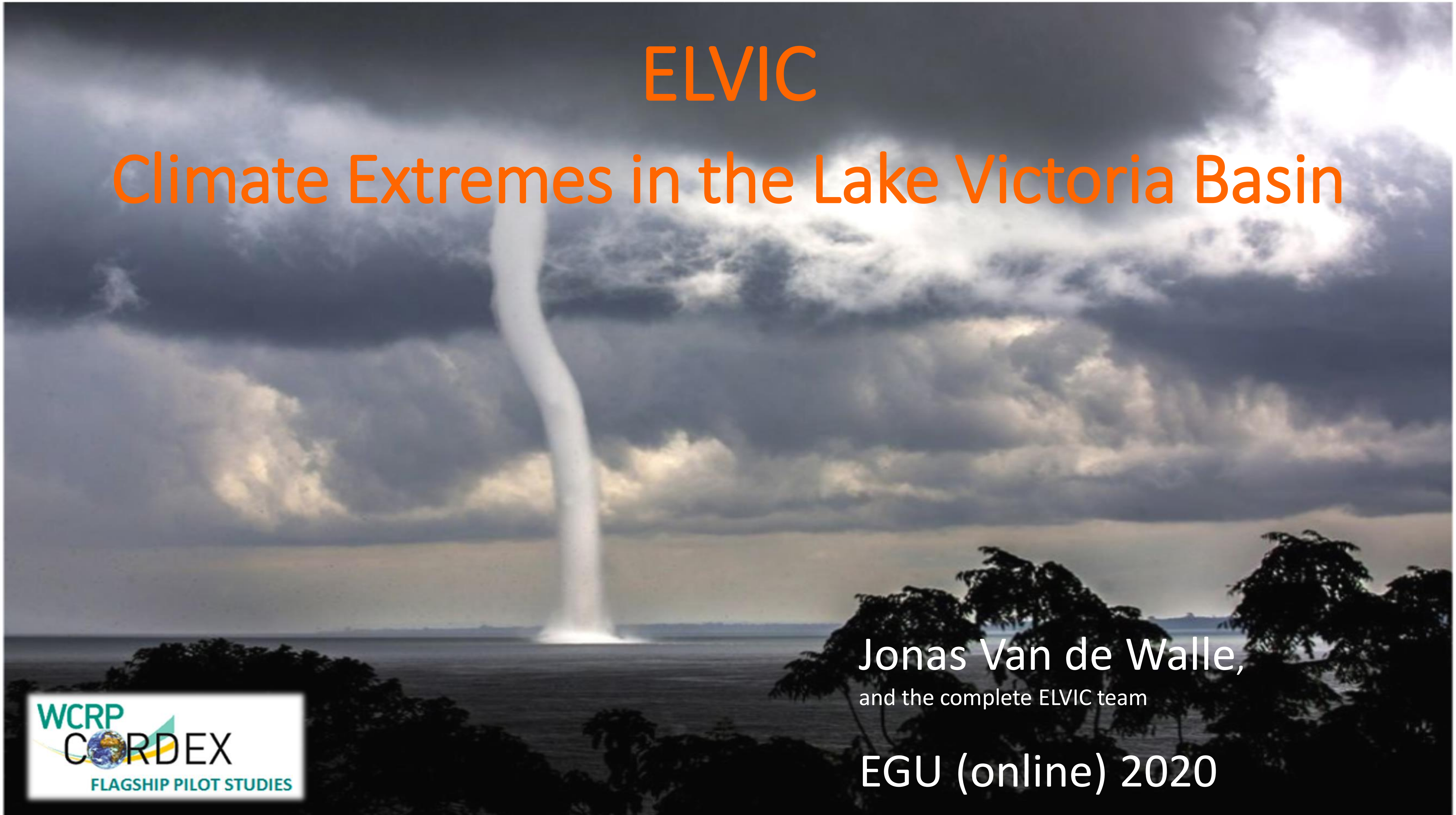
ELVIC

Climate Extremes in the Lake Victoria Basin



Jonas Van de Walle,
and the complete ELVIC team

EGU (online) 2020

WCRP CORDEX FLAGSHIP PILOT STUDIES

ELVIC: Climate Extremes in the Lake Victoria Basin

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DTU Technical University of Denmark

University of Cape Town · iYunivesithi yaseKapa · Universiteit van Kaapstad

TANZANIA METEOROLOGICAL AGENCY · MAMLAKA YA HALI YA HEWA TANZANIA

ICTP The Abdus Salam International Centre for Theoretical Physics

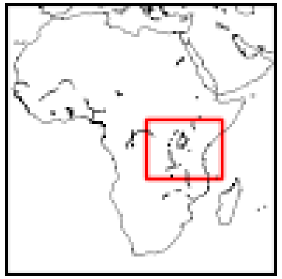
KIT Karlsruher Institut für Technologie

NORTH CAROLINA STATE UNIVERSITY · FOUNDED MARCH 7, 1887

ABOUT ELVIC

- Motivation and goals of the project
- Model ensemble

ELVIC: Climate Extremes in the Lake Victoria Basin



Region

One of world's convectively most active regions: often exposed to heavy precipitation, heat waves, severe droughts and windstorms

FPS tool

Coordinate ensemble climate projections at the Convection-Permitting (CP) scale

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Project goals

- Assess added value of Convection-Permitting ensemble
- Project evolution of future climate extremes
- Provide information to impact community

More information

https://ees.kuleuven.be/elvic/

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Set-up of different models

Model	Institute	Timing	Driver	Coarse resol	Fine resol	Lake model
CCLMe5	KUL	2005-2015	ERA 5	12 km	2.8 km	Flake
ALADIN-AROME	SMHI	2005-2015	ERA-Int	12 km	2.5 km	Flake
RegCM	ICTP	2005-2015	ERA-Int	25 km	3.0 km	Hostetler
WRF	KIT	2005-2015	ERA-Int	12 km	2.8 km	Flake
MO-UKV	MO	1997-2007	HadGEM + OBS SST	25 km	4.4 km	Obs LST

RESULTS

Assessment of the added value of the Convection-Permitting (CP) ensemble

No added value of CP for total precipitation

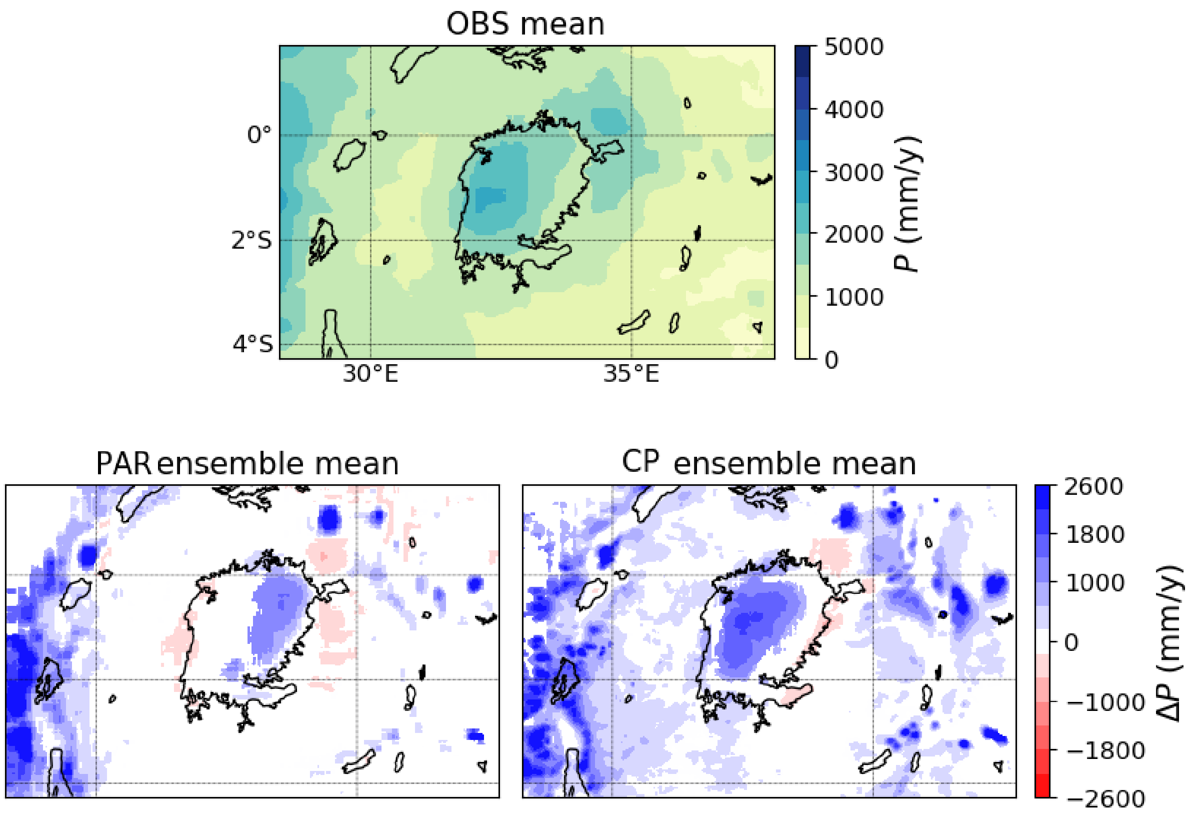

Fig. 1. top: observational mean (TRMM 3B42, GPM Imerg, MSWEP, CMORPH, GSMaP, TAMSAT) yearly accumulated precipitation, bottom: absolute precipitation bias against observational mean of parametrised (PAR) and convection-permitting (CP) ensemle mean.

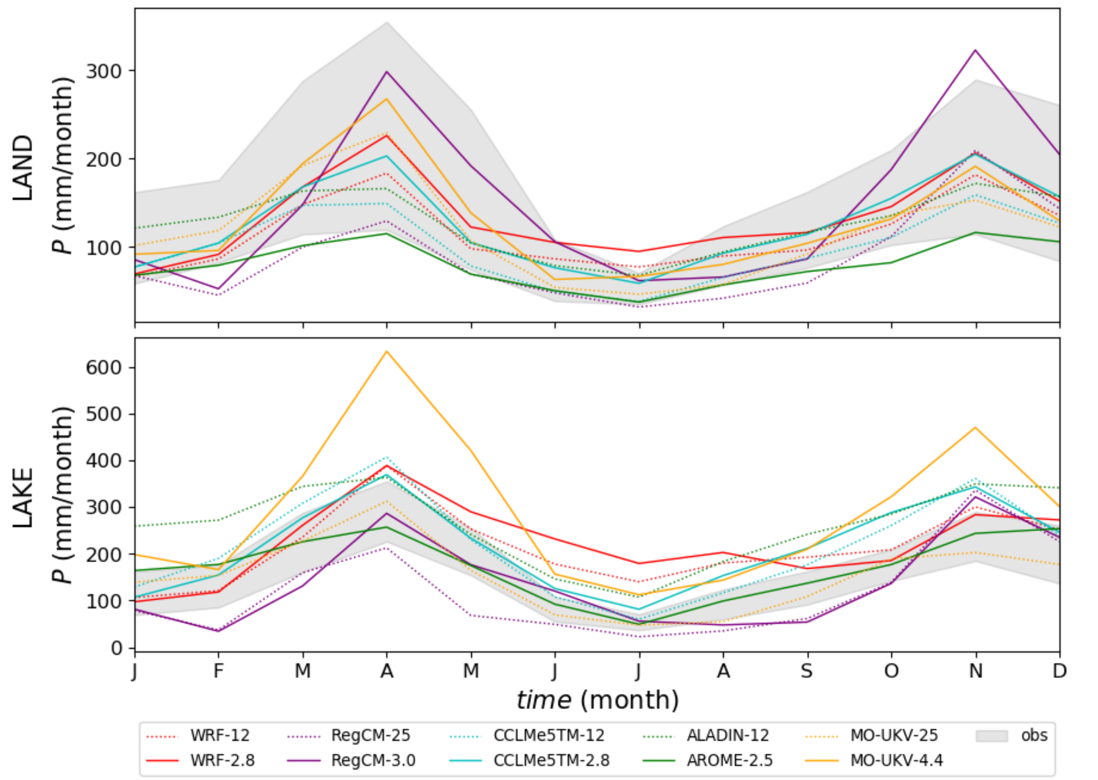

Fig. 2. seasonal cycle of precipitation for observational band and the full set of ELVIC models (both parametrised and convection-permitting), separated for land and lake.

CP has slight improved diurnal cycle of precipitation

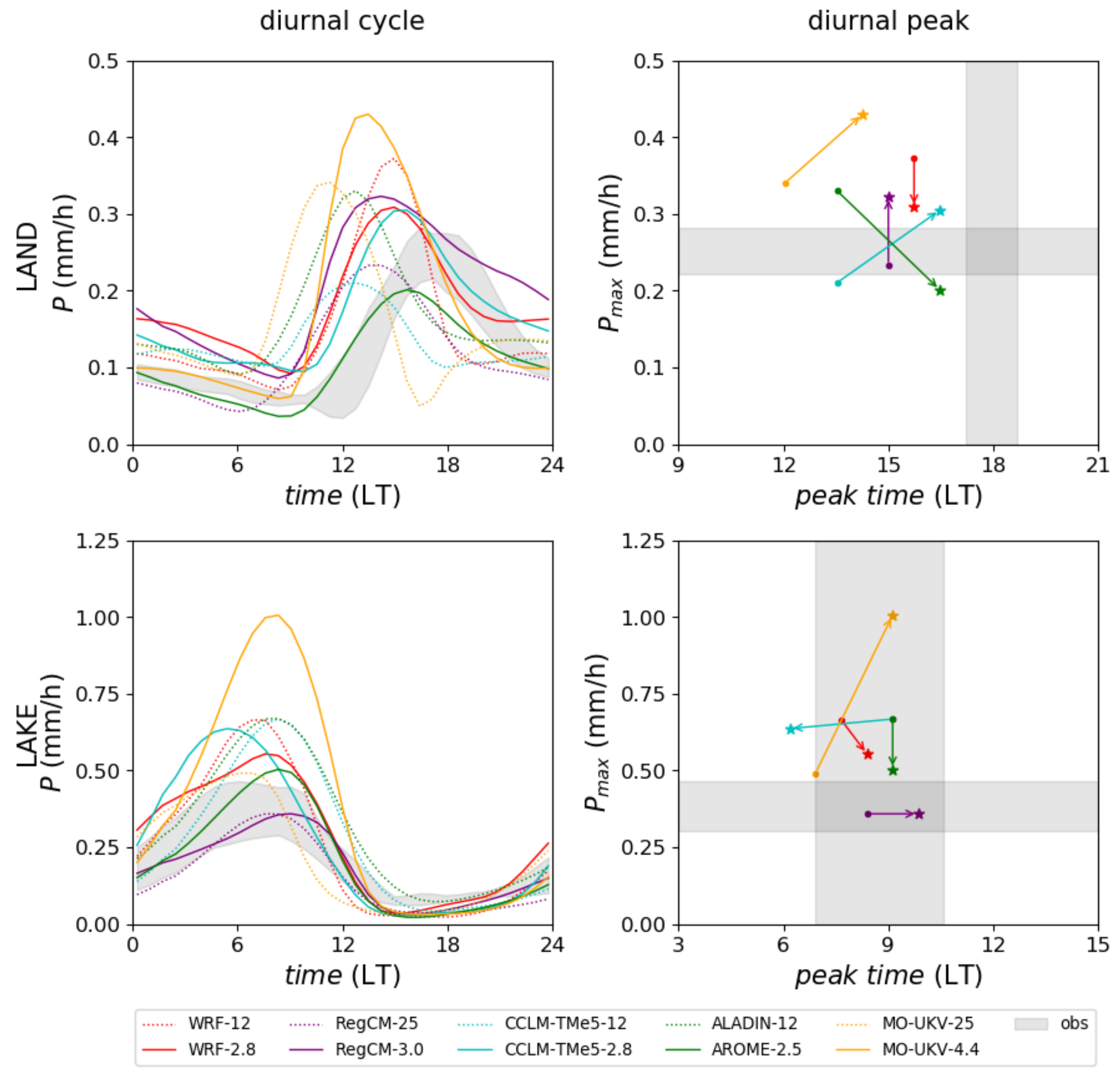

Fig. 3. Left: diurnal cycle of precipitation for observational band and the full set of ELVIC models, separated for land and lake.
Right: precipitation peak intensity versus peak timing for parametrised (dots) versus convection-permitting simulations (stars).

CP precipitation is more intense

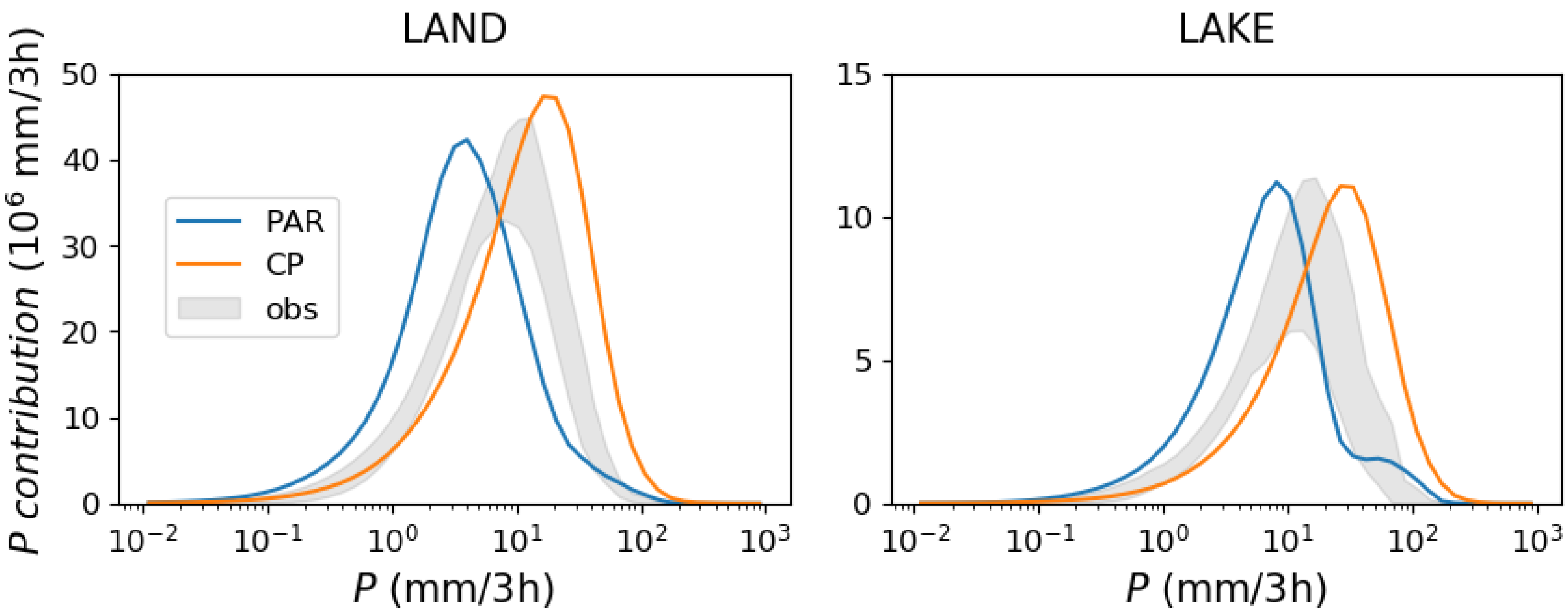

Fig. 4. Contribution of precipitation intensities to total precipitation for observational band and the parametrised (PAR) and convection-permitting (CP) ensemble mean for both land and lake.

Number of CP precipitation events is more realistic

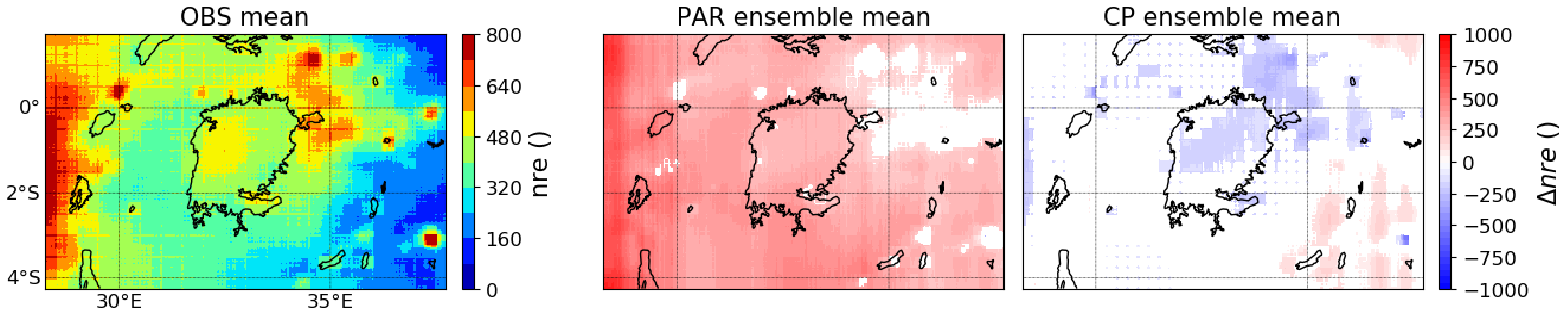

Fig. 5. left: observational mean (TRMM 3B42, GPM Imerg, MSWEP, CMORPH, GSMaP, TAMSAT) yearly number of rainy events (p>0.125mm/3h). right: absolute bias against observational mean of parametrised (PAR) and convection-permitting (CP) ensemle mean.

No added value of CP on lake temperature

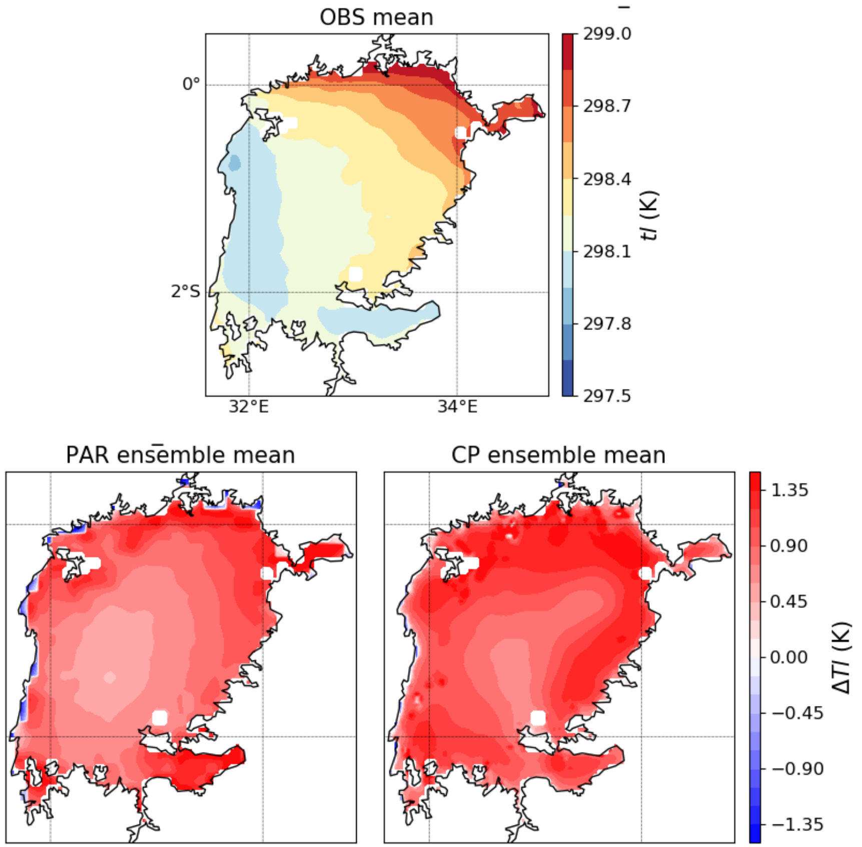

Fig. 6. top: ARC-Lake lake surface temperature observation, bottom: absolute lake temperature bias against ARC-Lake of the parametrised (PAR) and convection-permitting (CP) ensemle mean.

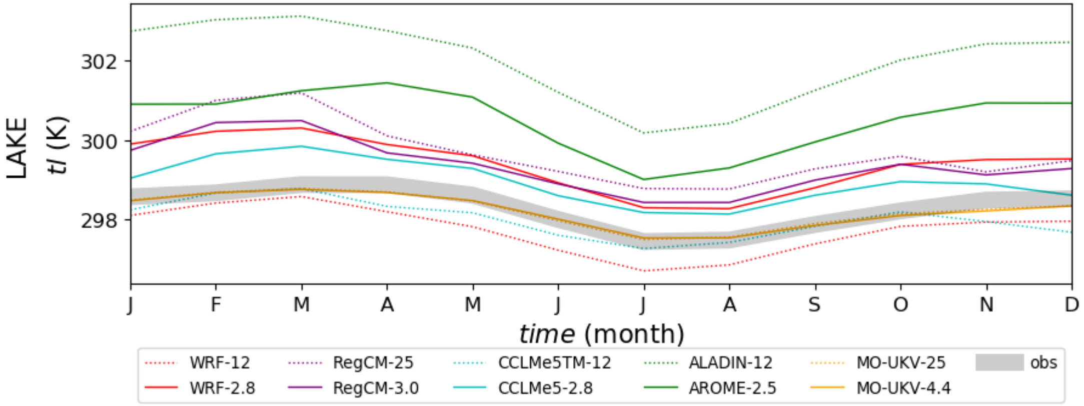

Fig. 7. seasonal cycle of lake surface temperature for ARC-Lake and the full set of ELVIC models (both parametrised and convection-permitting).

No added value of CP on shortwave toa radiation

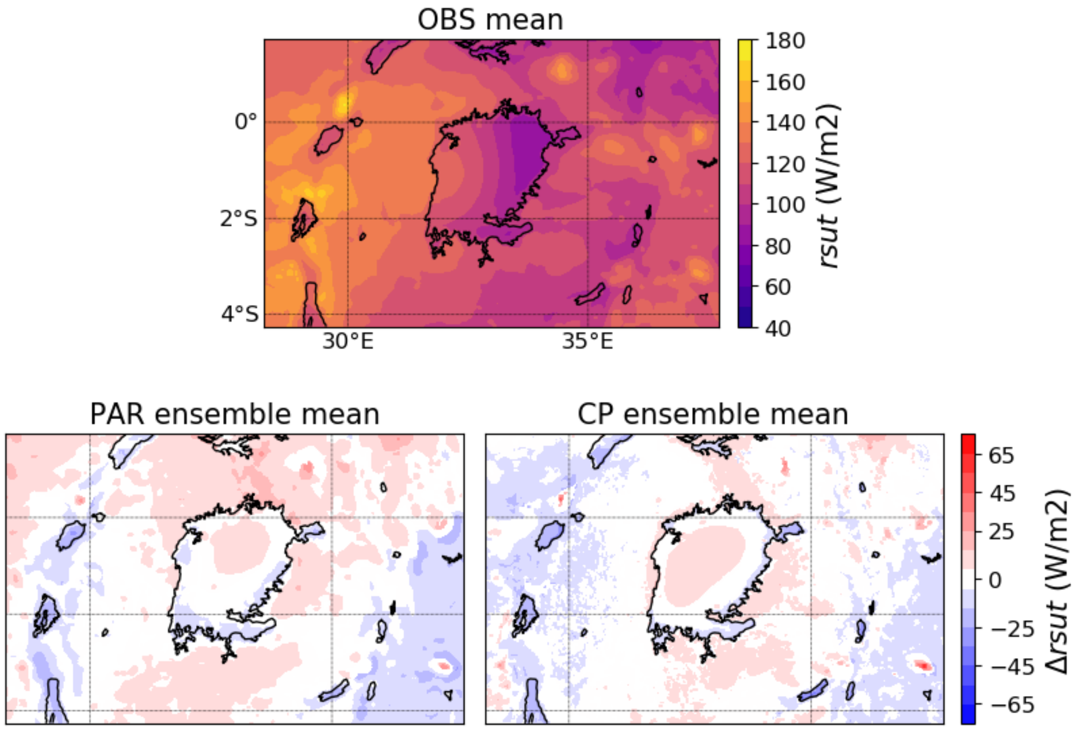

Fig. 8. top: observational mean (SEVIRI, GERB, CERES) outgoing shortwave top-of-the-atmosphere radiation, bottom: absolute radiation bias against observational mean of parametrised (PAR) and convection-permitting (CP) ensemle mean.

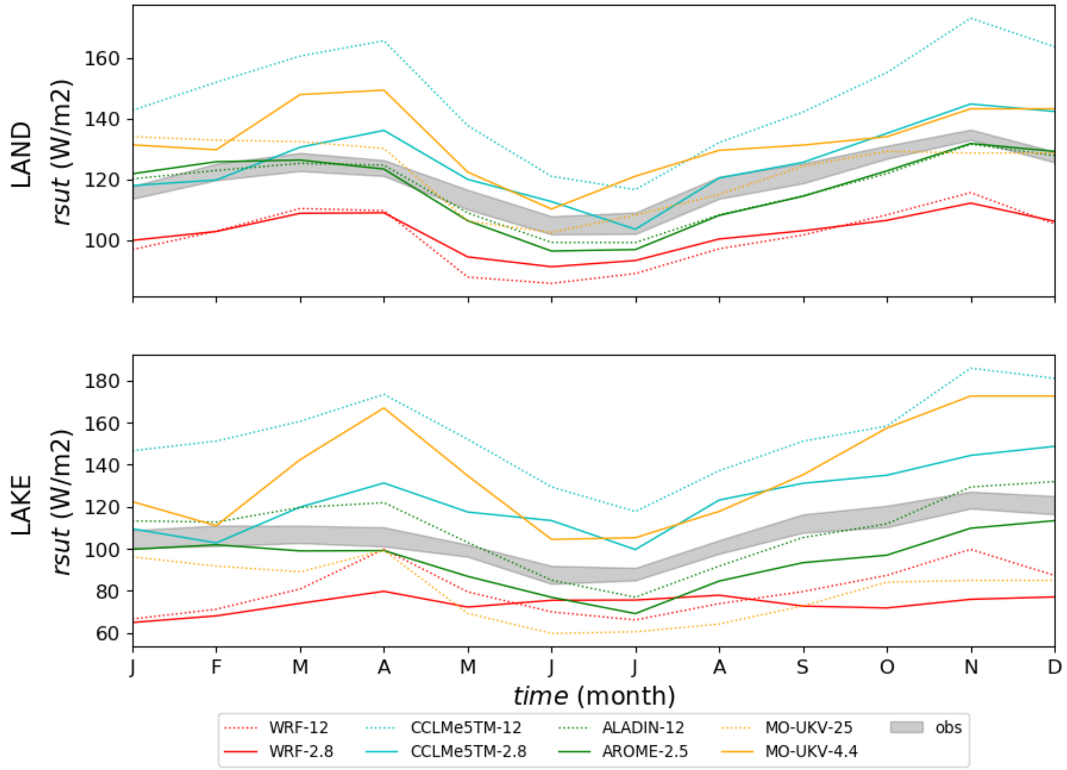

Fig. 9. seasonal cycle of outgoing shortwave top-of-the-atmosphere radiation for observational band and the full set of ELVIC models (both parametrised and convection-permitting), separated for land and lake.

CP has no improvement in diurnal range of RSUT

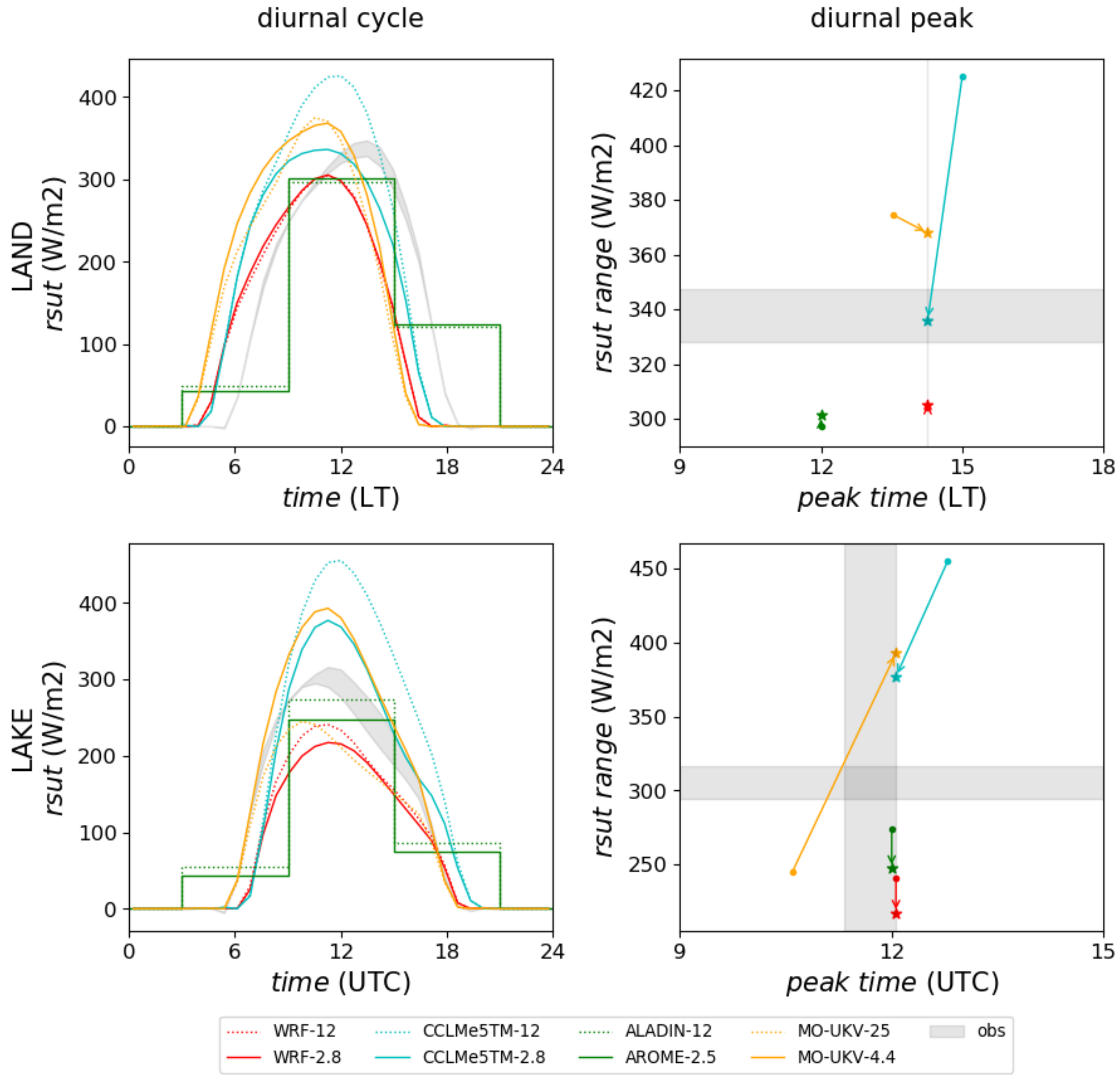

Fig. 10. Left: diurnal cycle of shortwave top-of-the-atmosphere radiation for observational band and the full set of ELVIC models, separated for land and lake.
Right: rsut diurnal range versus peak timing for parametrised (dots) versus convection-permitting simulations (stars).

No added value of CP on longwave toa radiation

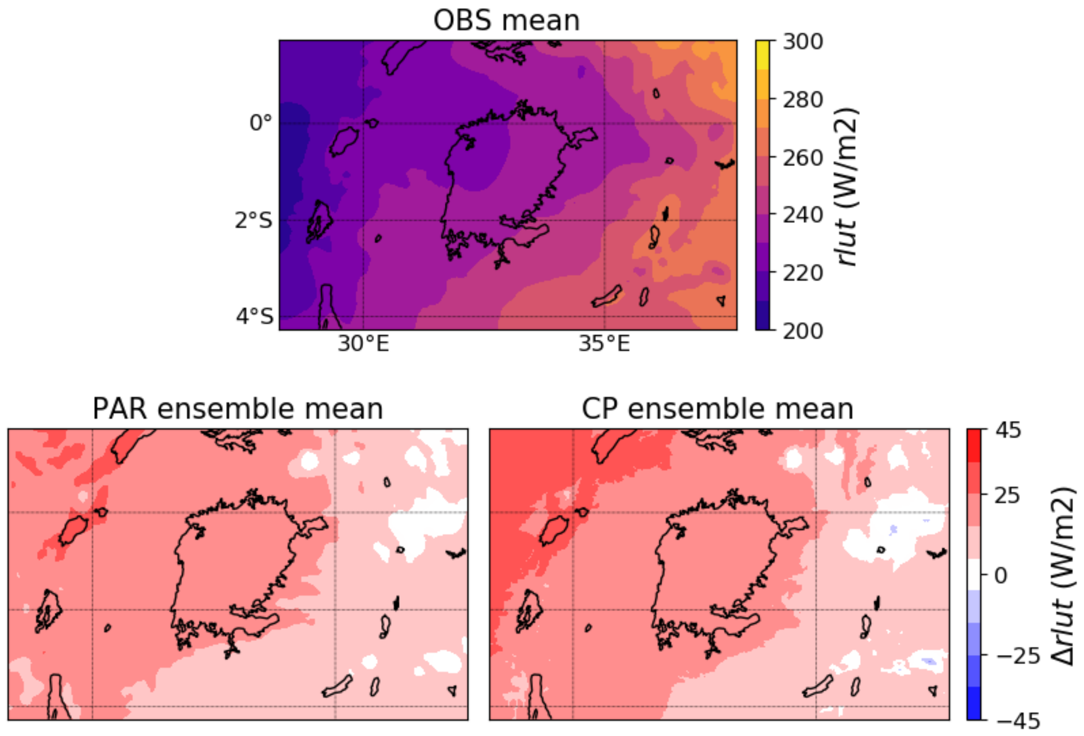

Fig. 11. top: observational mean (SEVIRI, GERB, CERES) outgoing longwave top-of-the-atmosphere radiation, bottom: absolute radiation bias against observational mean of parametrised (PAR) and convection-permitting (CP) ensemle mean.

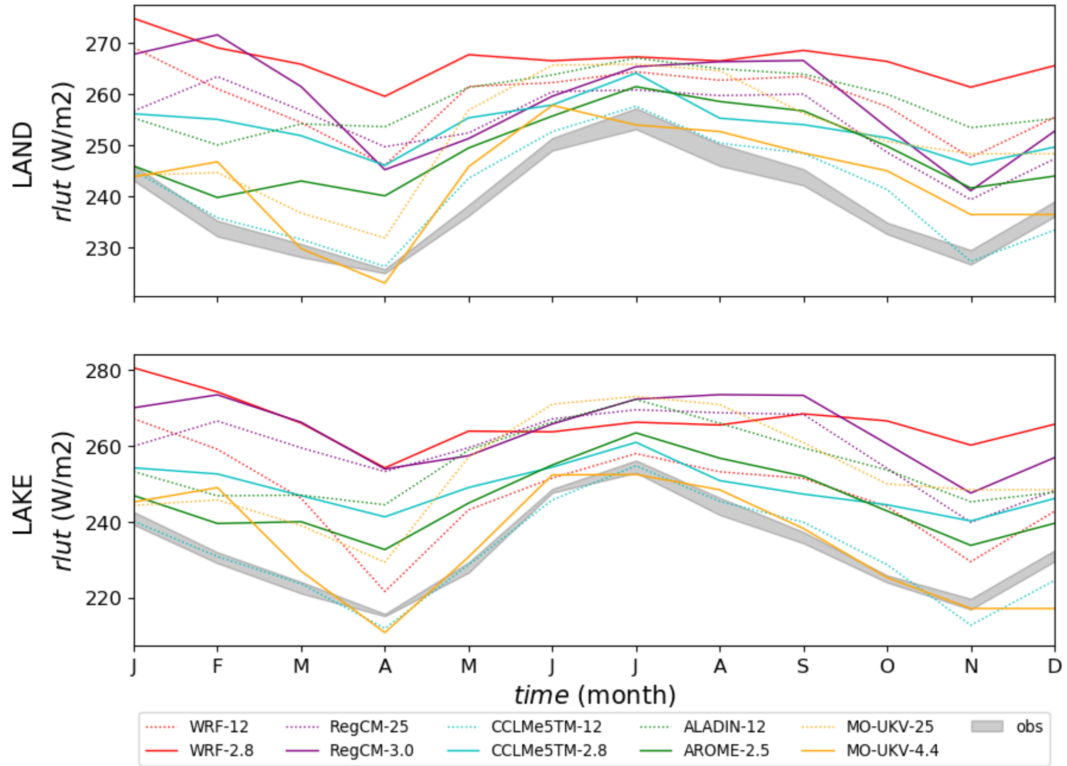

Fig. 12. seasonal cycle of outgoing longwave top-of-the-atmosphere radiation for observational band and the full set of ELVIC models (both parametrised and convection-permitting), separated for land and lake.

CP has improved diurnal range of RLUT

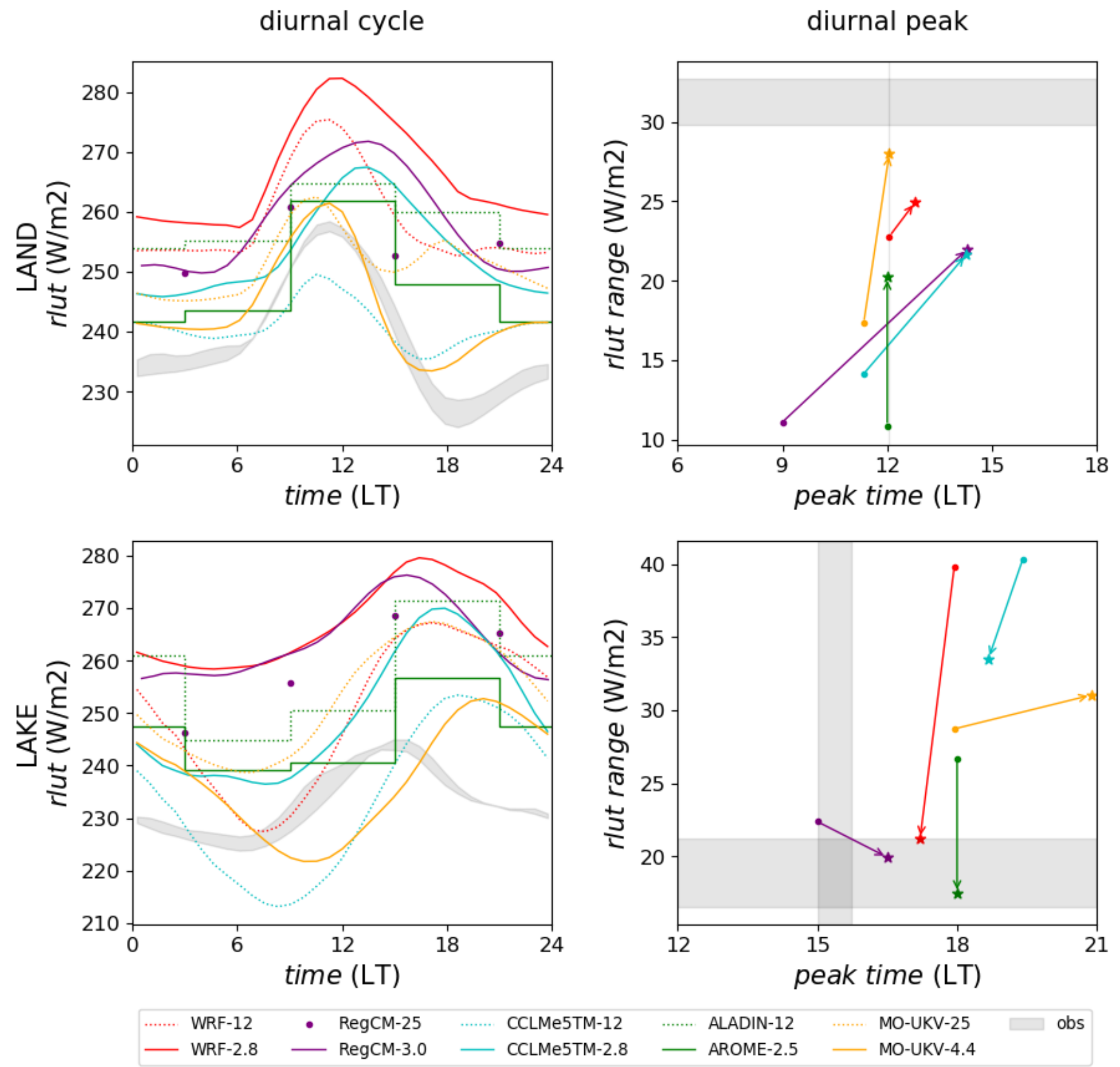

Fig. 13. Left: diurnal cycle of longwave top-of-the-atmosphere radiation for observational band and the full set of ELVIC models, separated for land and lake.
Right: rlut diurnal range versus peak timing for parametrised (dots) versus convection-permitting simulations (stars).

CONCLUSIONS

Does convection-permitting improve over this tropical area?

CONCLUSION: Is convection-permitting an improvement?

Seasonal average meteorological variables: no robust improvements.

Diurnal precipitation cycle and RLUT: improved representation.

Amount of rainy events: more realistic by intensification of precipitation.

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