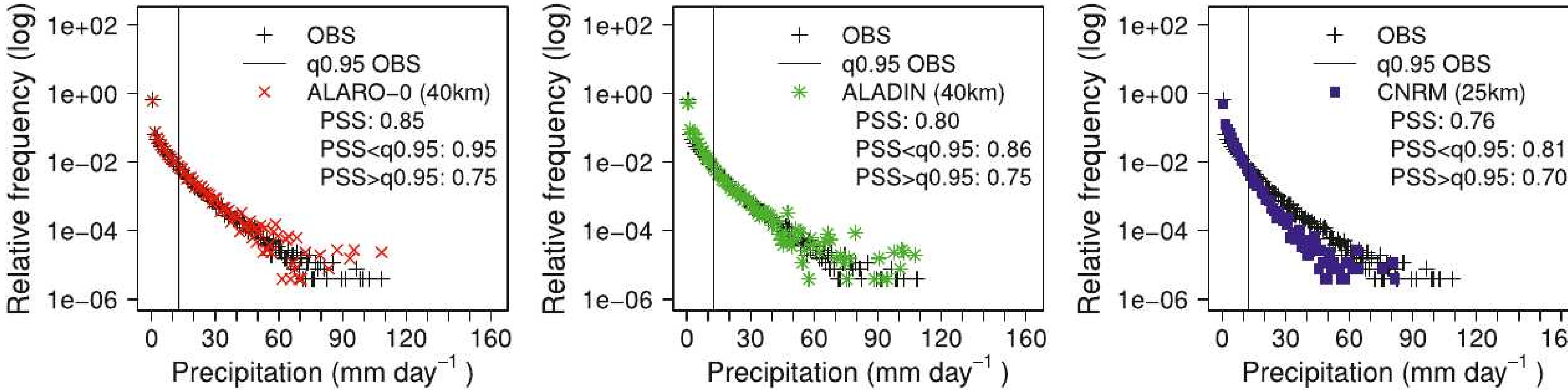
ALARO-climate

and the CORDEX.be project

The RMI climate team



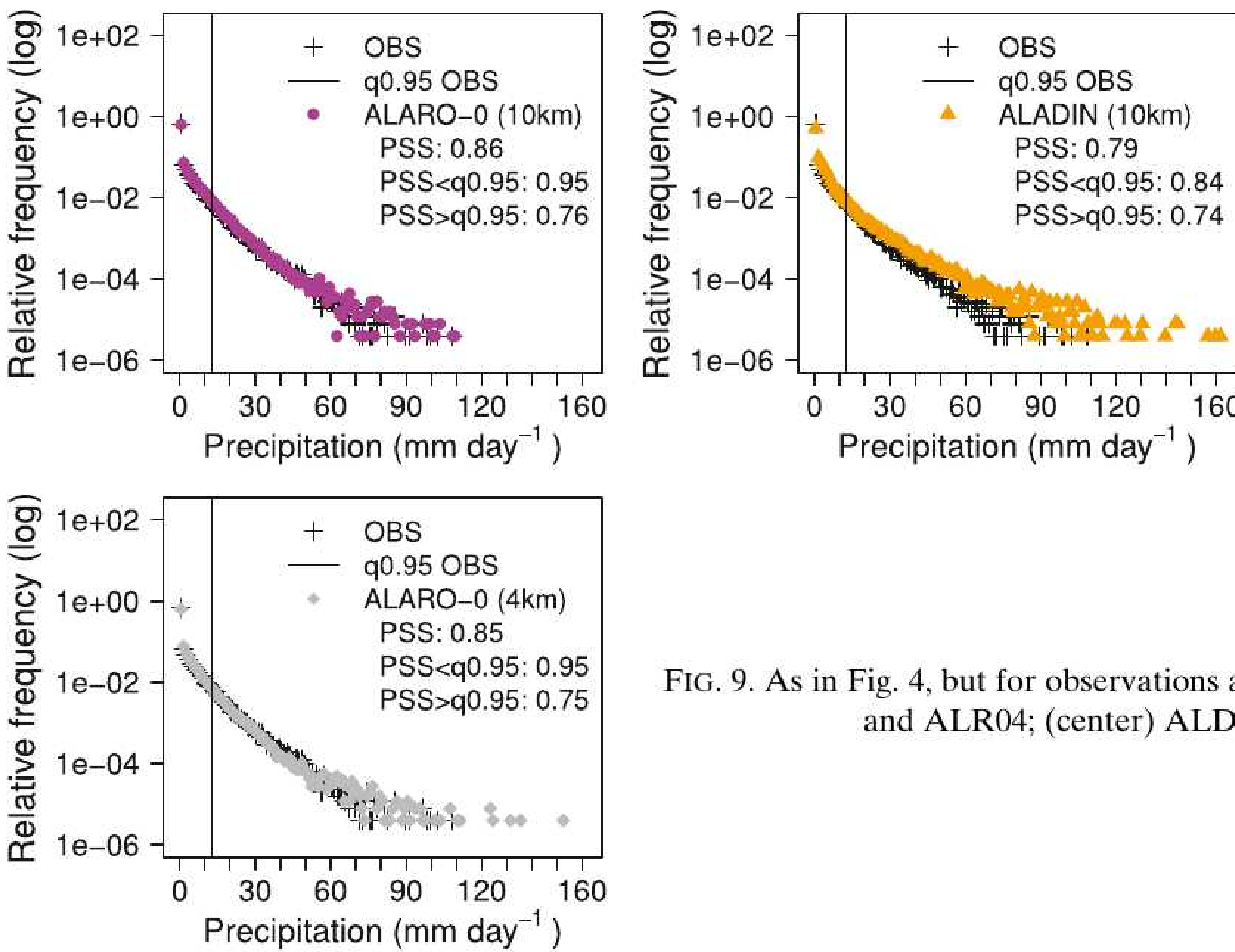
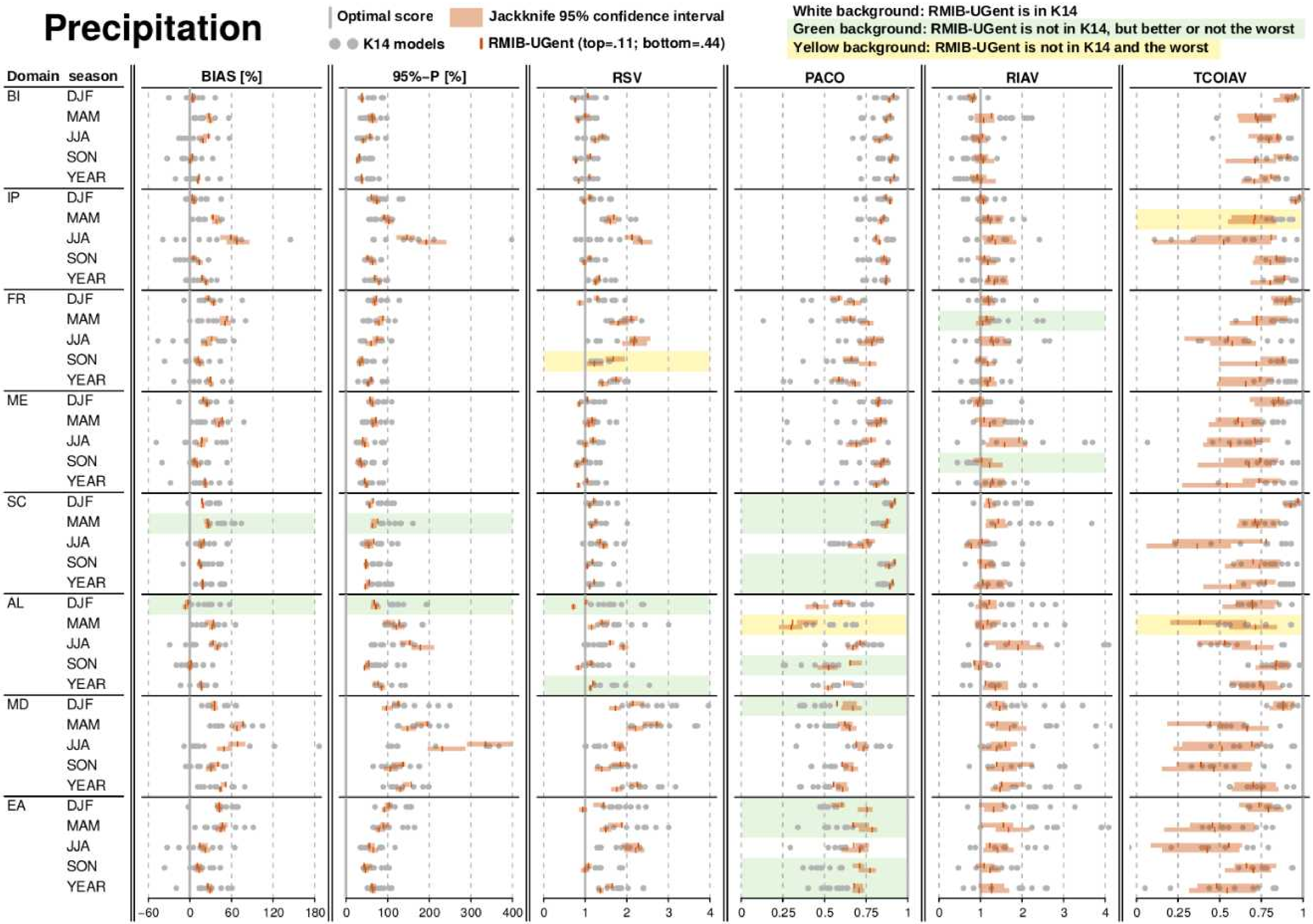


FIG. 9. As in Fig. 4, but for observations and model simulations: (left) ALR40, ALR10, and ALR04; (center) ALD40 and ALD10; (right) CNRM.

De Troch et al.

ALARO-1



Giot et al.

The CORDEX.be project

COmbining Regional climate Downscaling EXpertise in Belgium

P. Termonia,

CORDEX.be Stakeholders meeting, 25 September 2017

www.euro-cordex.be

A Belgian network

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[a] RMI
[b,c] KU LEUVEN
[d] UCL
[e] Ulg
[f] VITO
[g] BISA
[h] RBINS
[i] ROB

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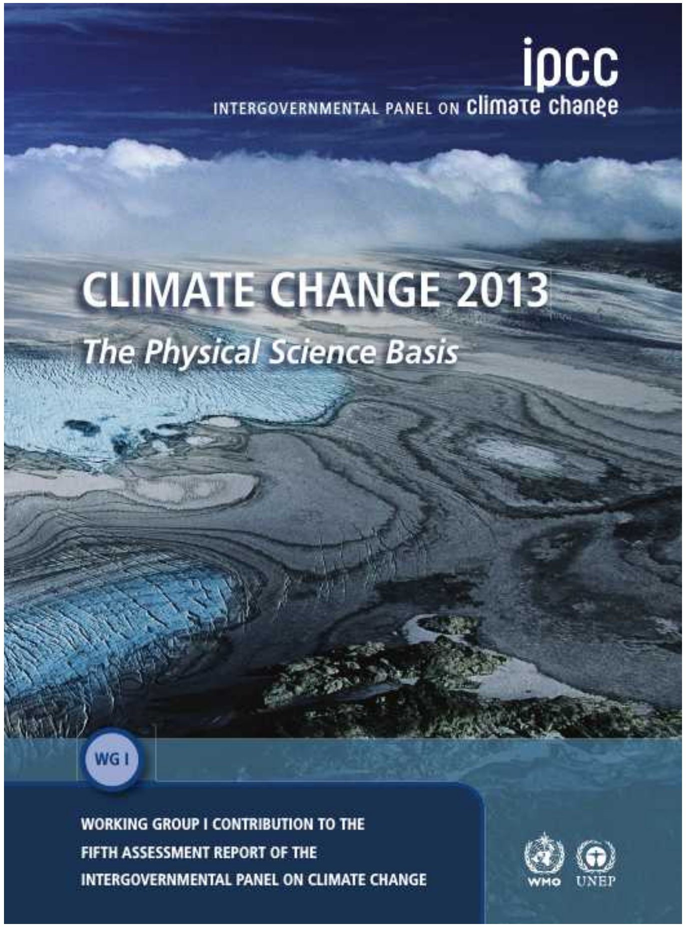
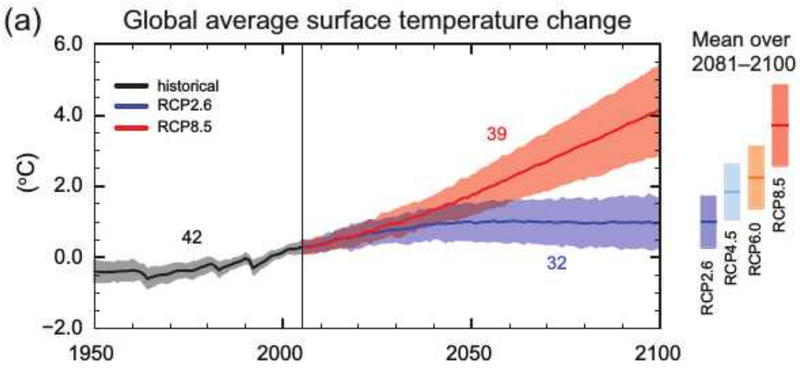
The scientific basis

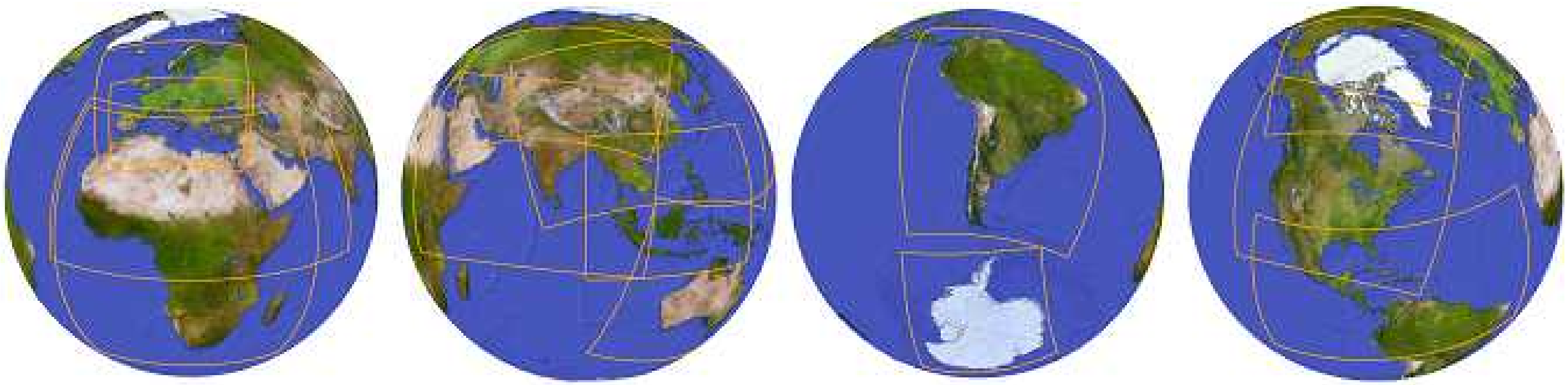




IPCC AR5 key climate risks

Europe				
Key risk	**Adaptation issues & prospects**	**Climatic drivers**	**Timeframe**	**Risk & potential for adaptation**
Increased economic losses and people affected by flooding in river basins and coasts, driven by increasing urbanization, increasing sea levels, coastal erosion, and peak river discharges (*high confidence*) [23.2-3, 23.7]	Adaptation can prevent most of the projected damages (*high confidence*). • Significant experience in hard flood-protection technologies and increasing experience with restoring wetlands • High costs for increasing flood protection • Potential barriers to implementation: demand for land in Europe and environmental and landscape concerns		Present Near term (2030–2040) Long term (2080–2100) 2°C / 4°C	Very low – Medium – Very high
Increased water restrictions. Significant reduction in water availability from river abstraction and from groundwater resources, combined with increased water demand (e.g., for irrigation, energy and industry, domestic use) and with reduced water drainage and runoff as a result of increased evaporative demand, particularly in southern Europe (*high confidence*) [23.4, 23.7]	• Proven adaptation potential from adoption of more water-efficient technologies and of water-saving strategies (e.g., for irrigation, crop species, land cover, industries, domestic use) • Implementation of best practices and governance instruments in river basin management plans and integrated water management		Present Near term (2030–2040) Long term (2080–2100) 2°C / 4°C	Very low – Medium – Very high
Increased economic losses and people affected by extreme heat events: impacts on health and well-being, labor productivity, crop production, air quality, and increasing risk of wildfires in southern Europe and in Russian boreal region (*medium confidence*) [23.3-7, Table 23-1]	• Implementation of warning systems • Adaptation of dwellings and workplaces and of transport and energy infrastructure • Reductions in emissions to improve air quality • Improved wildfire management • Development of insurance products against weather-related yield variations		Present Near term (2030–2040) Long term (2080–2100) 2°C / 4°C	Very low – Medium – Very high

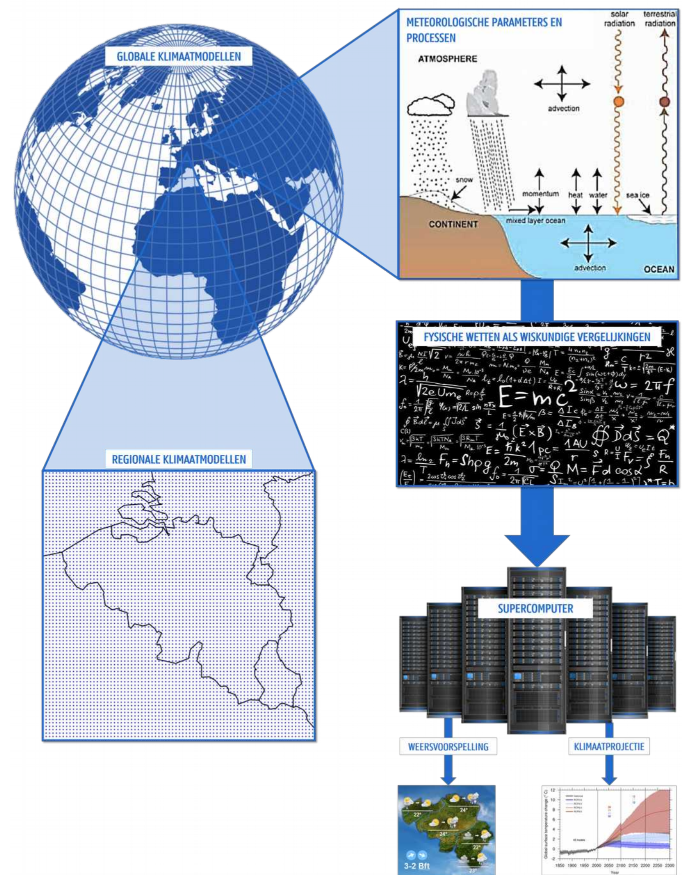
The CORDEX project

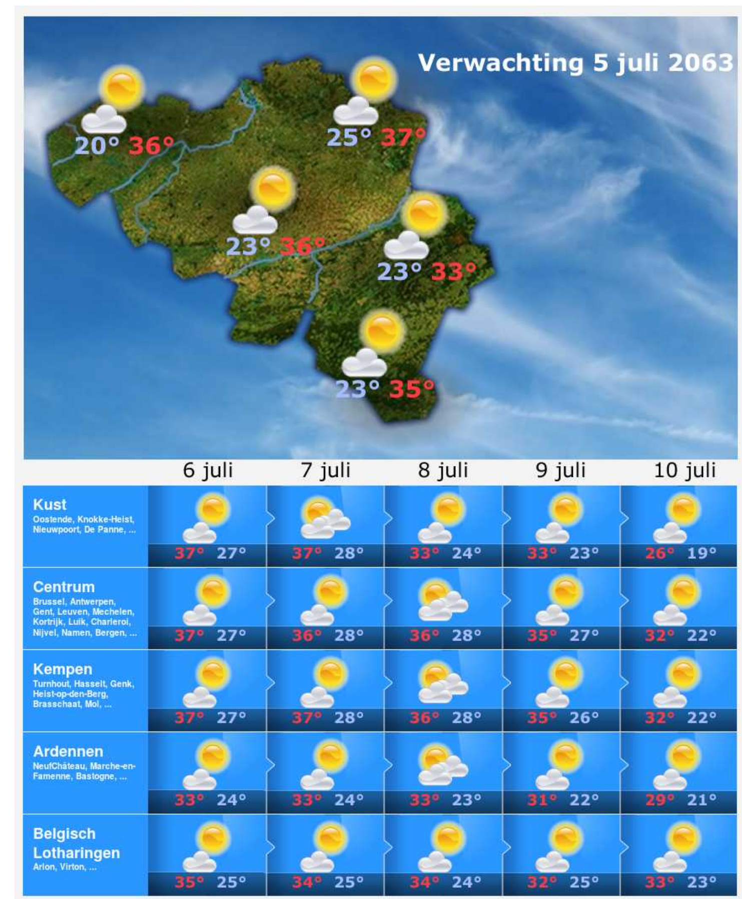


CORDEX Goals

- To better understand relevant regional/local climate phenomena, their variability and changes, through downscaling.
- To evaluate and improve regional climate downscaling models and techniques
- To produce coordinated sets of regional downscaled projections worldwide
- To foster communication and knowledge exchange with users of regional climate information

Computer models: same technology for weather forecasting and climate





.be-yond CORDEX

Objectives:

1. Contribution to the CORDEX project
2. Beyond CORDEX: high-resolution runs
3. Beyond CORDEX: local-impact models
4. Assessment of the climate uncertainties

EURO-CORDEX simulations at 12.5 km resolution

✔: done | o: ongoing

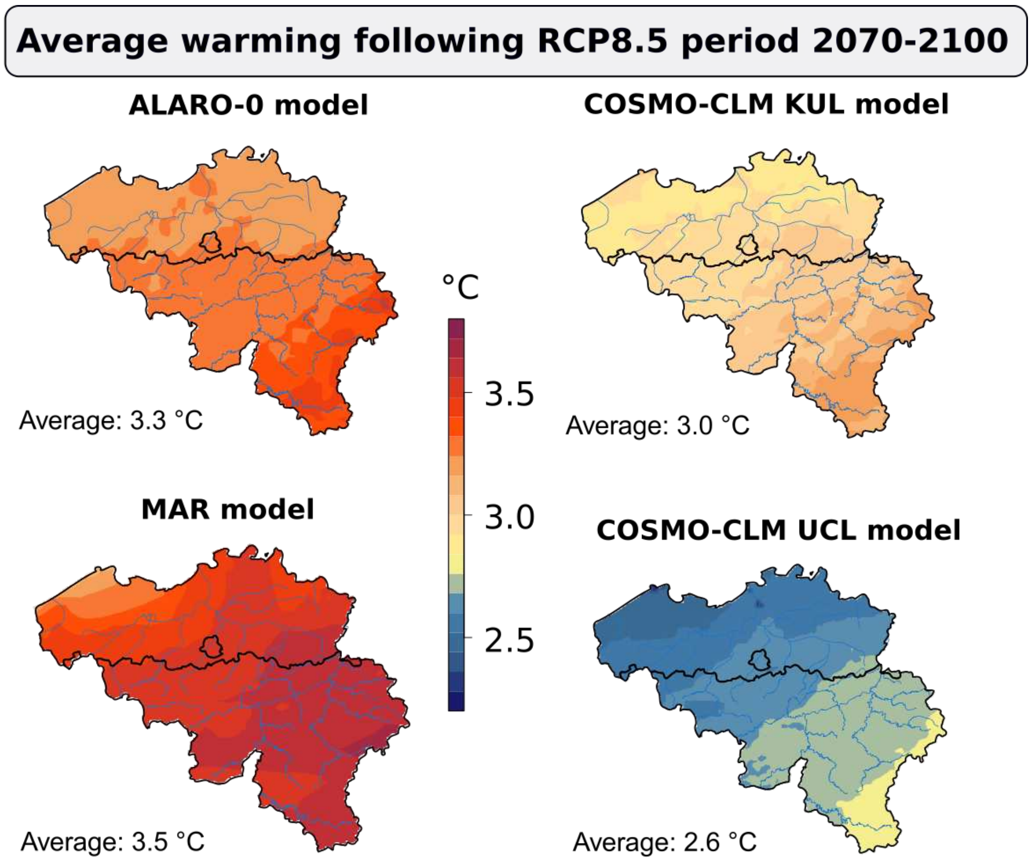
	Evaluation	Historical	RCP2.6	RCP4.5	RCP8.5
1950-1976	✔ (1958-1979)	✔	-	-	-
1976-2005	✔	✔	-	-	-
2005-2040	-	✔ (2005-2015)	✔	✔	✔
2040-2070	-	-	✔	✔	✔
2070-2100	-	-	✔	✔	✔

Belgian simulations at 4 km resolution

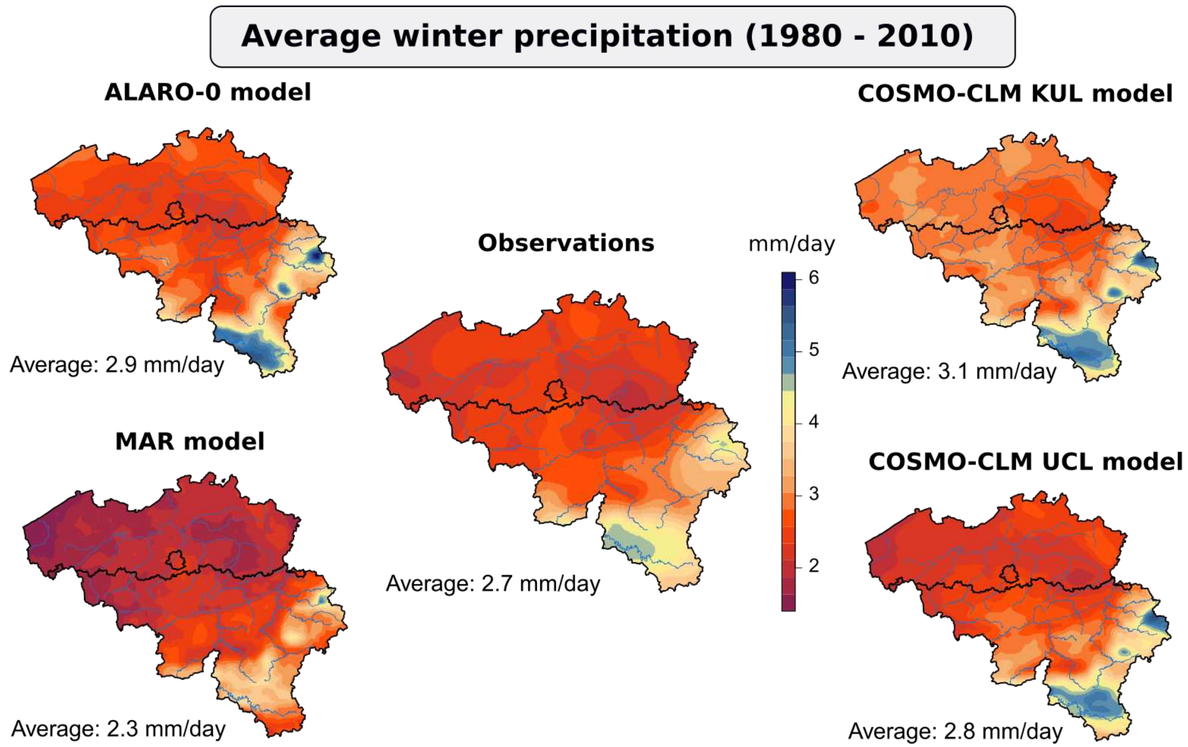
✔: done | o: ongoing

	Evaluation	Historical	RCP2.6	RCP4.5	RCP8.5
1950-1976	✔ (1958-1979)	✔	-	-	-
1979-2010	✔	-	-	-	-
1976-2005	-	✔	-	-	-
2006-2040	-	-	✔	✔	✔
2040-2070	-	-	✔	✔	✔
2070-2100	-	-	✔	✔	✔

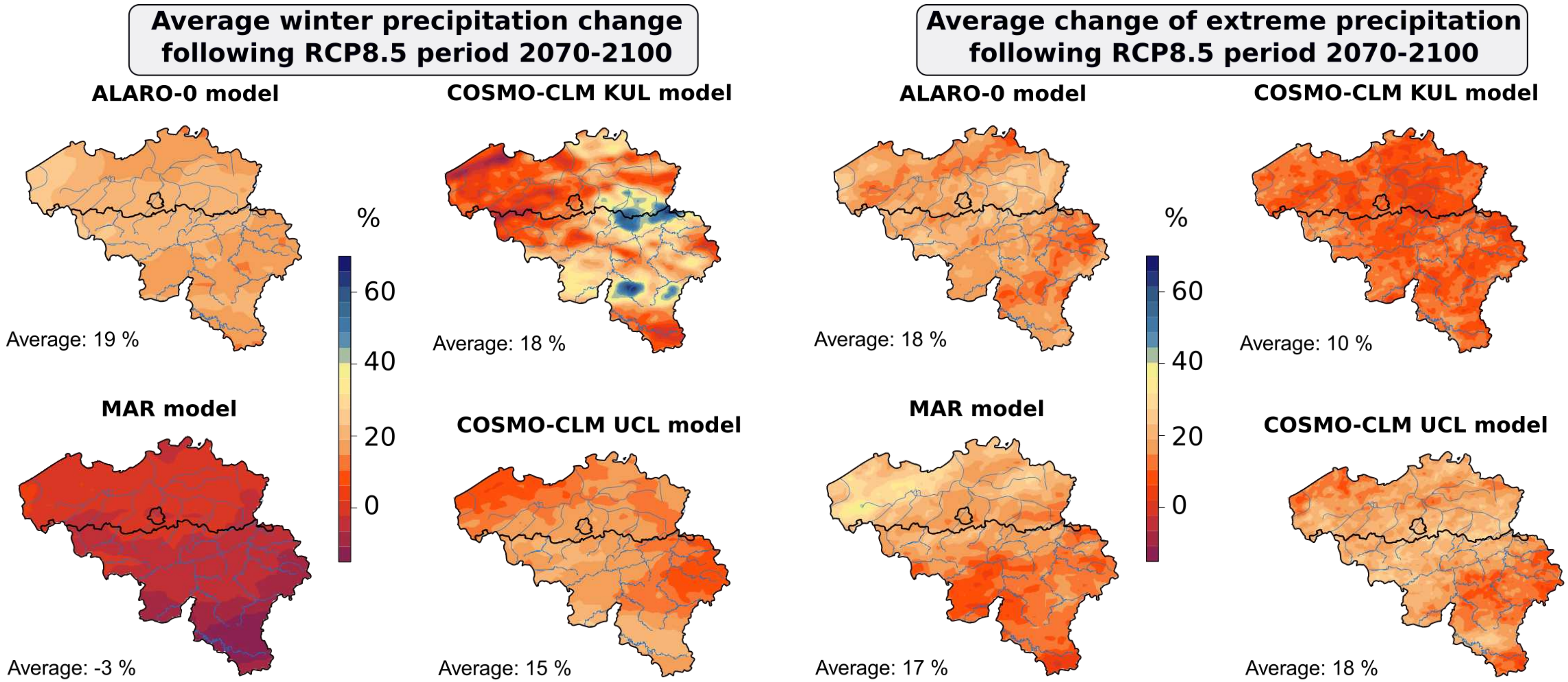
“local” warming



How well do we simulate precipitation?



Can we be certain?



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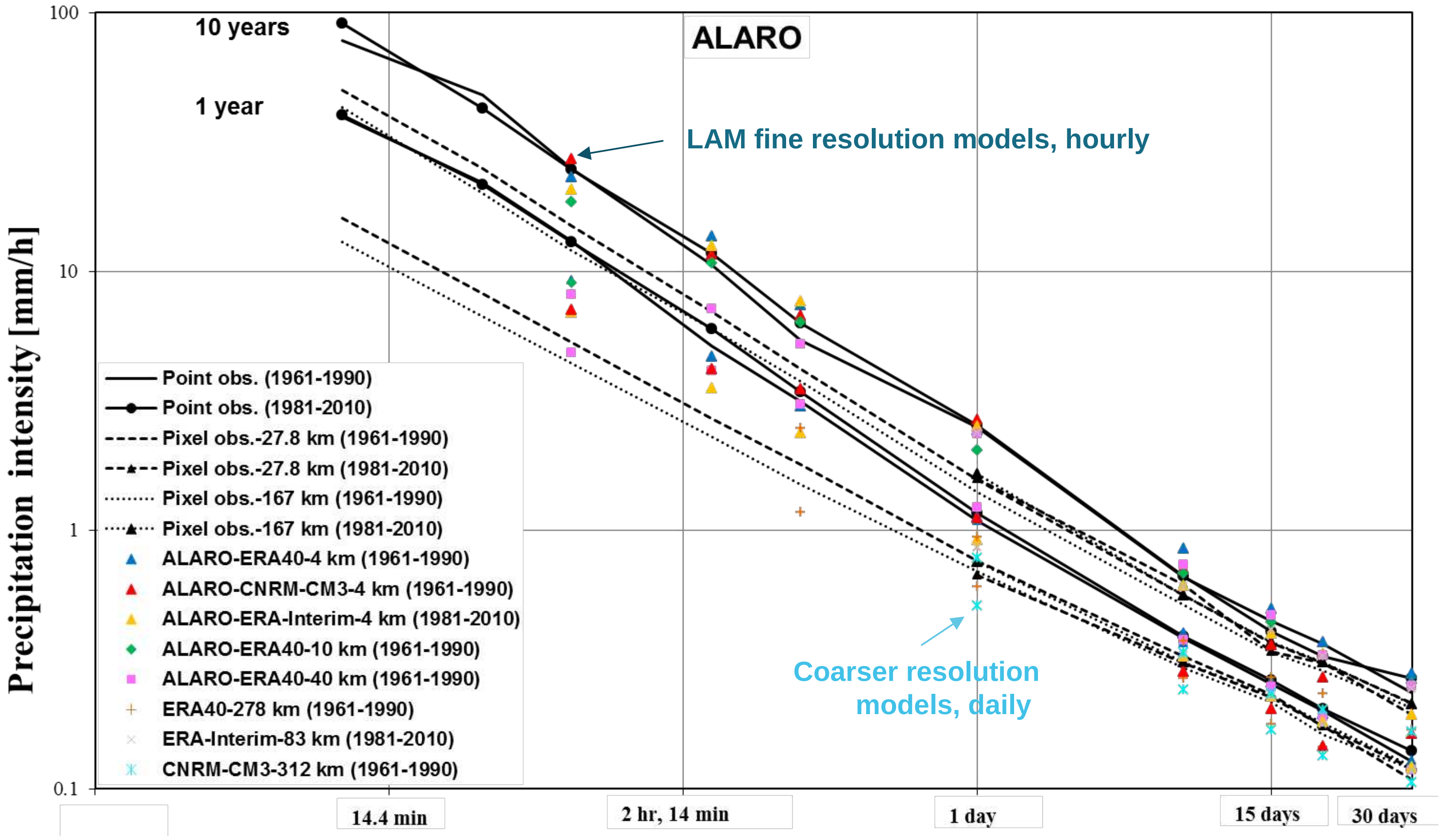
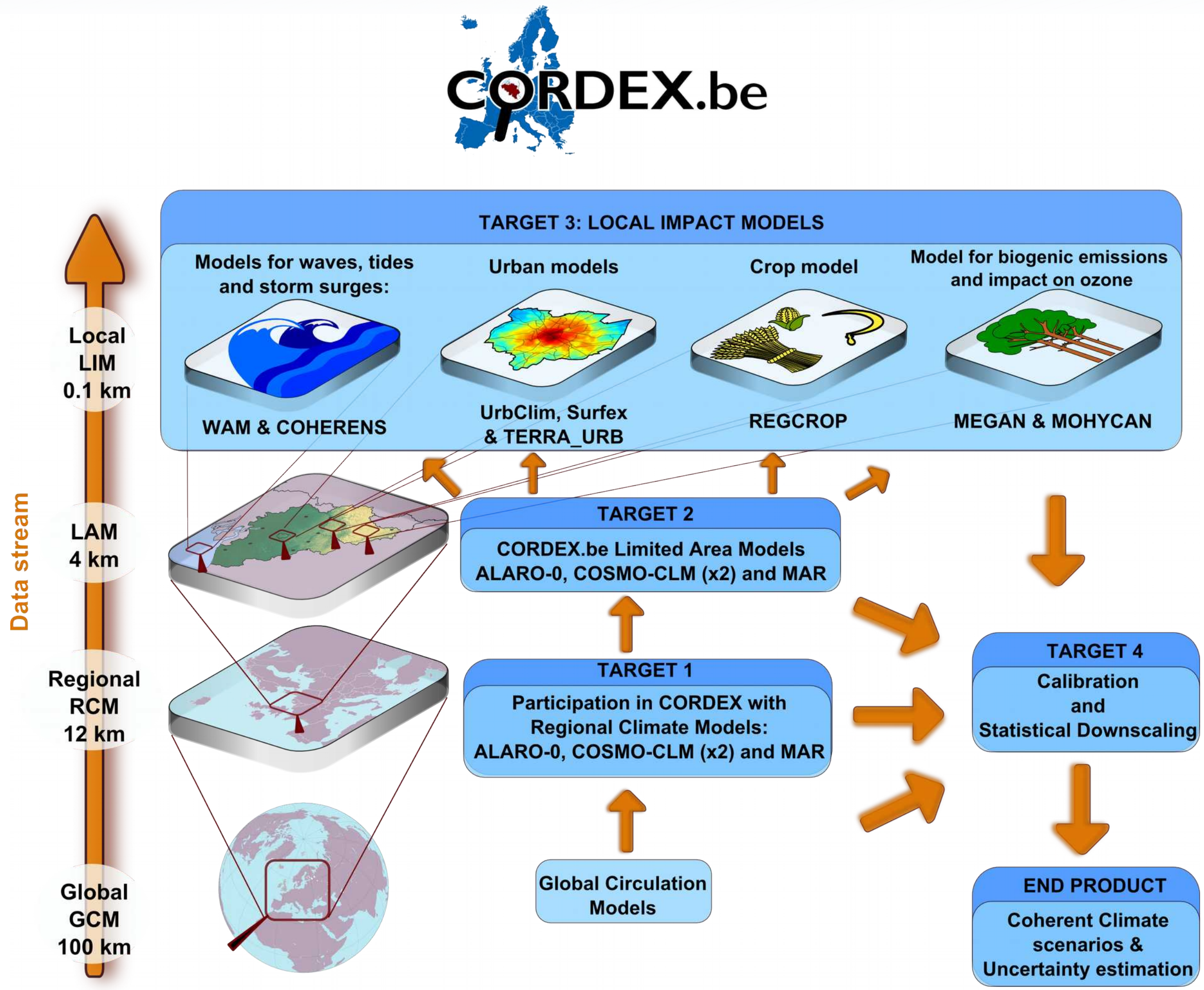
CORDEX.be downscaling
lower bias for precipitation extremes



Tabari H, De Troch R, Giot O, Hamdi R, Termonia P, Saeed S, Brisson E, Van Lipzig N, Willems P (2016) Local impact analysis of climate change on precipitation extremes: are high-resolution climate models needed for realistic simulations? ***Hydrology and Earth System Sciences*** 20: 3843-3857

.beyond projections as input for local-impact models



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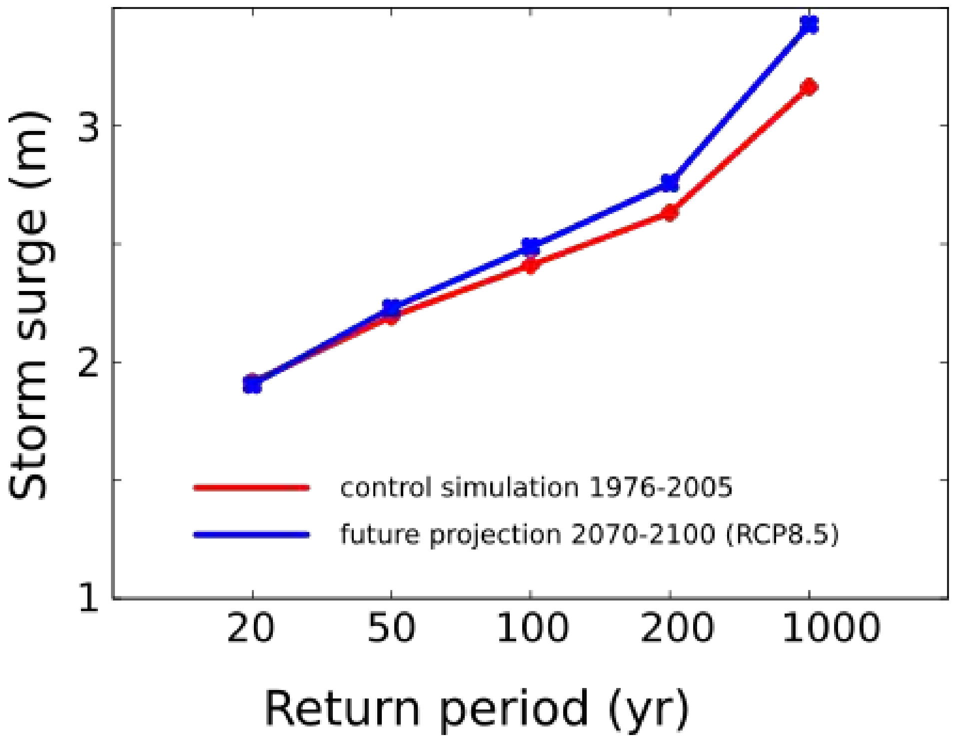
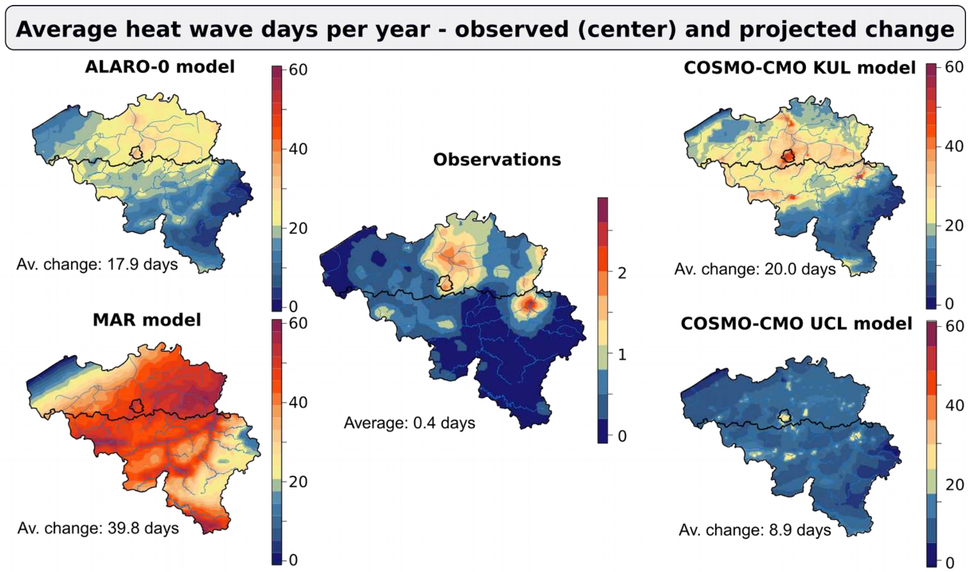
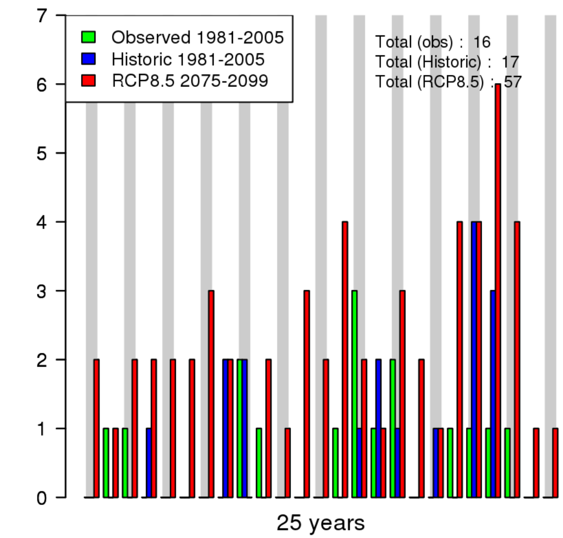
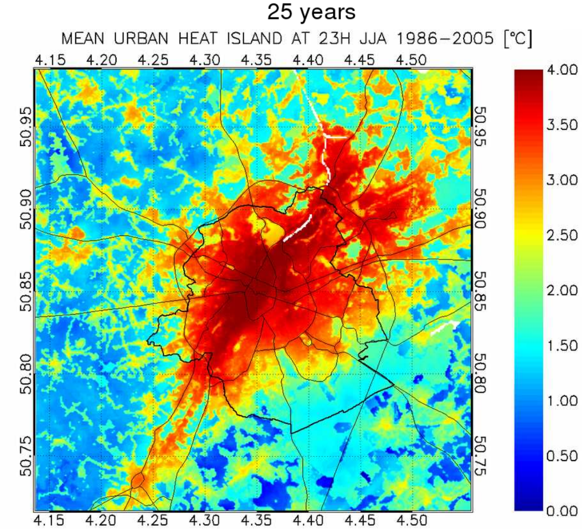
Models for waves, tides and storm surges for the North Sea (KBIN)

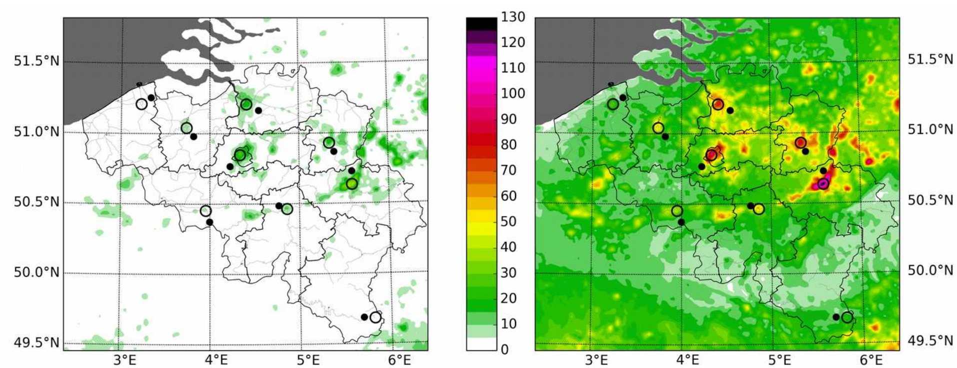


Heat waves and urban effects (VITO, KULeuven, RMI)

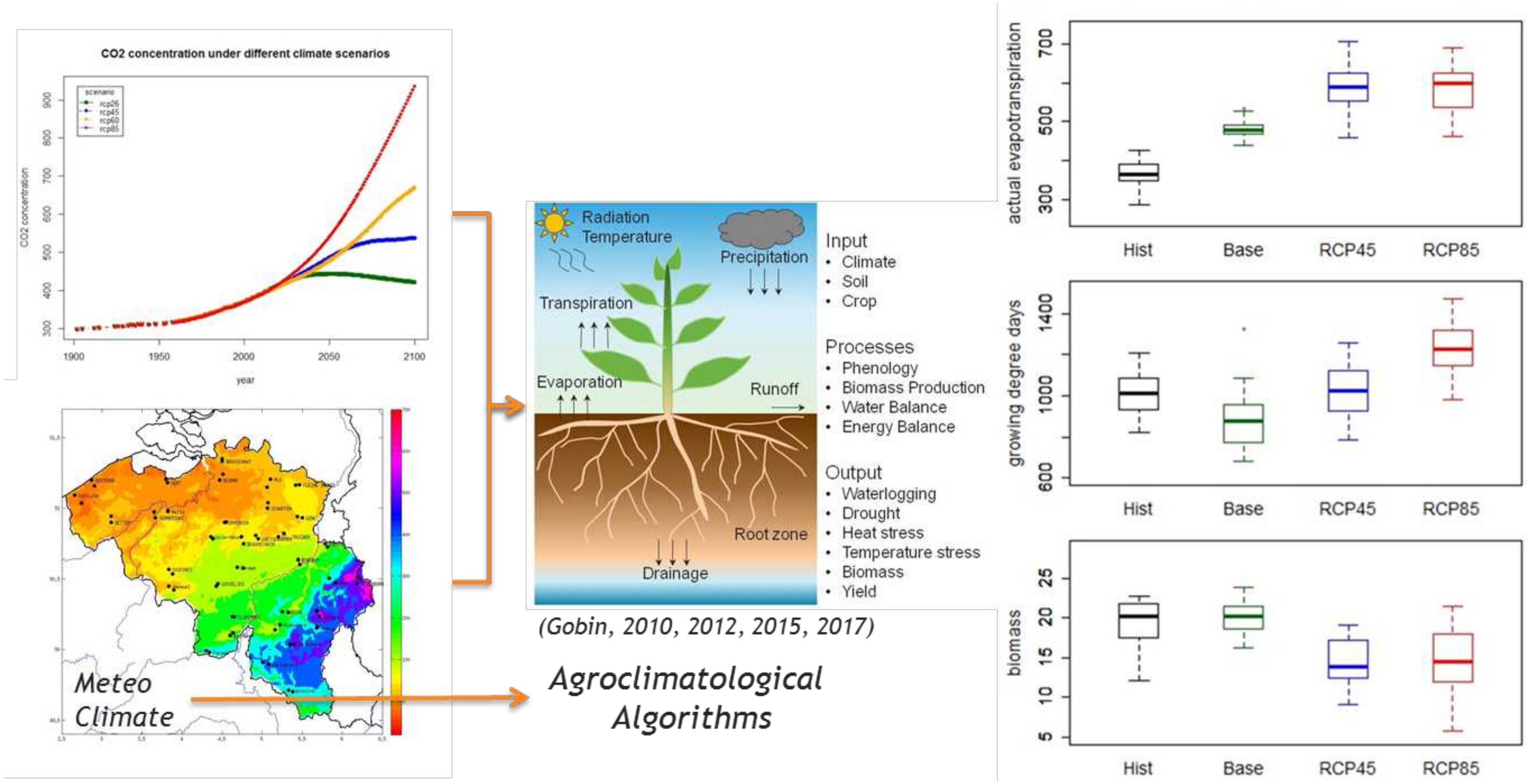








Impact on agriculture (VITO)



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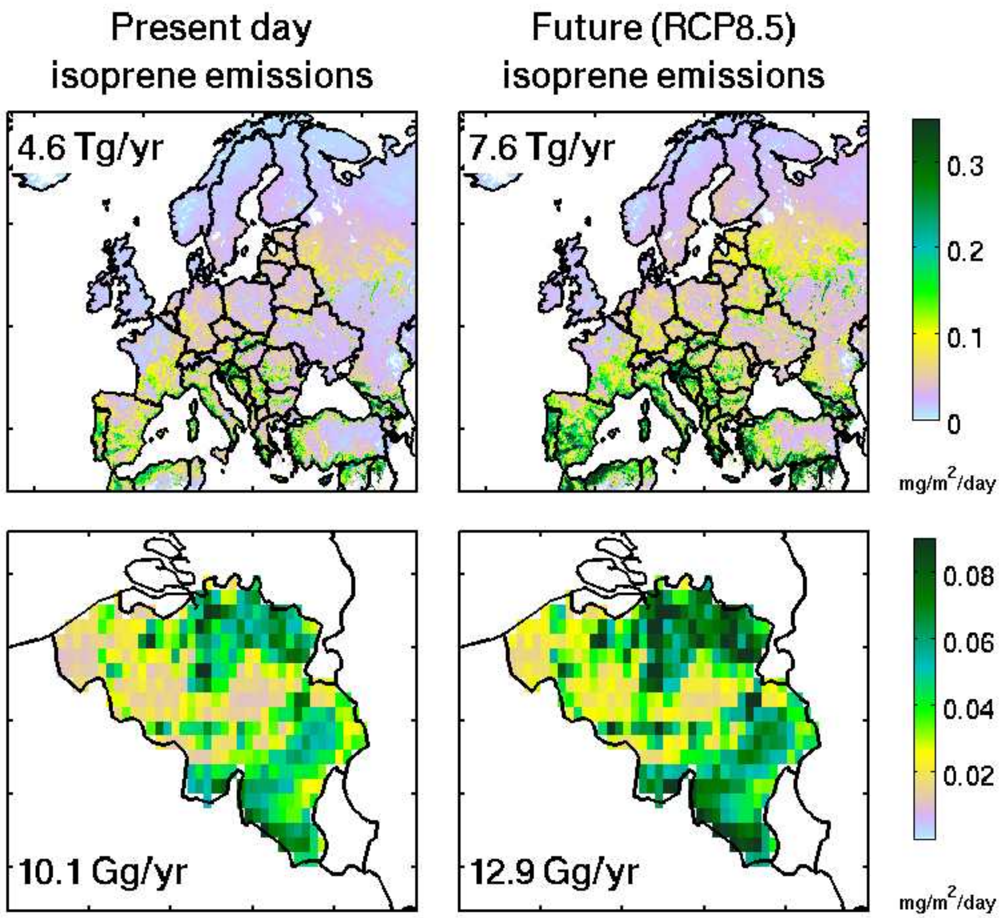
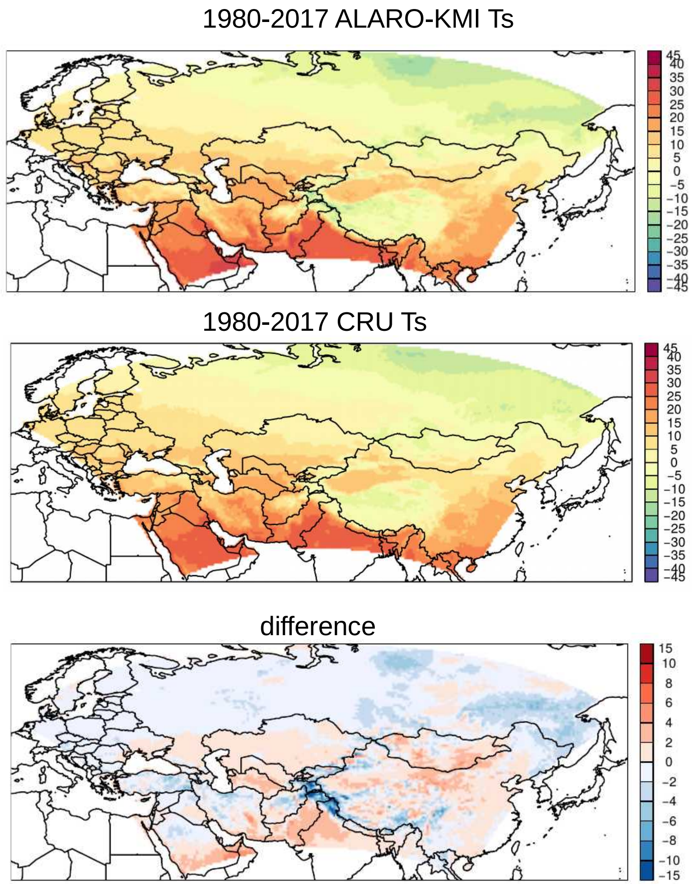
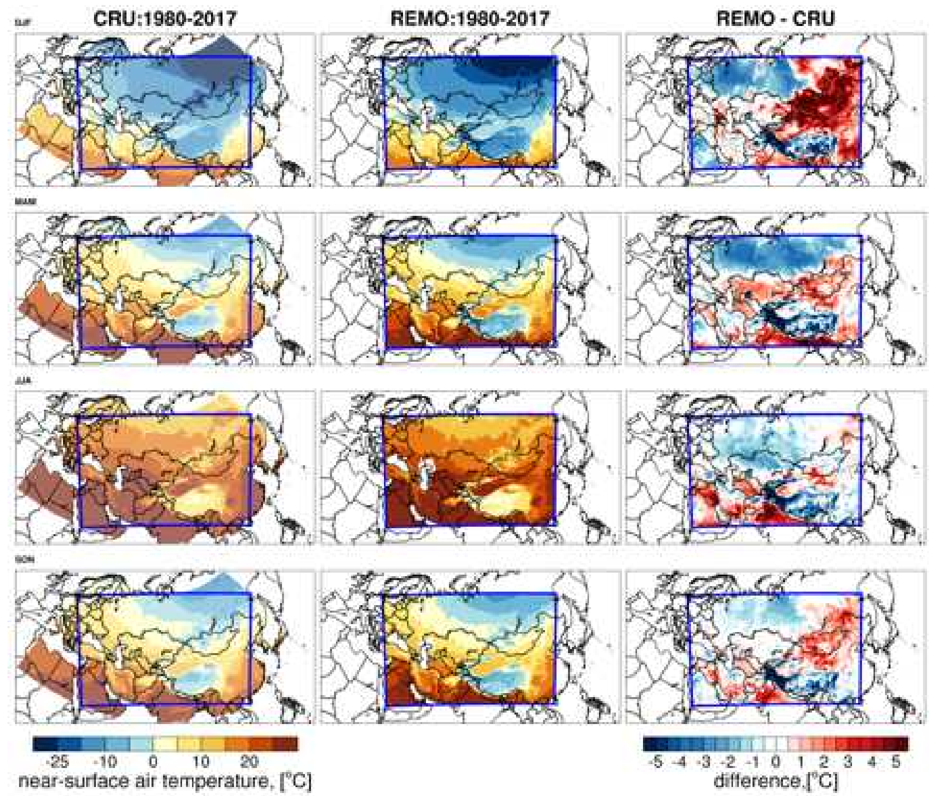
Isoprene emissions (BISA)



CORDEX Central Asia

https://www.projectafter.net

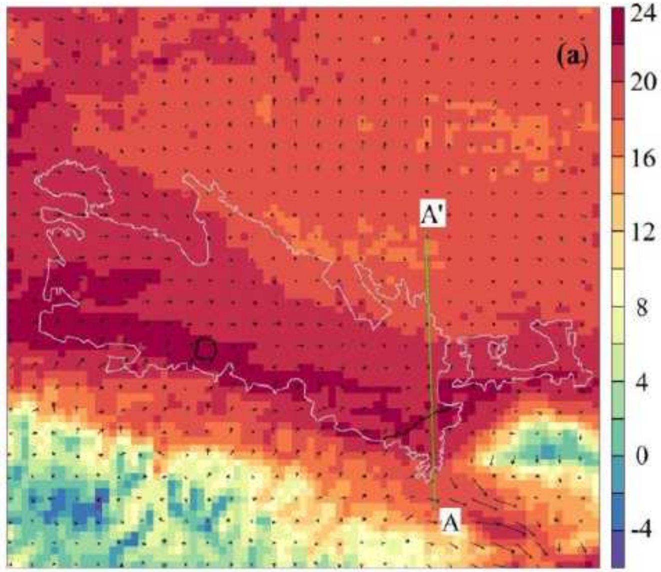


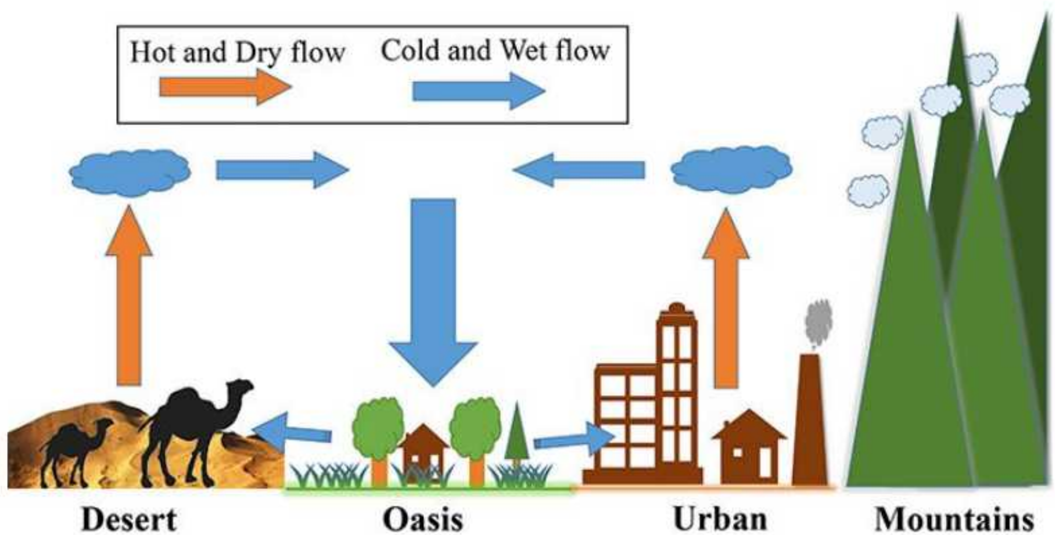


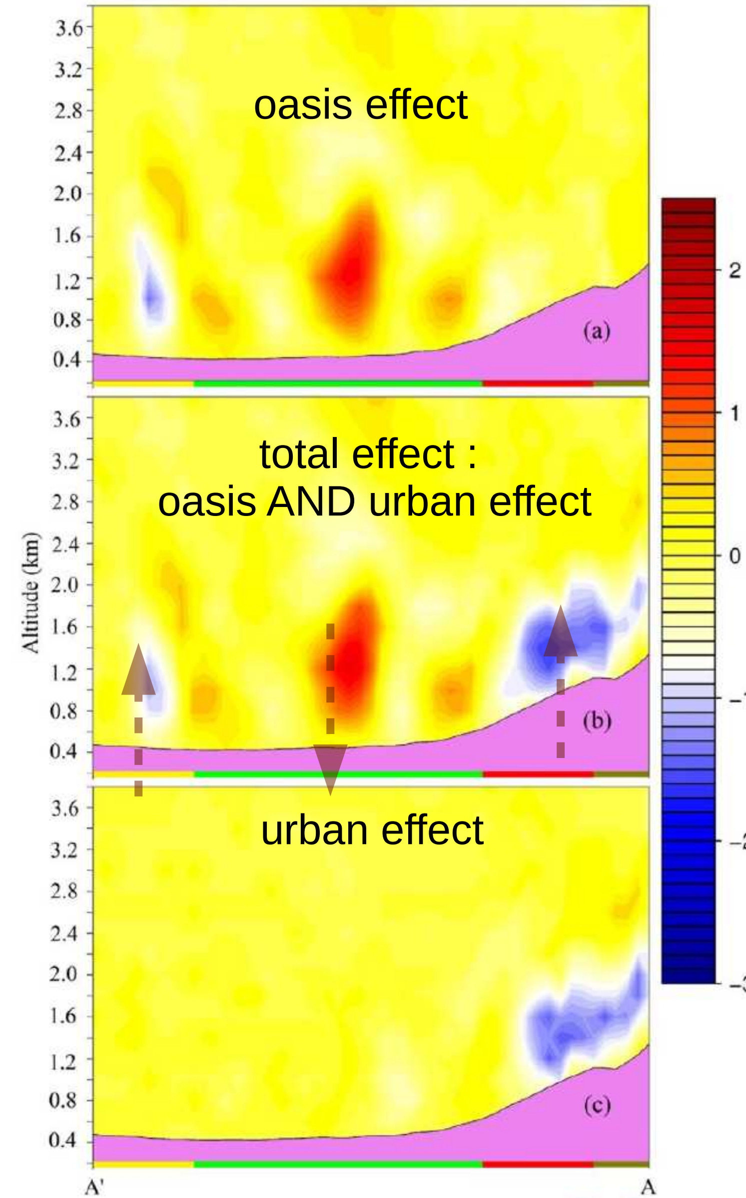
Kotova et al., Climate Services, (2018)

The project is granted by the ERA.Net RUS Plus Initiative, ID 166

RMI-UGent Collaboration with the Xinjiang Institute of Ecology (XIEG), China:
Mountain Oasis Desert System (MODS)







(Peng *et al.* 2019)

CORDEX.be: A few general outcomes

- An increase in extreme precipitation.
- An intensification of extreme storm surges near the Belgian coast by the end of the century.
- For the Brussels urban environment:
  - An increase of factor 3 to 4 in the number of heat waves.
  - Significant increase of heat stress for people living in the city of Brussels, up to twice as large as in the surrounding rural areas.
- An increased variability for biomass production and yields. Average yields for fodder maize and late potatoes will also decline.
- An increase of 51% of biogenic emissions from isoprene.

Conclusions

- The CORDEX.be consortium contributed to the CORDEX project.
- We went beyond (.be) the CORDEX goals both in resolutions (details computed) and in more downstream impact modeling.
- The data exists, first impacts have been computed, future ones are planned. The data contains a wealth of information, ready to be uncovered. e.g. in future projects.
- Detailed climate model data has the potential to make climate information tangible, understandable in human language. This may help to bridge communication gap with the stakeholders, provided it is interpreted in a correct way.

Thank you for your attention!