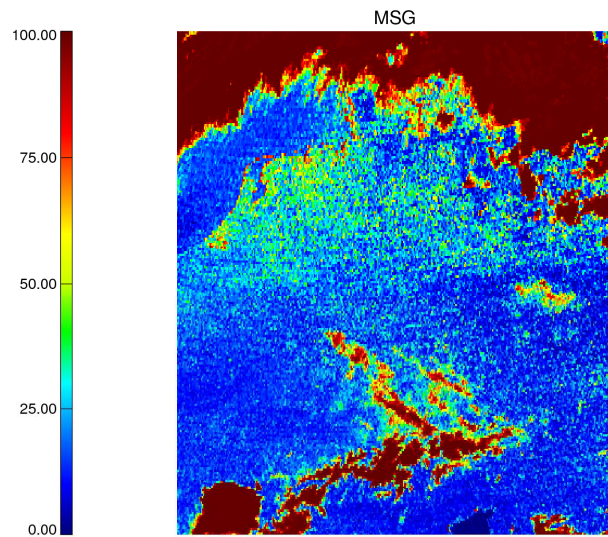
12/03/2007 LMK

MSG

LMK 15

overlap

cloud?  
LMK/MSG



no/no

yes/no

no/yes

yes/yes

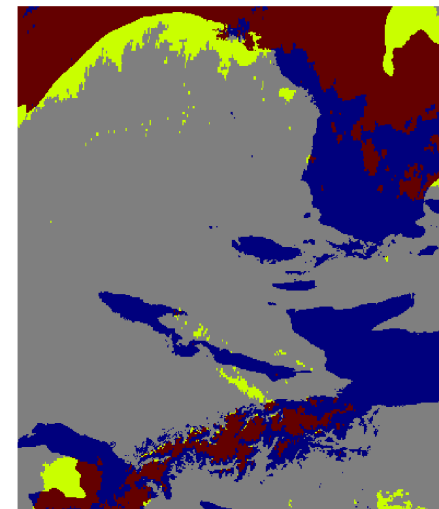
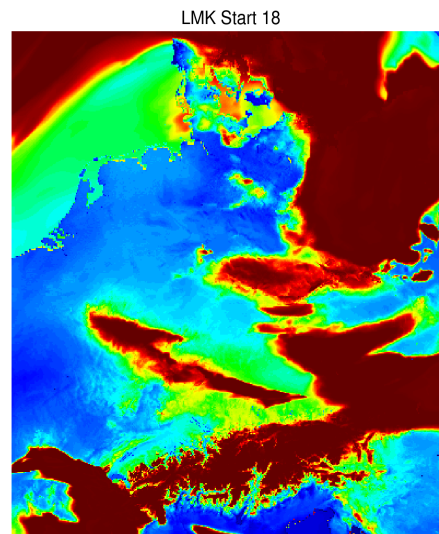
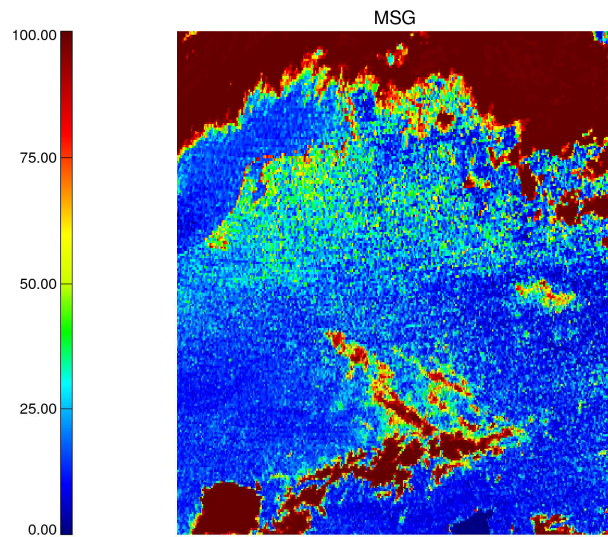
12/03/2007 LMK

MSG

LMK 18

overlap

cloud?  
LMK/MSG



no/no

yes/no

no/yes

yes/yes

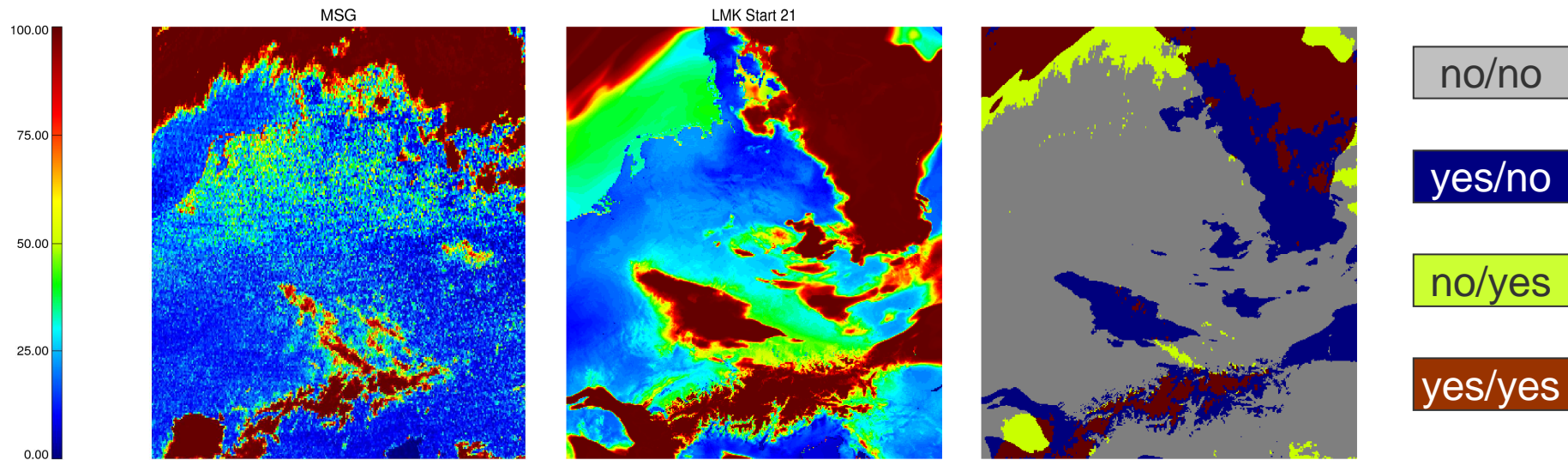
12/03/2007 LMK 21

MSG

LMK 21

overlap

cloud?  
LMK/MSG



mean values: 64% 14,5% 6,4% 13,7%

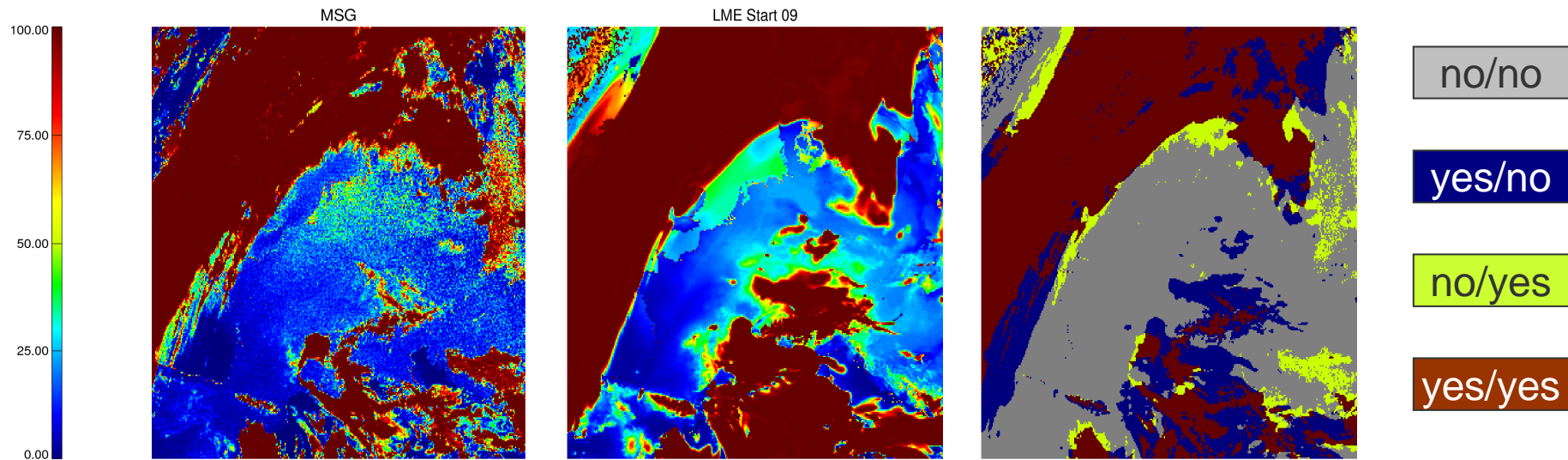
12/03/2007 LME

MSG

LME 09

overlap

cloud?  
LME/MSG



mean values:

42,6%

16,5%

7,2%

33,2%

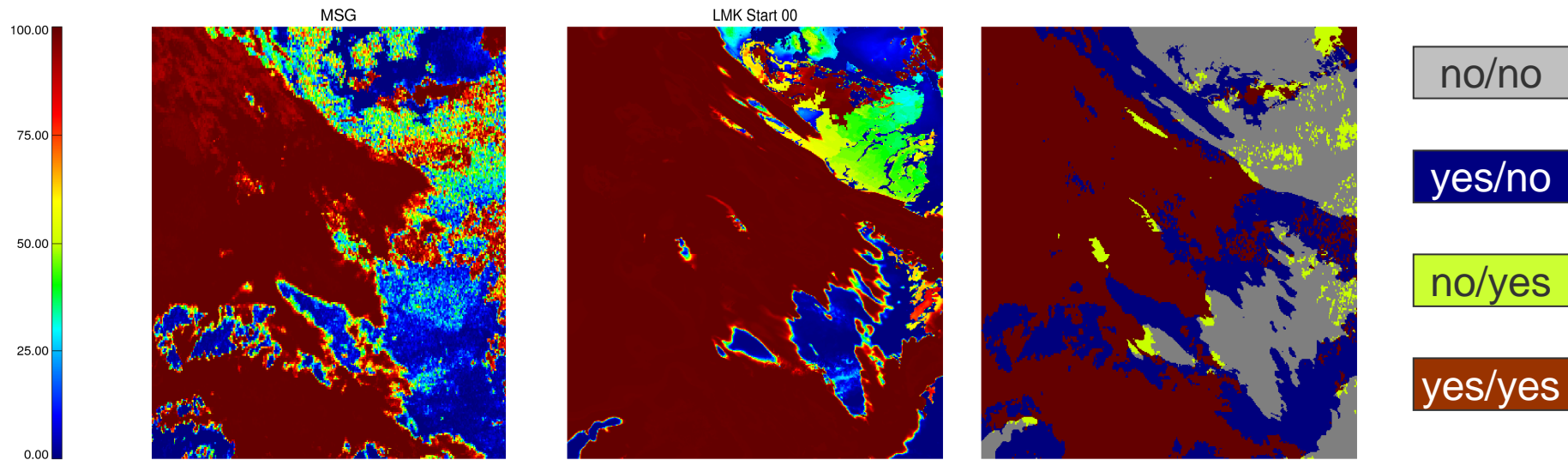
01/07/2007 LMK

MSG

LMK 00

overlap

cloud?  
LMK/MSG



mean values: 26,1% 19,8% 4,4% 46,9%

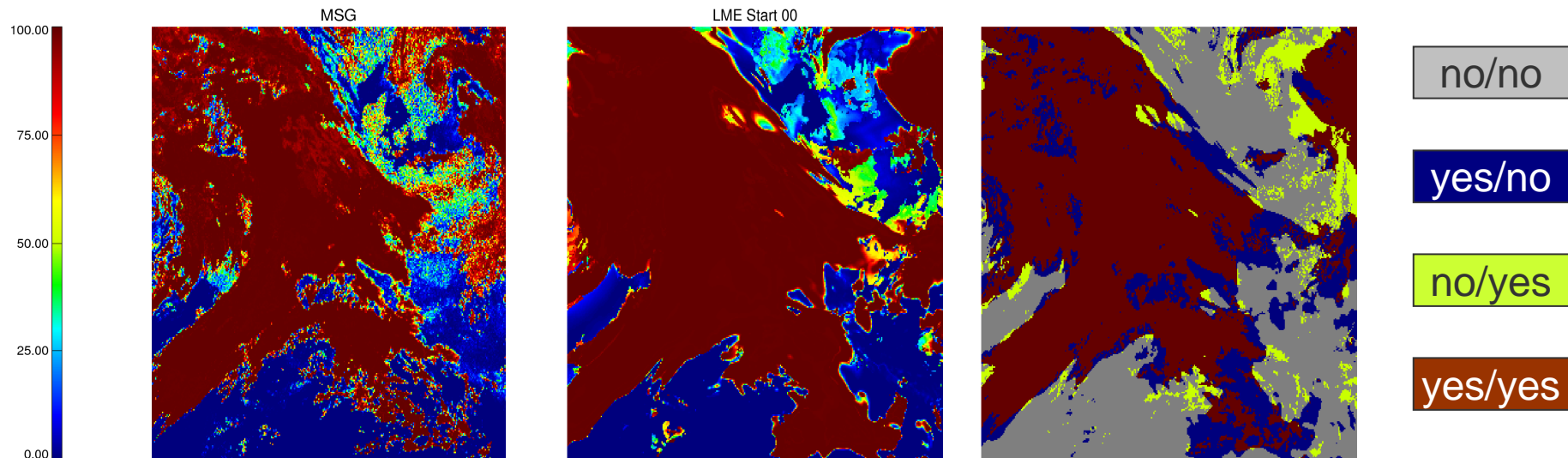
01/07/2007 LME

MSG

LME 00

overlap

cloud?  
LME/MSG



mean values: 28,2% 18,4% 5,2% 47,1%

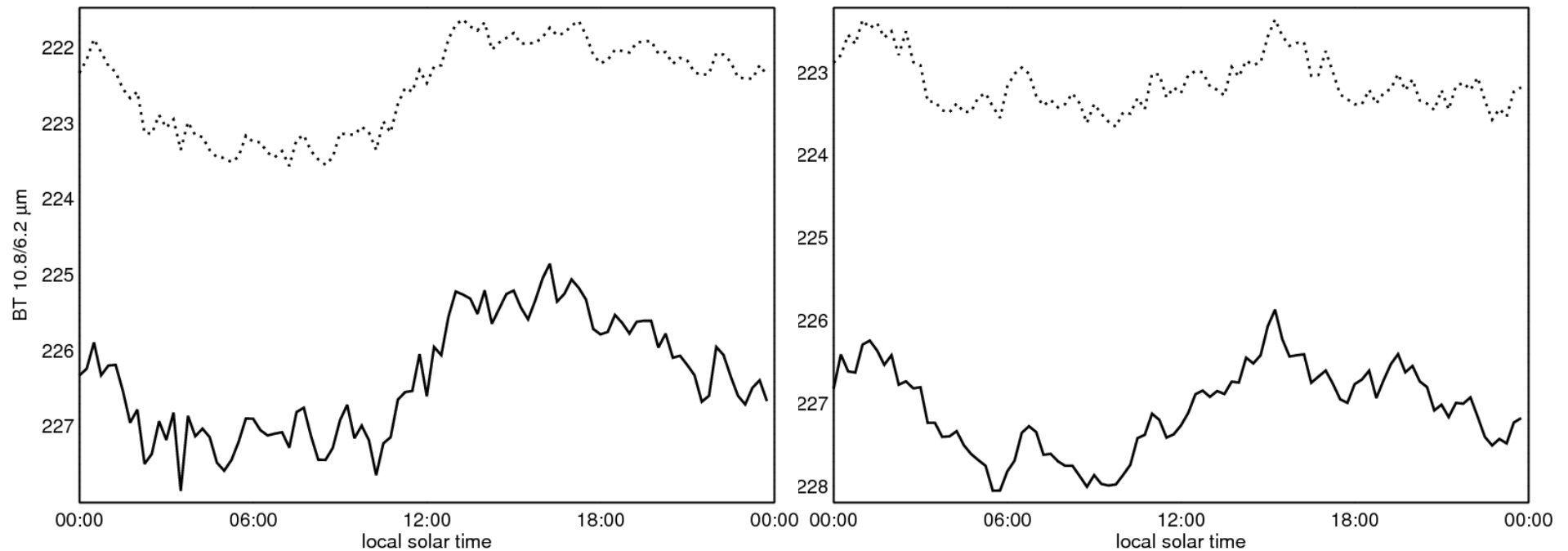
# Cloud Tracking June 2008

Mean diurnal cycle of WV062 and BT108 brightness temperatures of all tracked clouds in June 2008 for MSG and LMK.

... WV062  
 --- IR108

MSG

LMK



## LMK Longterm Summery

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- BT 10.8  $\mu\text{m}$  (clouds) , 6.2 $\mu\text{m}$  (water vapor absorption)
  - over all years 2007-2008 all BT's show a diurnal cycle
  - 10.8  $\mu\text{m}$  bias of LMK is negative -> indicates more or higher clouds
    - strong depnedence of bias and rmse due to a threshold value
    - no threshold: neg bias -> to much or to high clouds in LMK/LME
    - bt108 lower thresh : strong neg. bias -> to high clouds
    - bt108 greater thresh : low and positive bias -> MSG more clouds
      - -> LMK / LME -> overestimating of the height of clouds
  - 6.2  $\mu\text{m}$  bias is overall positive -> less water vapor in LMK/LME
  - 3.9  $\mu\text{m}$  : significantly underestimation of diurnal cycle during noon
  - high startup values , esp. for then 12 UTC and 15 UTC start runs
  - phase shifting up to -2 hours
  - bias and rmse of LME constantly bigger in all Channels than LMK bias and rmse



## Case study Summery

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- 12/03/2007
  - LMK / LME : overestimating of clouds over poland
  - LME frontal zone over UK is been well forecasted
- 01/07/2007
  - frontal zone is well forecasted in place and time
  - LME/LMK forecast more and higher clouds
- agreements in around 75-80 percent
- disagreement show significant overestimation of cloudy pixel
  - yes/no to no/yes cases -> 20% to 5%