Robust increase in extreme future precipitation in the Lake Victoria basin

from a mini-ensemble of pseudo global warming projections

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Motivation

Lake Victoria basin is prone to: hazardous thunderstorms,

droughts and floods,

landslides.

Evolution in warmer climate? 10y COSMO-CLM PD simulation + EoC projection:

2.8 km convection-permitting resolution,

Pseudo Global Warming approach,

perturbation derived from CMIP6 ensemble-mean.

Motivation

Lake Victoria basin is prone to: hazardous thunderstorms,

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Can we trust our projection?

Evolution in warmer climate? 10y COSMO-CLM PD simulation + EoC projection:

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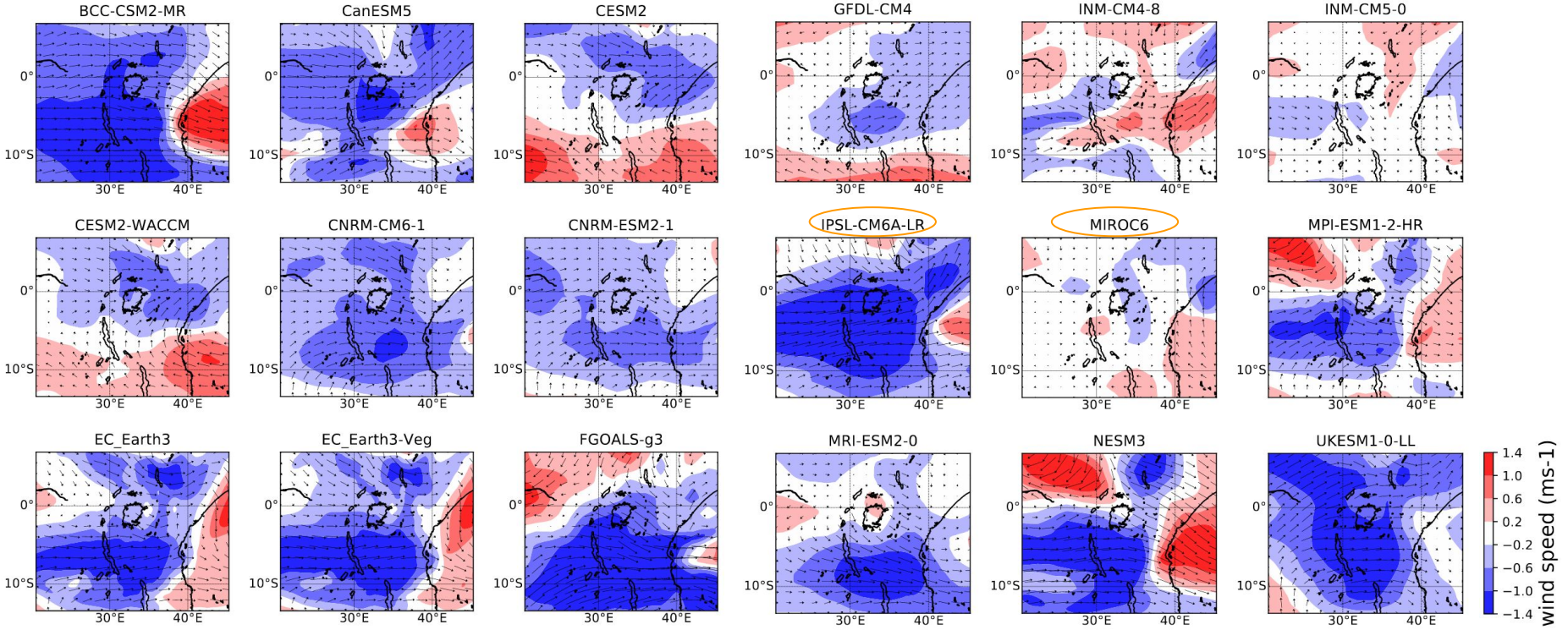
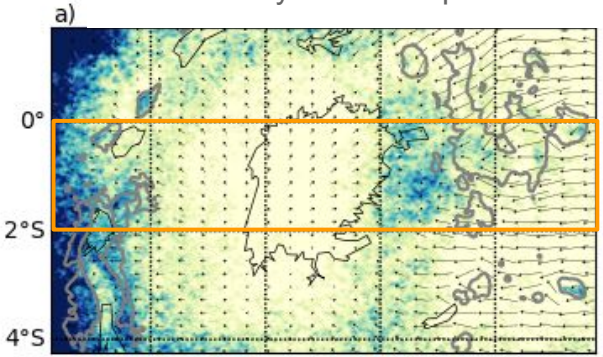
Large variations in CMIP6 circulation changes

Mean 700 hPa wind change EoC (2070-2100, SSP5-8.5) - PD (1995-2025)

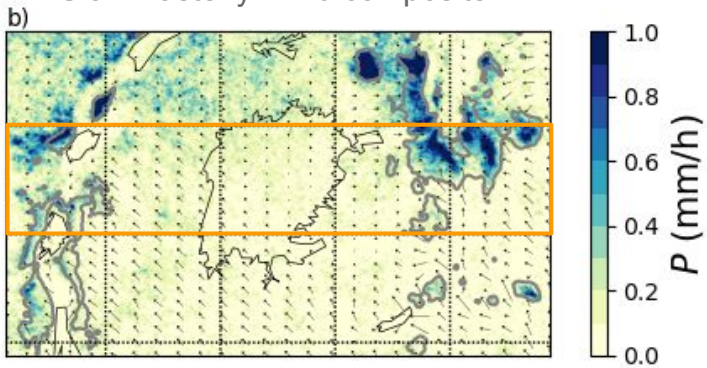


… while large-scale circulation determines rainfall pattern

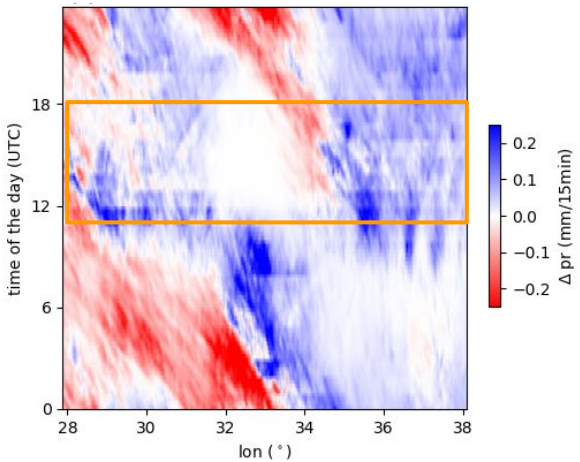
Fast Easterly Wind composite



Slow Easterly Wind composite



Slow - Fast composite

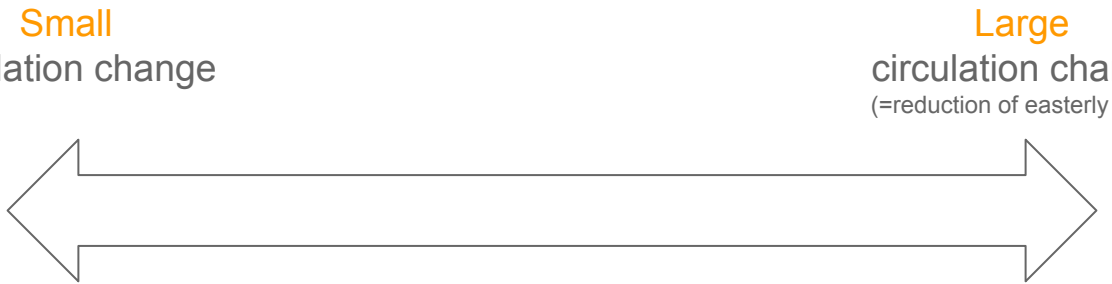


Van de Walle et al. (2020). A convection-permitting model for the Lake Victoria Basin: Evaluation and insight into the mesoscale versus synoptic atmospheric dynamics. *Climate Dynamics*, *54*(3), 1779-1799.

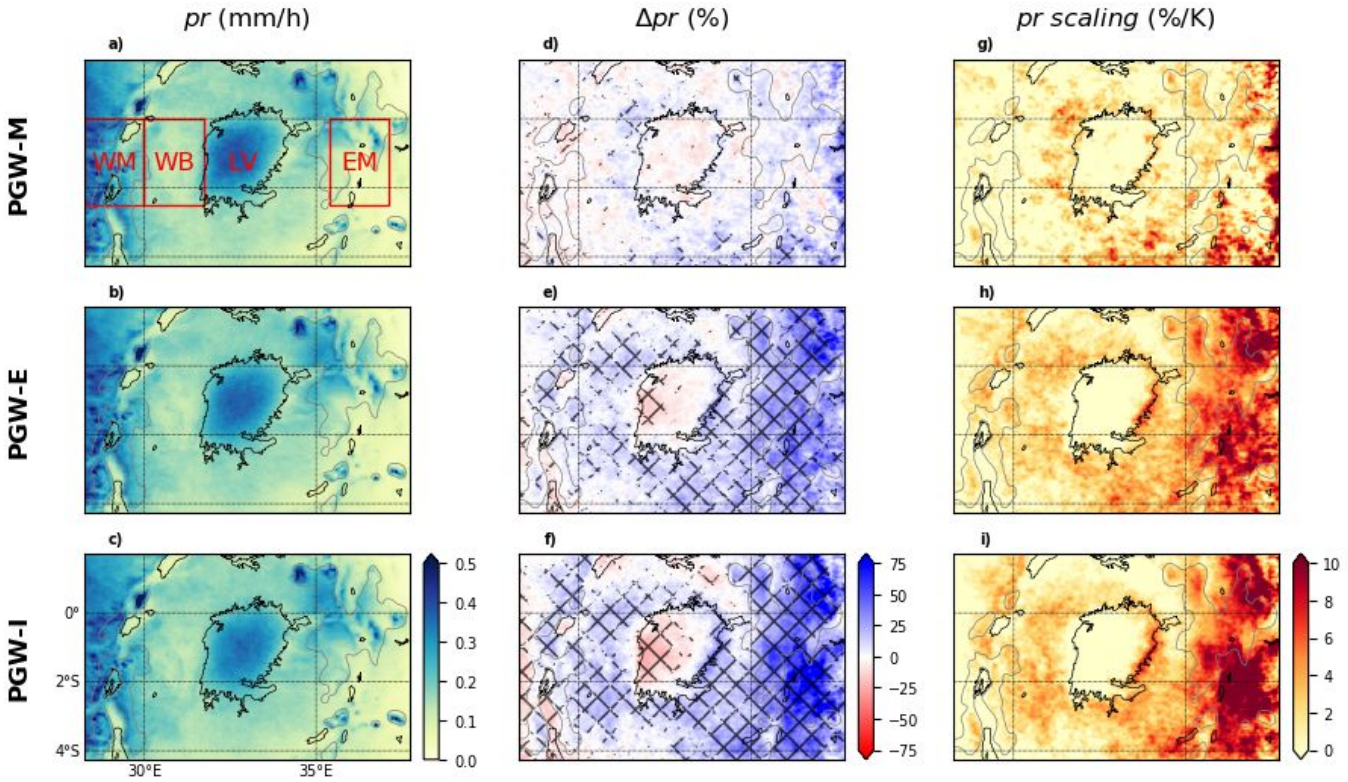
Problem: variations in large-scale circulation change

& we expect effects on regional climate

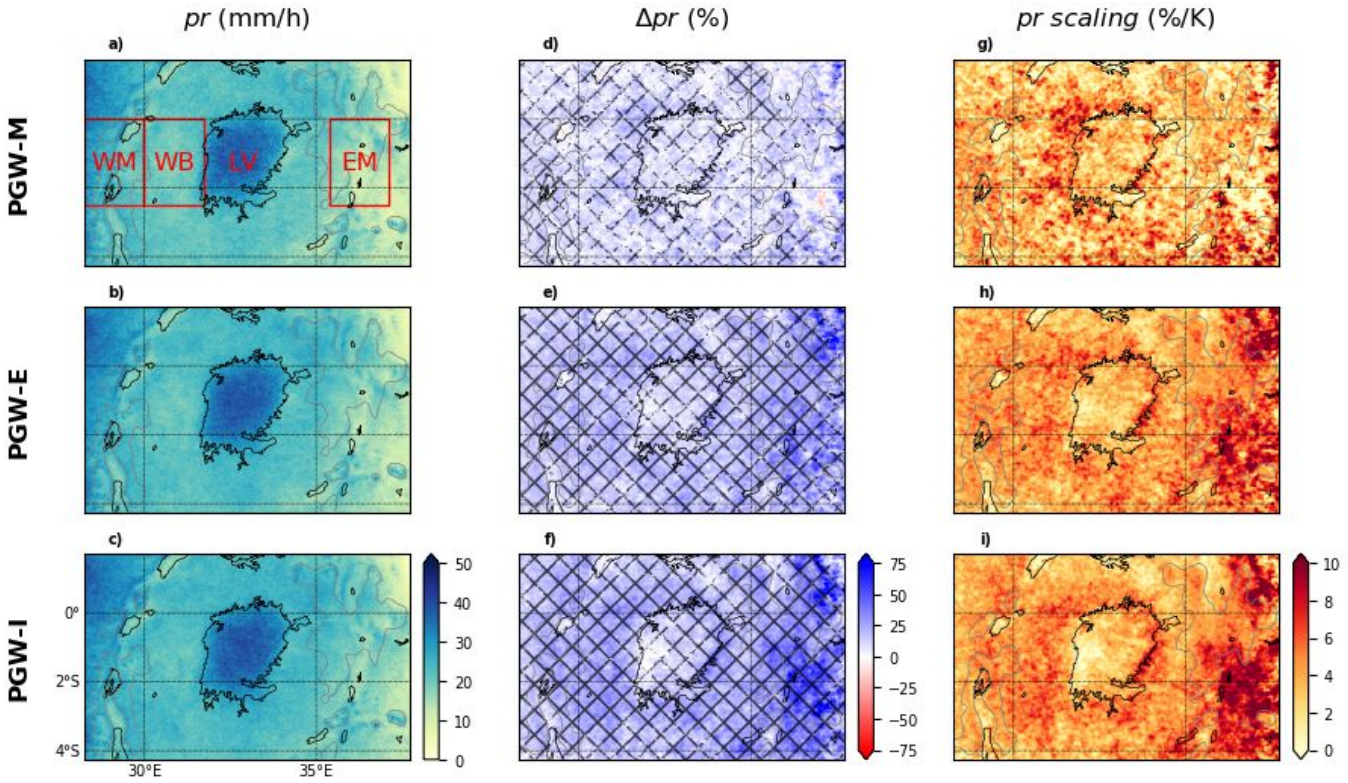
Goal: find robust signals, assess uncertainties
Method: mini-ensemble



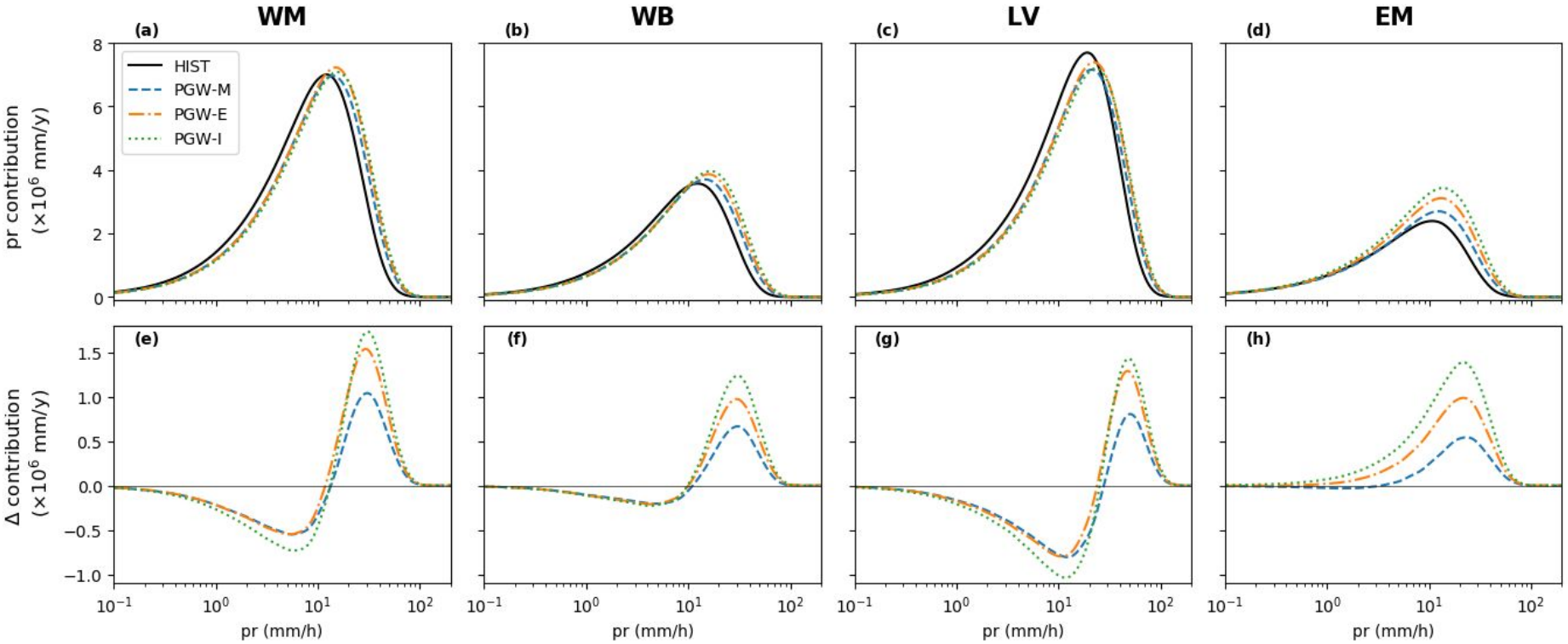
Mean precipitation projection / change / scaling



P99.9% precipitation projection / change / scaling



Contributions of different precipitation intensities

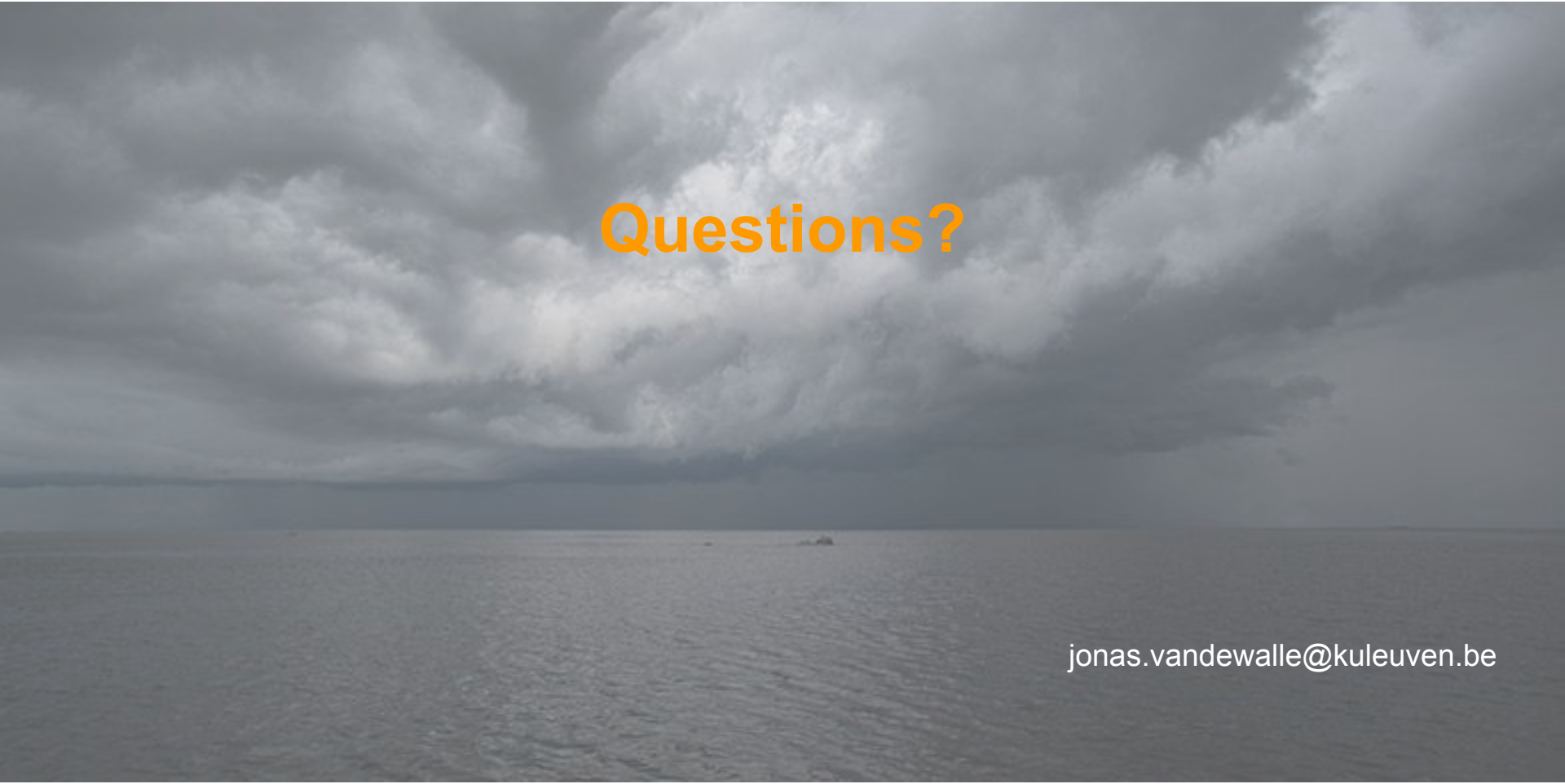


Conclusion

Large spread in large-scale circulation changes implies:

- scaling of extreme precipitation is robust:
  - lake 3%, land 5% per degree T_d change,

- uncertainty on mean rainfall:
  - decrease over Lake Victoria
  - largest increase over eastern mountains



Large-scale circulation determines rainfall pattern

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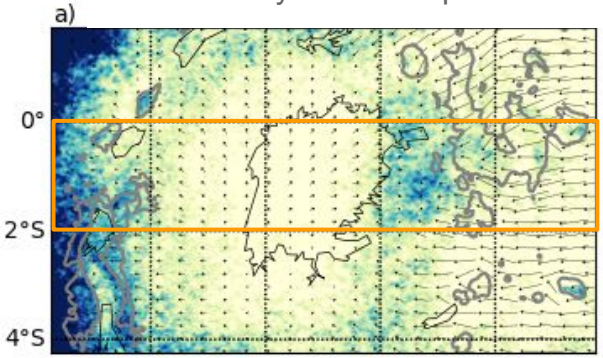
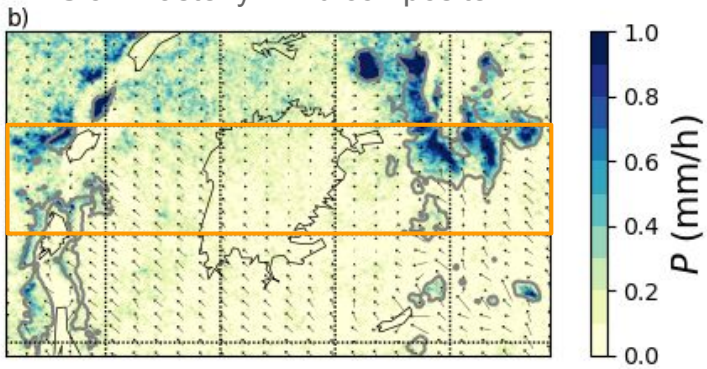
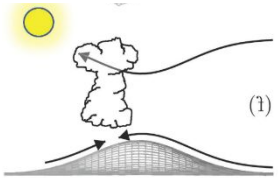
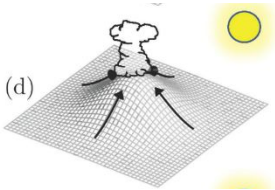
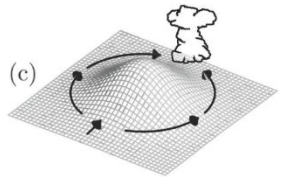


Slow Easterly Wind composite









Kirshbaum et al. (2018)

Van de Walle et al. (2020). A convection-permitting model for the Lake Victoria Basin: Evaluation and insight into the mesoscale versus synoptic atmospheric dynamics. *Climate Dynamics*, *54*(3), 1779-1799.