



DEPARTMENT OF EARTH AND  
ENVIRONMENTAL SCIENCES  
K.U.LEUVEN - BELGIUM



# The impact of the African Great Lakes on the regional climate in a dynamically downscaled CCLM CORDEX simulation

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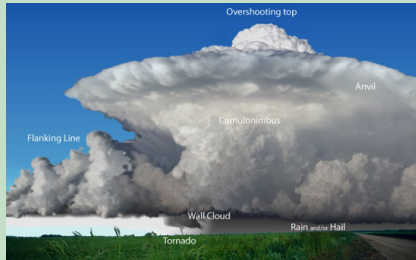
<sup>2</sup> IMK-TRO, Karlsruhe Institute of Technology, Germany

<sup>3</sup> IACETH, Swiss Federal Institute of Technology, Switzerland



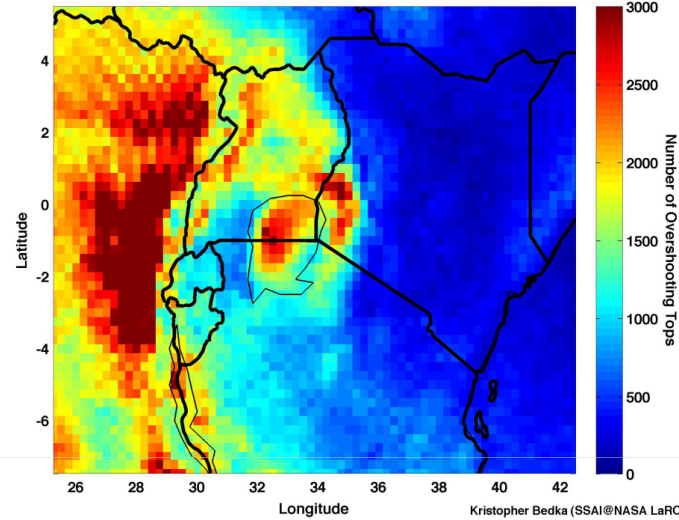


# Motivation and objectives



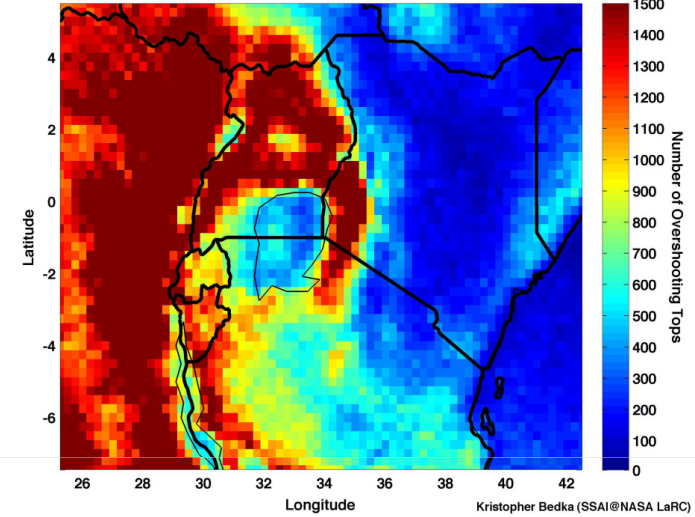
(severe-wx.pbworks.com)

2005-2009 SEVIRI Overshooting Top Detections, 0.25 deg Grid: Total



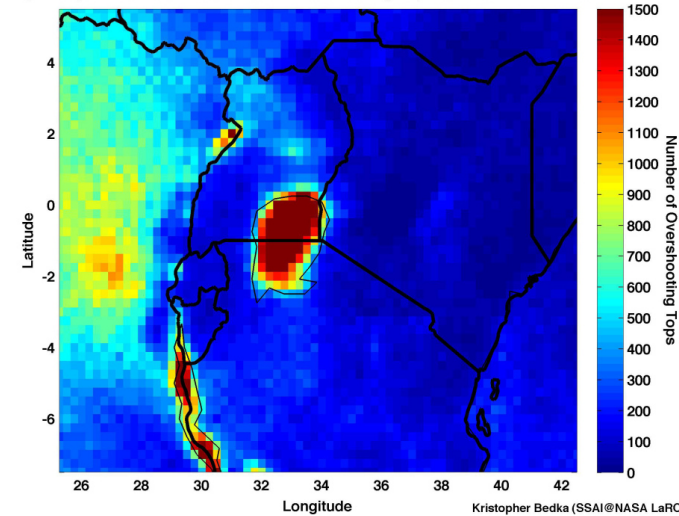
Kristopher Bedka (SSAI@NASA LaRC)

2005-2009 SEVIRI Overshooting Top Detections, 0.25 deg Grid: 9 AM - 9 PM



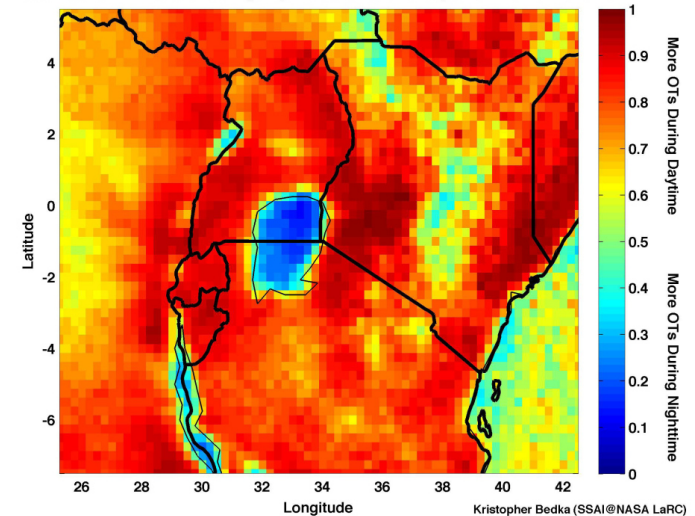
Kristopher Bedka (SSAI@NASA LaRC)

April-September 2004-2009 Gridded Overshooting Top Detections: 9 PM to 9 AM



Kristopher Bedka (SSAI@NASA LaRC)

2005-2009 SEVIRI Overshooting Top Detections, 0.25 deg Grid: Diurnal Behavior



Kristopher Bedka (SSAI@NASA LaRC)

(Bedka, pers. comm.)



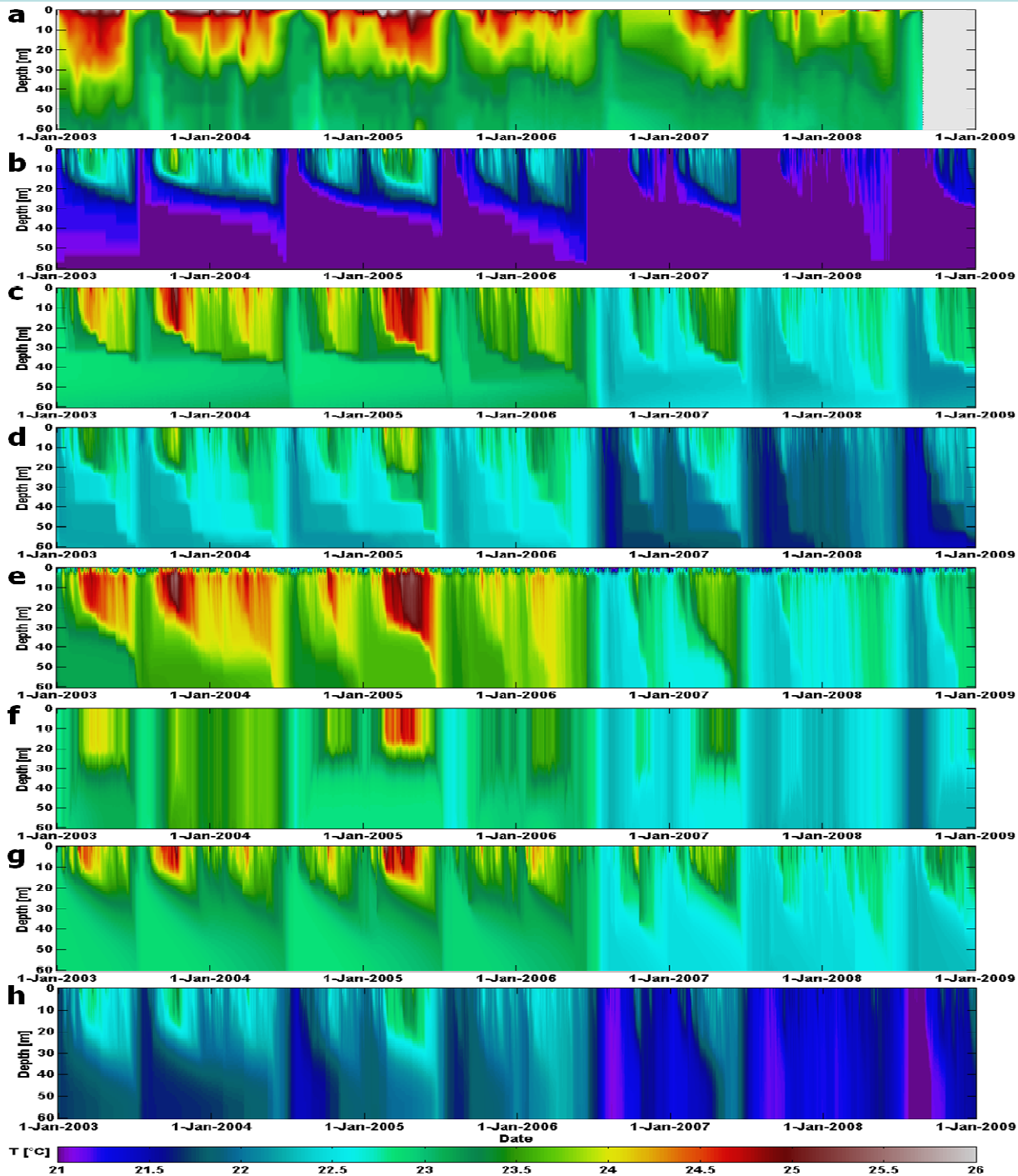
# Motivation and objectives



(Lake Kivu)

**best model configuration?**

**impact?**



observations

Hostetler

LAKEoneD

SimStrat

LAKE

Although  $T_{bot}$  is extremely sensitive to extpar and forcing,  $T_{surf}$  predictions are robust (Thiery et al., GMD 2014)

FLake

MINLAKE2012

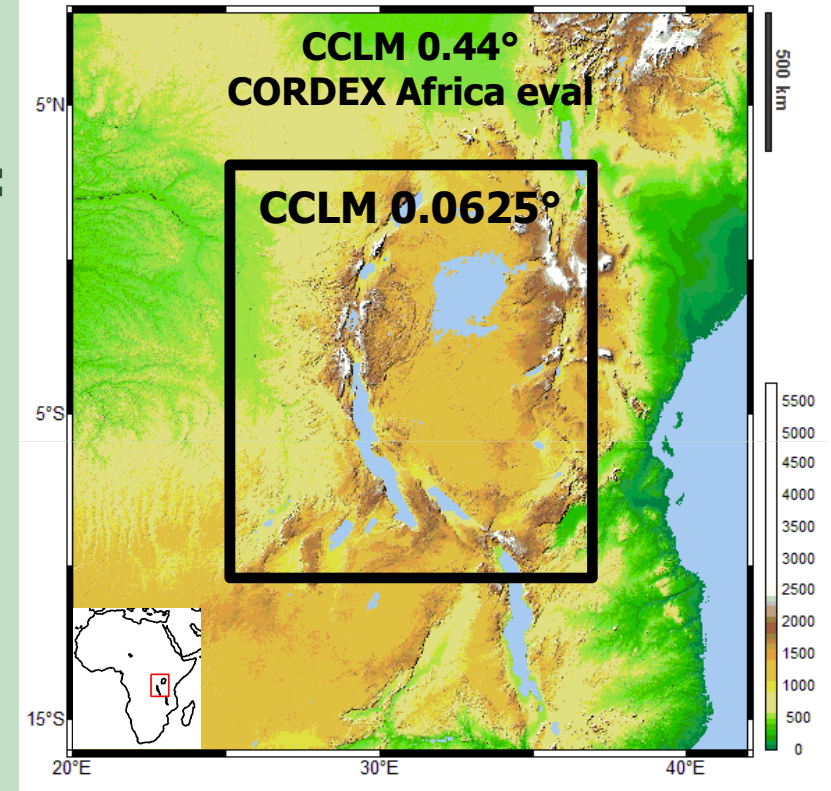
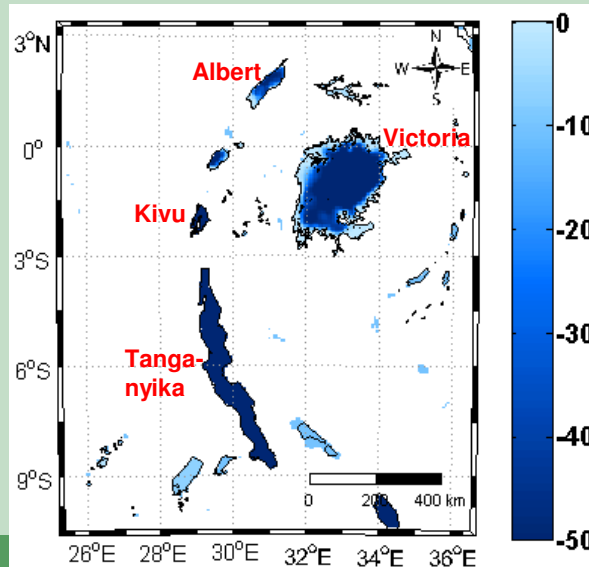
CLM4-LISSS

(Thiery et al., TA 2014)



## Model setup

- AGLs
- 0.062°, 180 x 220 grid points
- Tested >15 configurations, of which:
  - CCLM SST
  - CCLM FLake
  - CCLM<sup>2</sup> (Davin & Seneviratne, BG 2012)
- LBC by CORDEX Africa evaluation simulation 0.44° (Panitz et al., CD 2013)
- 2002



Lake bathymetry  
in FLake [m]

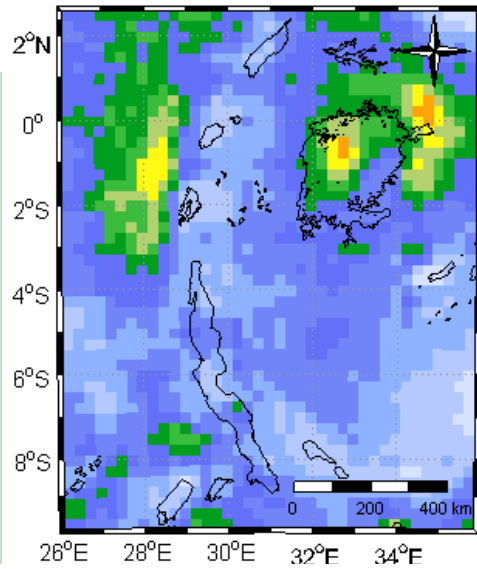


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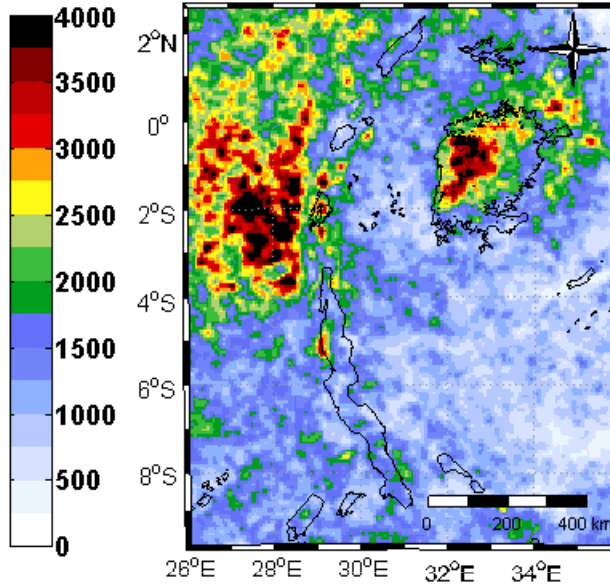
content

# Model evaluation

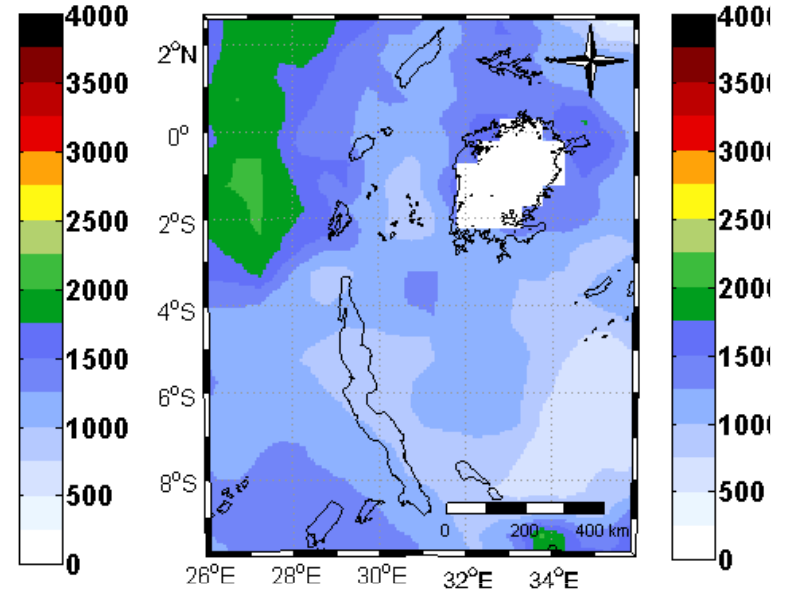
### TRMM 3B42



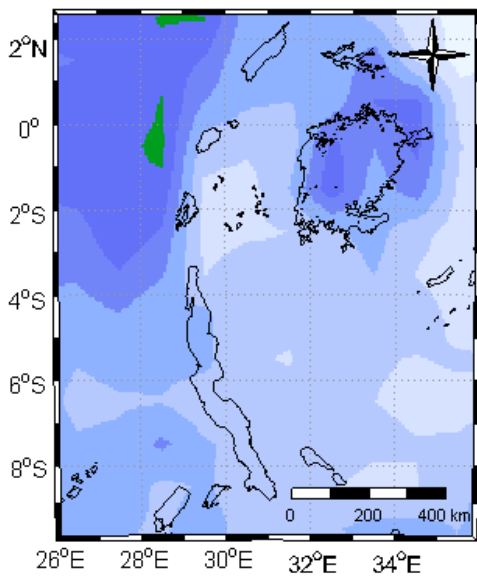
### TRMM 2B31



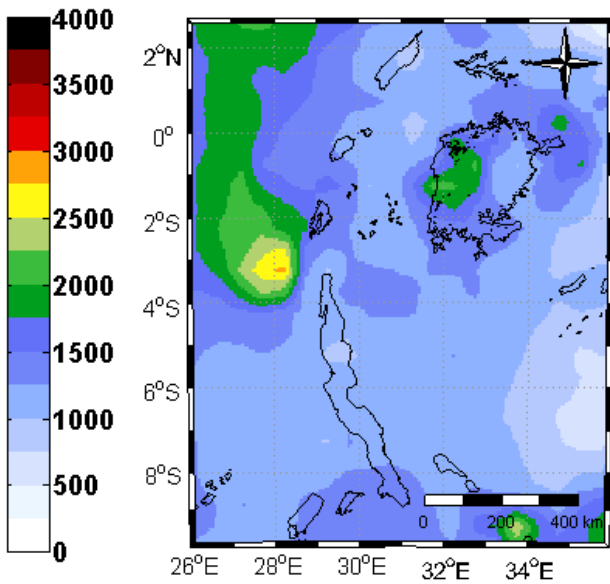
### GPCC



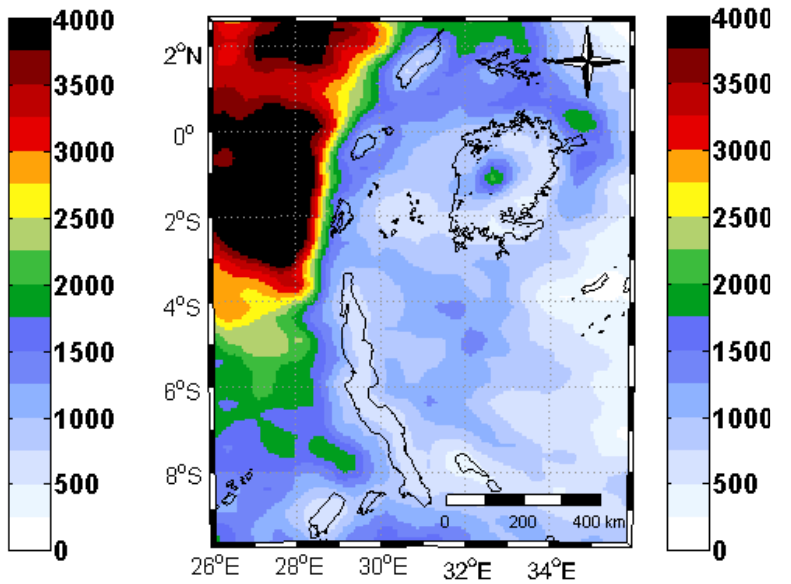
### GPCP



### UDEL

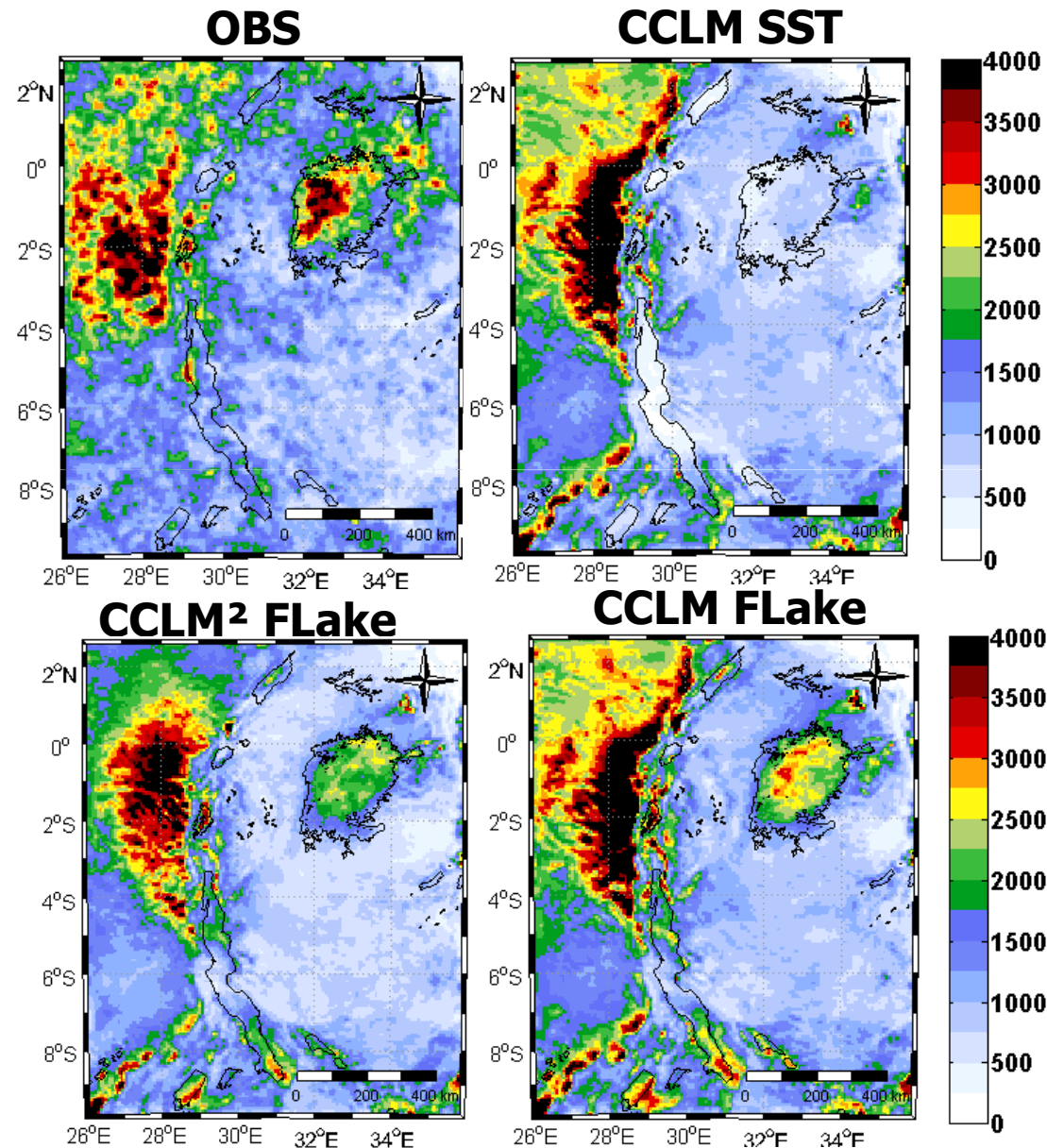


### CMORPH





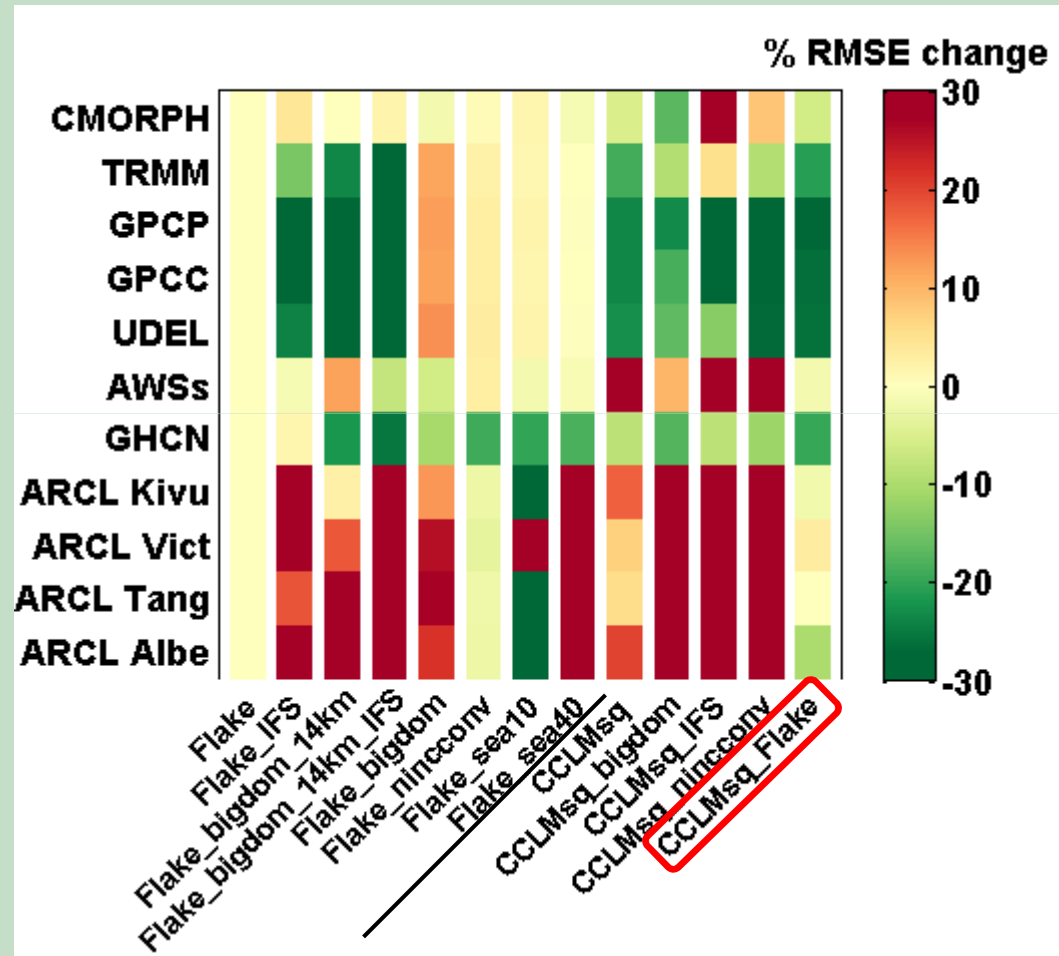
# Evaluation: TRMM precipitation





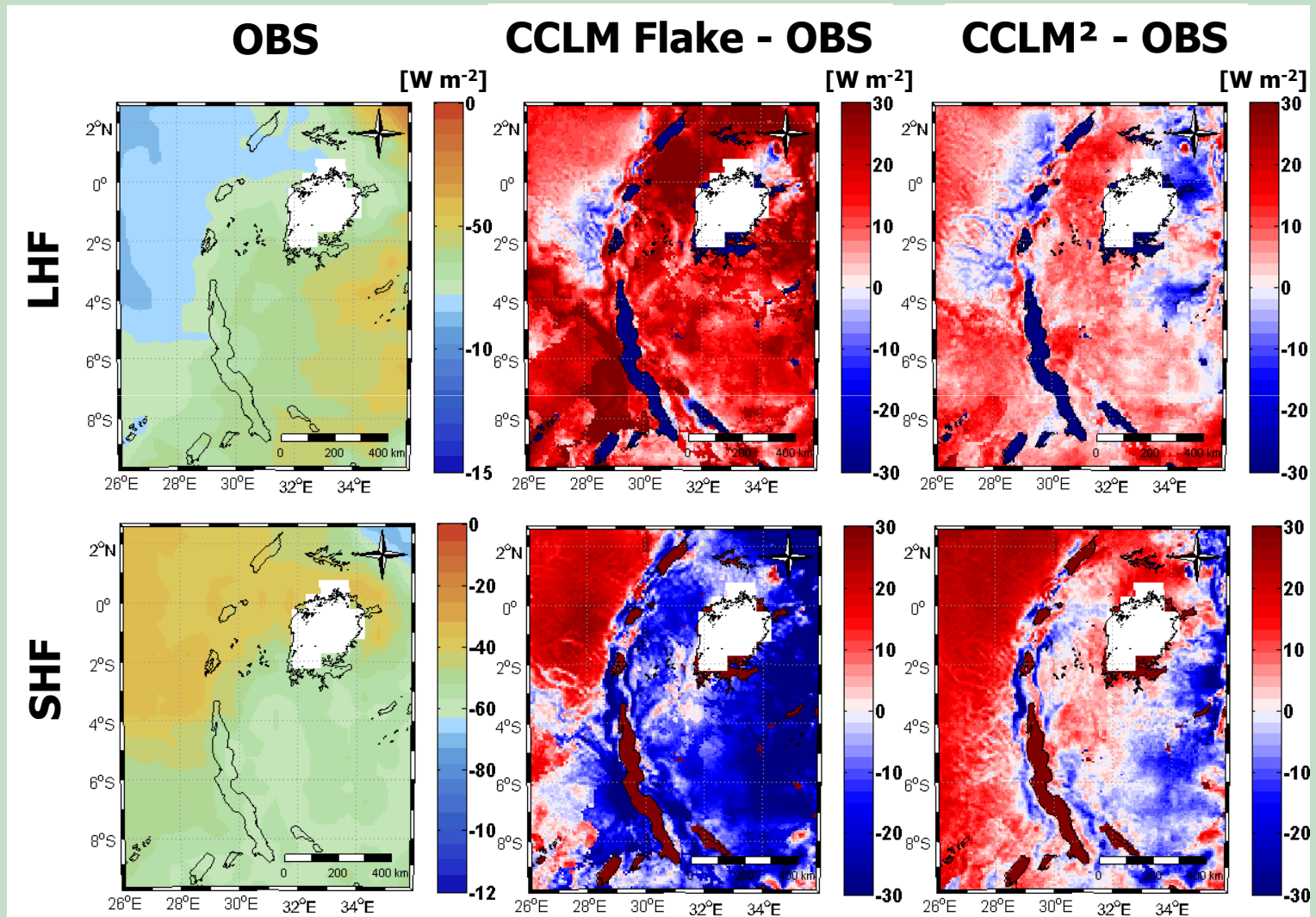


# Comparing skill of different configurations



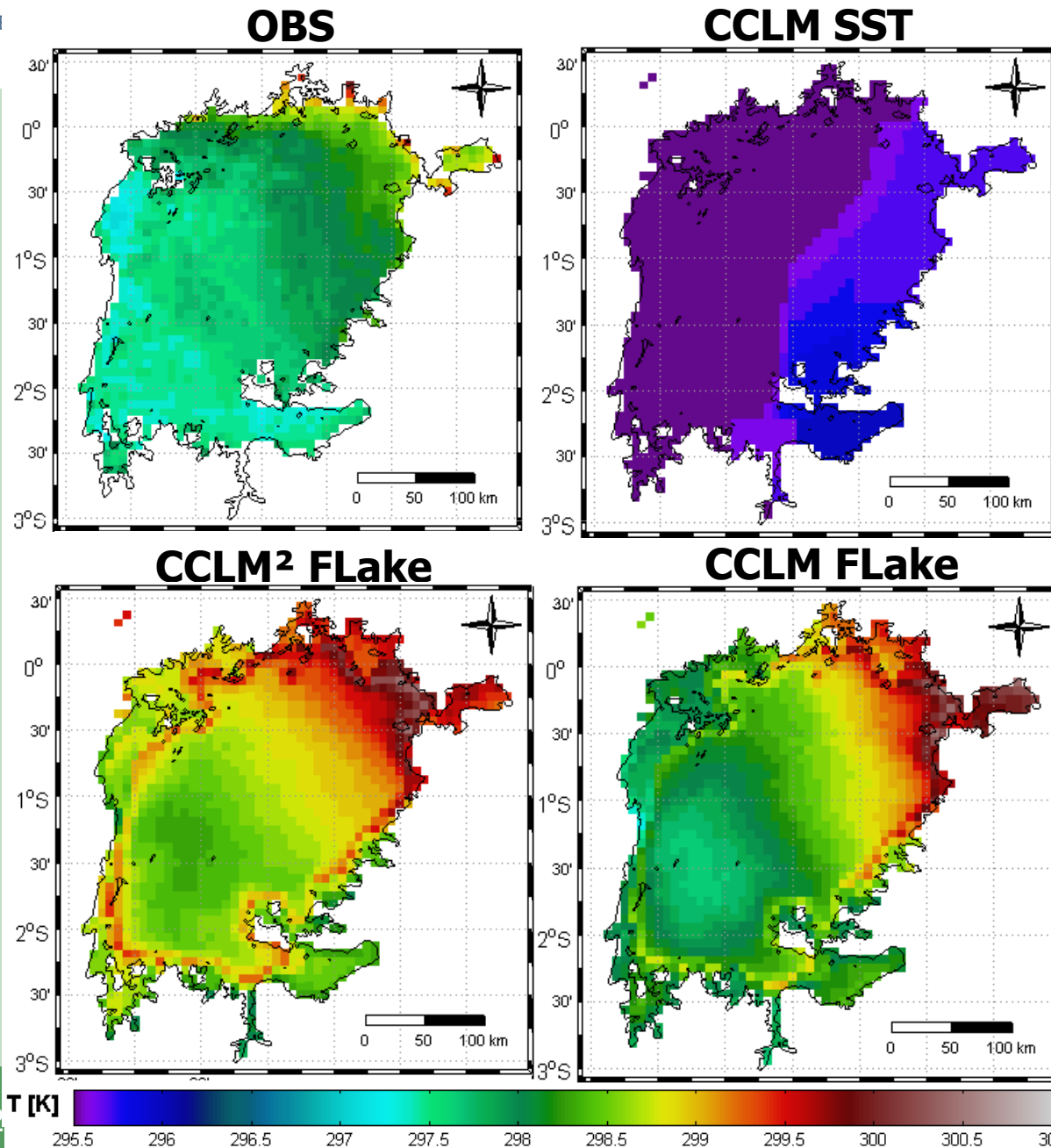


# Evaluation: Fluxnet





# Evaluation: ARC Lake Victoria

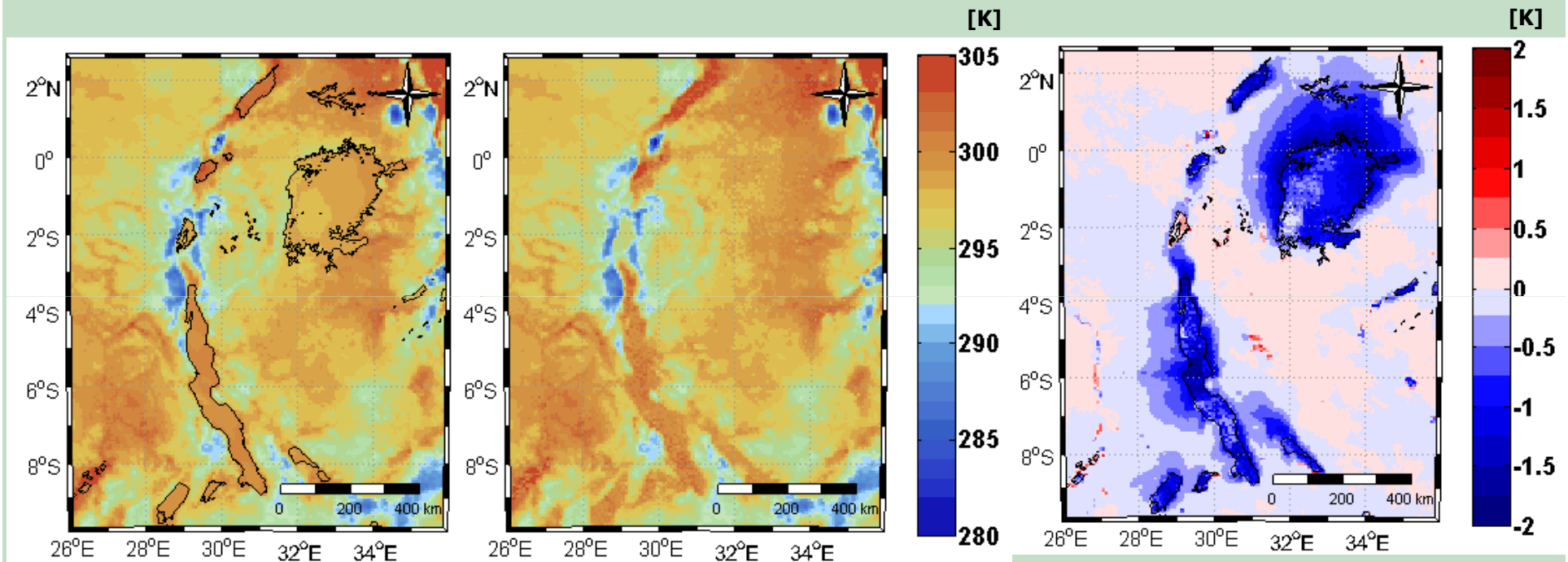




# Impact of AGLs on the regional climate



# Impact on surface temperature



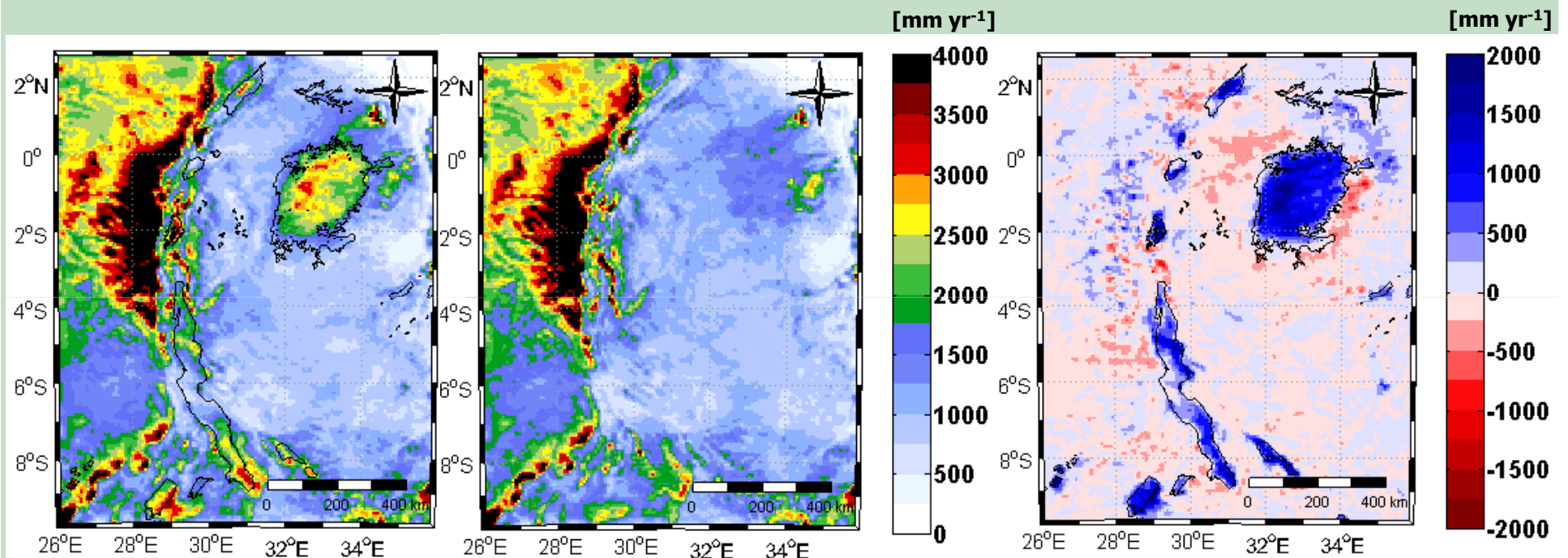
**CCLM FLake**

**CCLM nolakes**

**FLake - nolakes**



# Impact on precipitation



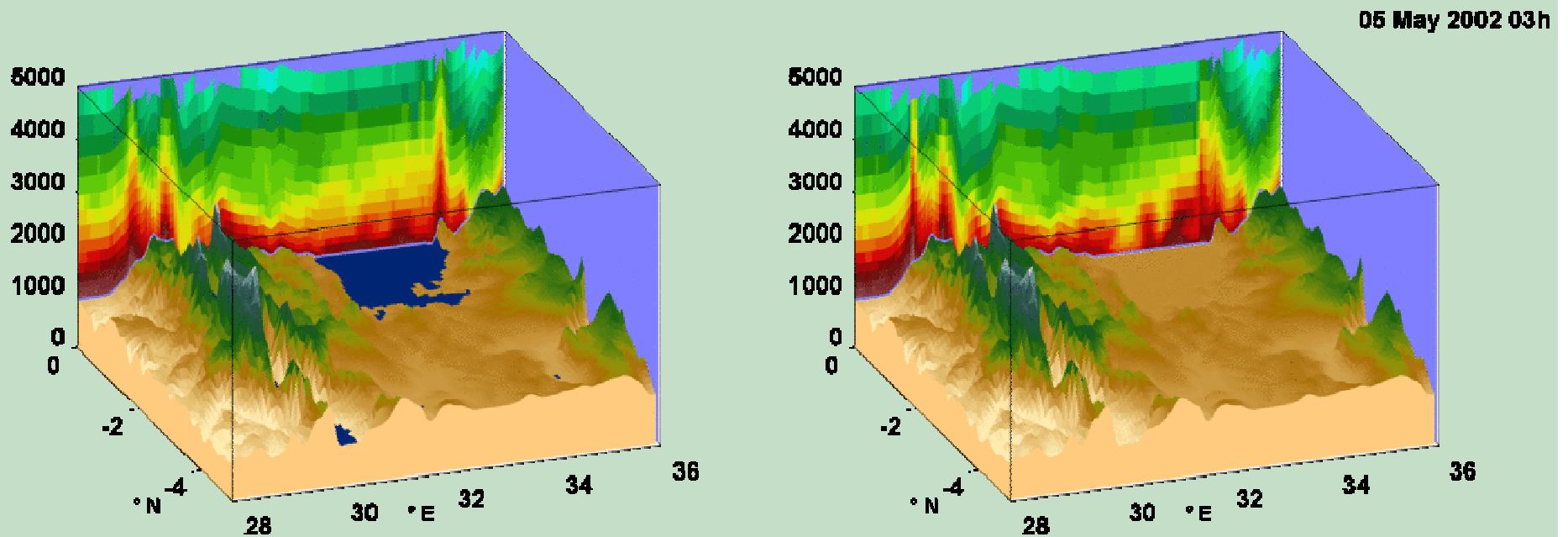
**CCLM FLake**

**CCLM nolakes**

**FLake - nolakes**

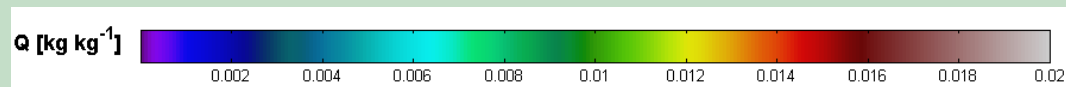


# Impact on convective storm development



CCLM FLake

CCLM nolakes



# Thank you for your attention!

Acknowledgements: FWO, BELSPO

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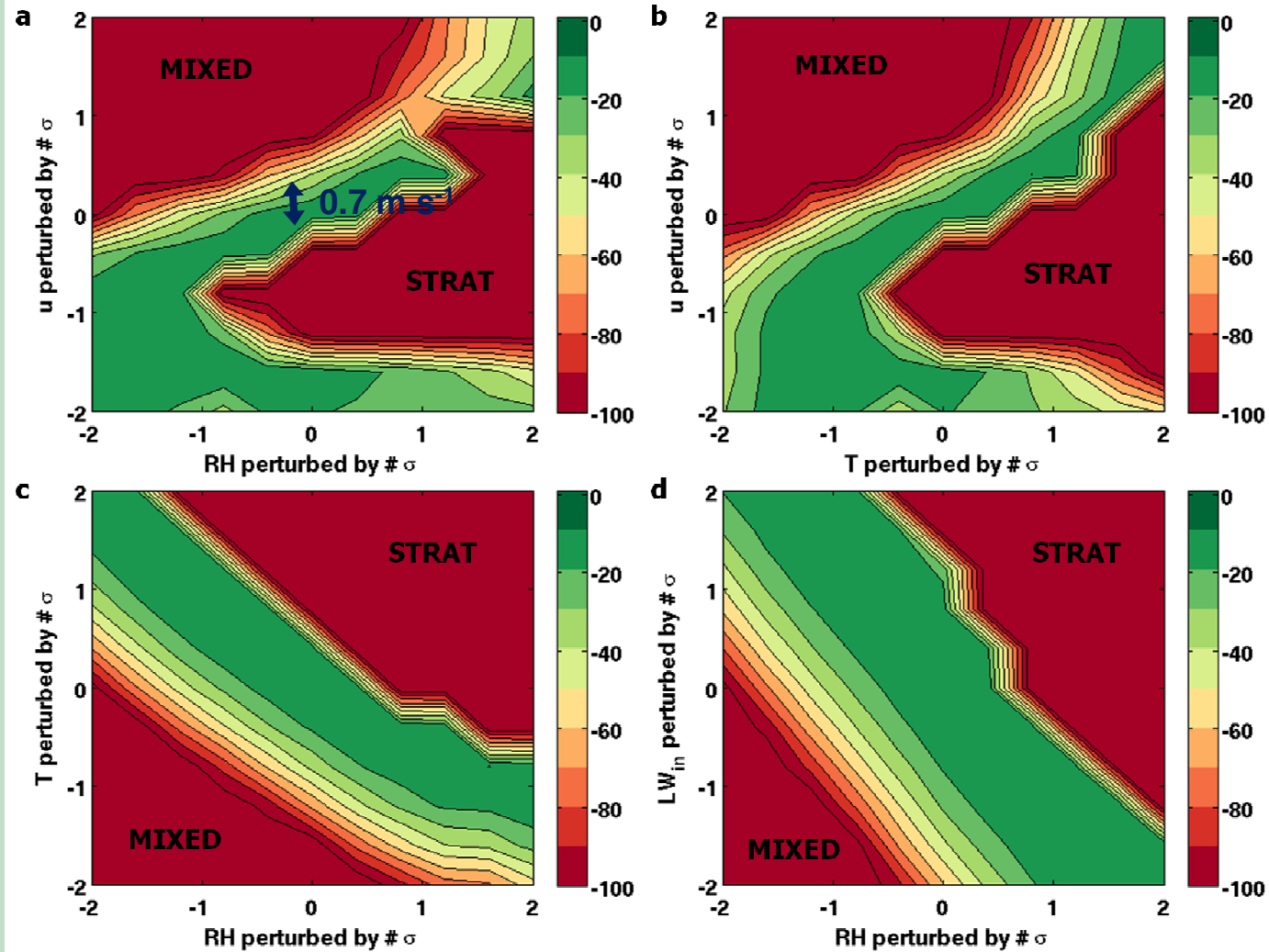


## Conclusions & outlook

- conclusions
  - switching on the lake model strongly improves the predictive quality of CCLM
  - for CCLM<sup>2</sup>, a cold bias in the lake temperatures compensates the skill of the LSM
  - AGLs have a significant impact on the regional climate by:
    - cooling the surface layer
    - strongly enhancing precipitation amounts
    - triggering nighttime deep convection
- outlook
  - improve/update lake models?
  - extend simulations to 10 years
  - extend evaluation to more variables
  - analyse impact on circulation



# Sensitivity: forcing fields (L. Kivu)



(Thiery et al., GMD in rev.)



## Why no temperature evaluation (yet)

- CRU: only 1 station within our model domain...
- Krahenman: granted, but only 2008 and 0.22°
- Willems: much less stations than precipitation:
  - Tmax: 2 stations
  - Tmin: 7 stations