

# COSMO-CLM for East Asia

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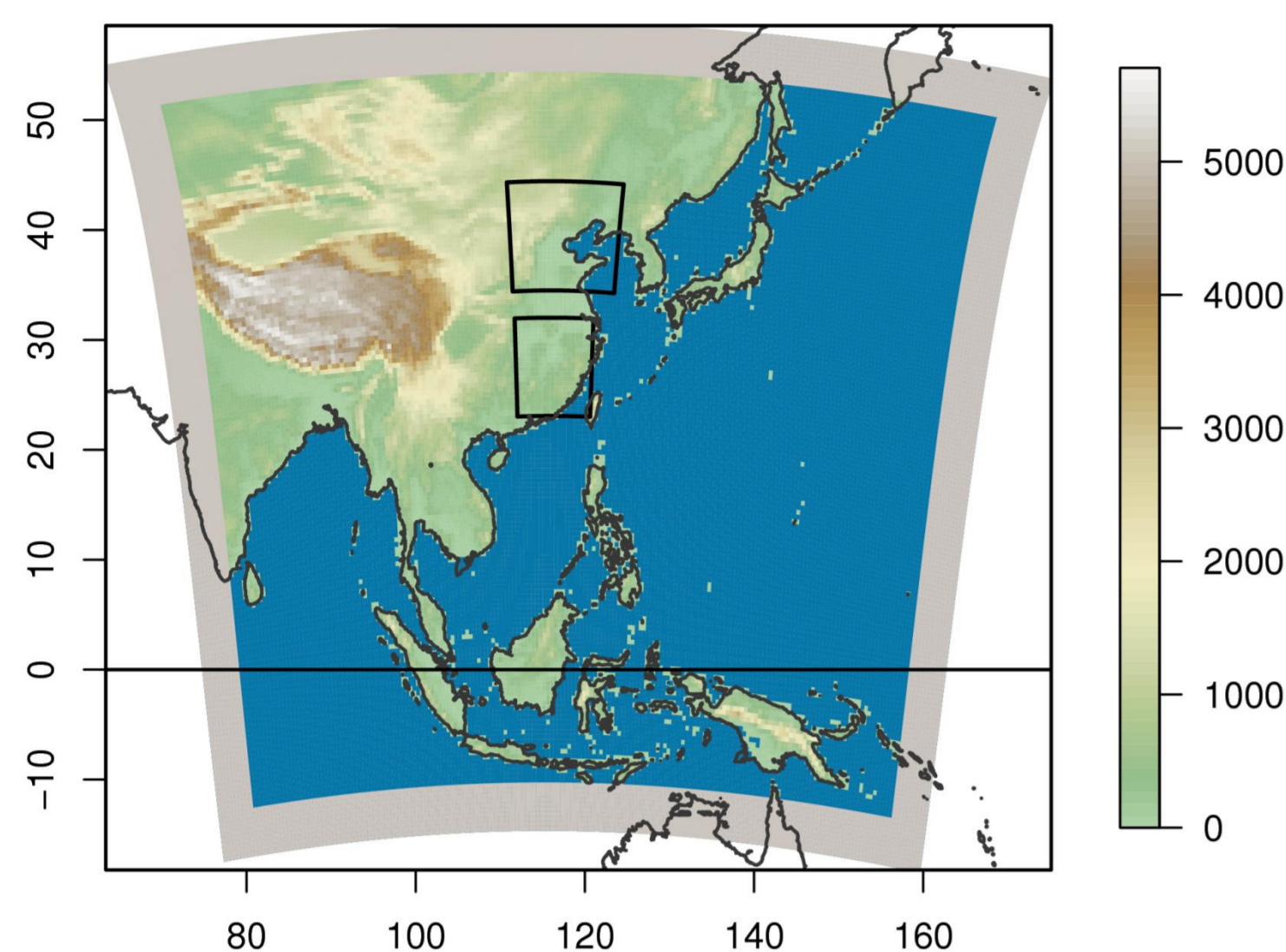
## EXTREME EVENTS IN THE PAST AND FUTURE

### A COMPARATIVE ASSESSMENT FOR THE HAIHE RIVER AND THE POYANG LAKE BASINS

DFG/NSFC-joint funding program 'Land Use and Water Resources Management under Changing Environmental Conditions'

The impact of future climate change on land use and water resources management is strongly dependent on the related changes in weather extremes. Global general circulation models currently lack the resolution to incorporate all processes leading to extremes. Therefore, a dynamical downscaling, with the COSMO-CLM (COnsortium for Small-scale MOdelling – Climate Limited area Model) adapted to East Asia, was performed.

Two catchments in China are of main interest, namely the Haihe river and the Poyang lake basin. On the one hand, with 10 percent of China's population living in the Haihe river basin and the two megacities Beijing and Tianjin lying in vicinity of the river, water shortage is always a major problem in the region. On the other hand, the Poyang lake is the largest natural fresh water reservoir of China. The influence of the East Asian Summer Monsoon leads to strong interannual variability of precipitation. Therefore, flood and drought events are difficult to predict in this region.

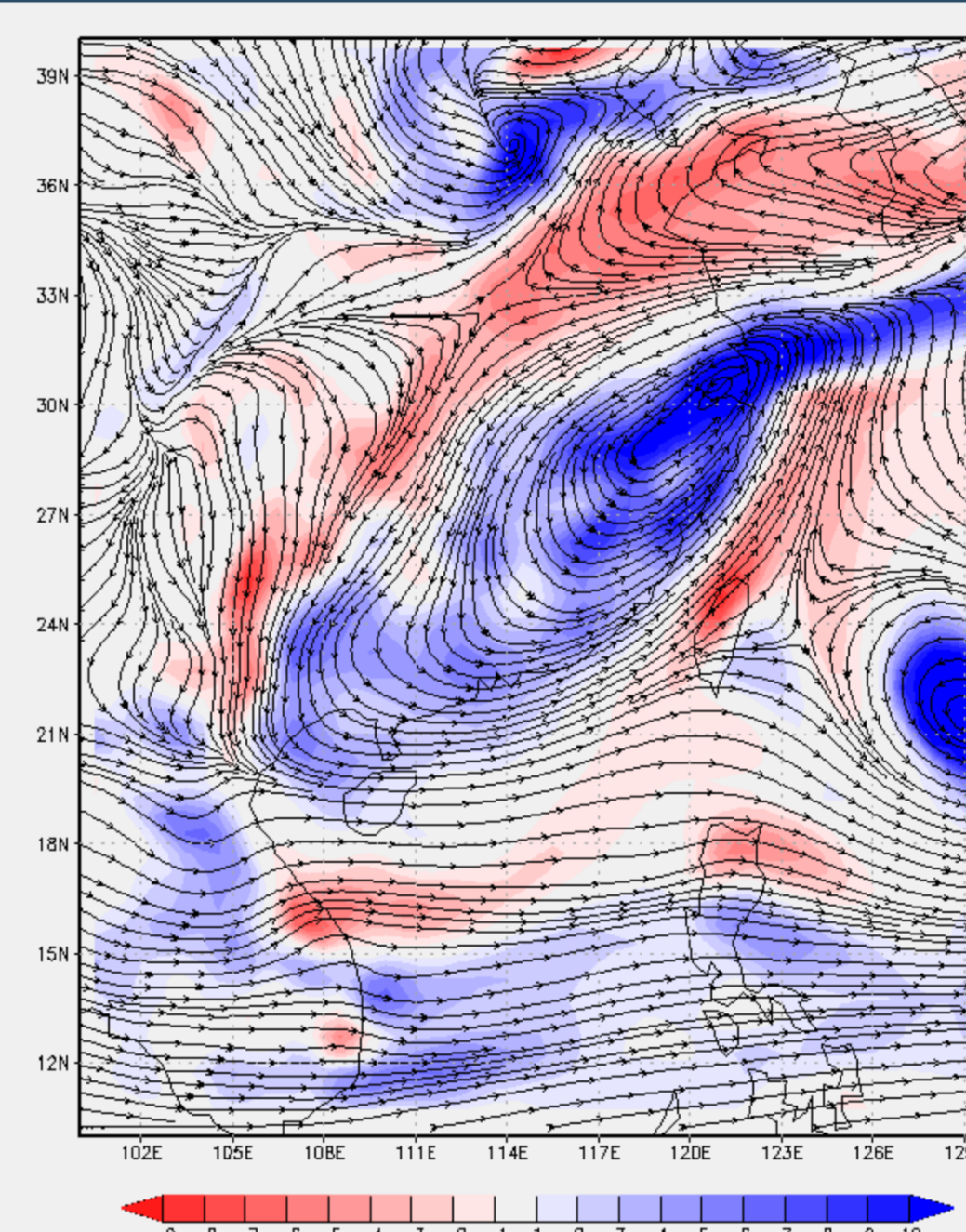


Orography [m] for the East Asia domain in 0.44° resolution. The gray frame indicates the sponge zone. Two sub-catchments (North - Haihe; South - Poyang) are highlighted by boxes.

## SCOPE OF PROJECT

	1. nesting step	2. nesting step Haihe	2. nesting step Poyang
<b>model</b>	COSMO_4.8_CLM_11+		
<b>horizontal resolution</b>	0,44° (ca 50km)	0,0625° (ca 7km)	
<b>horizontal grid size (excl sponge zone)</b>	183x147	160x160	128x144
<b>timestep</b>	150s	60s	
<b>convection scheme</b>	Tiedtke		
<b>spin-up</b>	3 years		
<b>time interval for boundary conditions</b>	6 hour		
<b>simulations driving model</b>	ERA40 1971-2000 (Eval50km)	Eval50km 1971-2000	Eval50km 1971-1975
	EH5 20C3M run3 1971-2000 (20C50km)	20C50km 1971-2000	20C50km 1971-1997
	EH5 A1B run3 2011-2050 (A1B50km)	A1B50km 2021-2050	A1B50km 2021-2050

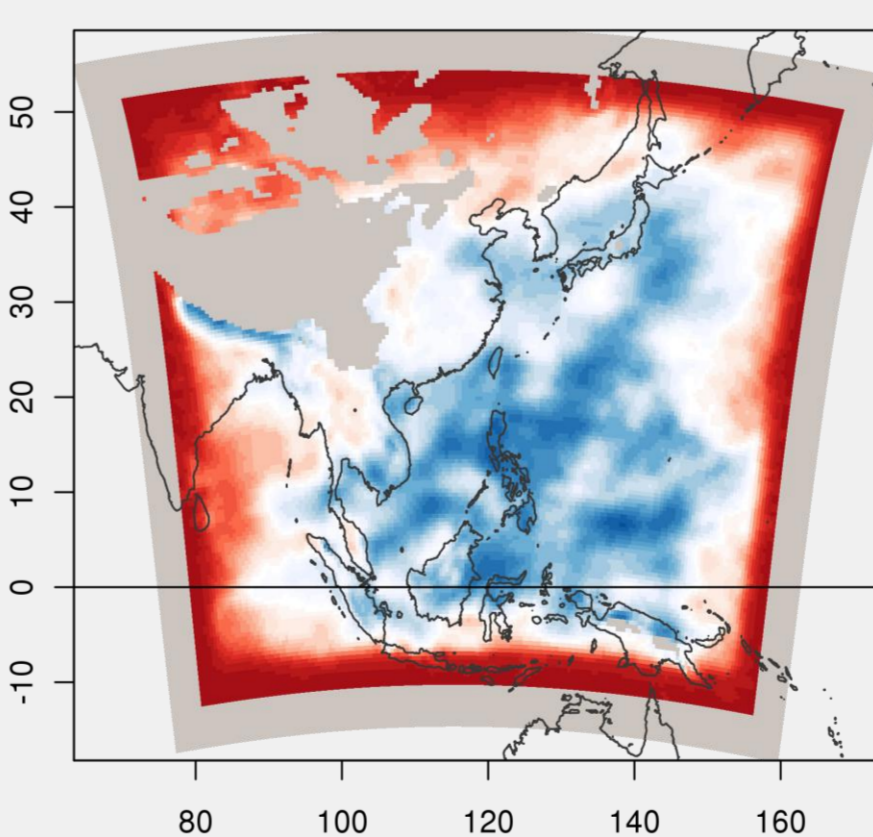
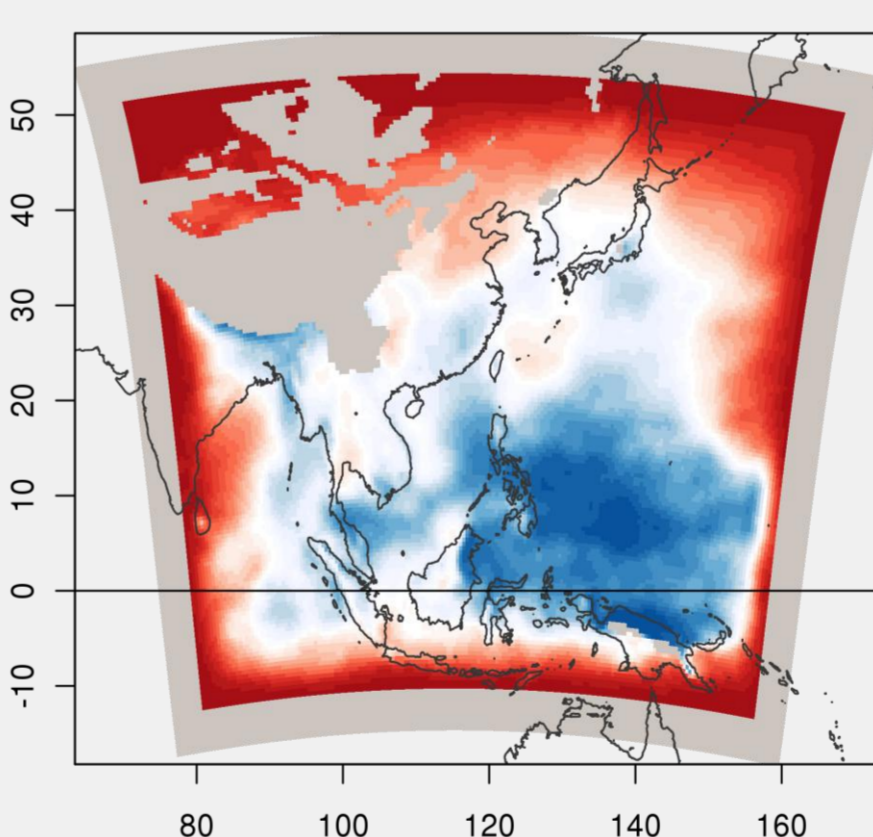
## COMPLETED RESEARCH



The formation of a Southwest vortex at 850hPa. Color shading indicates relative vorticity [ $10^{-5} \text{ s}^{-1}$ ]

An analysis of the 50km simulations was published in collaboration with 'The Guanting Project' (contact: C. Menz / PIK). As this is the first time COSMO-CLM was adapted to East Asia, its general performance with respect to biases in temperature at 2m and precipitation was investigated. In addition to that, atmospheric phenomena typical for the East Asia region (e.g. Southwest vortices, cold surges, ...) were screened, in order to check the potential of the model to reproduce weather and climate in this setup.

## ONGOING RESEARCH



Currently the main focus is set on understanding on what time scale climate variability of the driving model is adapted by the driven model. The motivation for this work comes from the discussion about added value of RCM. It is crucial to analyze RCM output with respect to its added value compared to its driving model. Therefore, in this study the output of the driven model is directly compared to the output of the driving model. Hereby, both nesting steps are investigated.

Coherence between the 50km RCM and its driving model (EH5 20C3M) on the frequency 1/month for temperature (top panel) and specific humidity (bottom panel) at 850hPa in summer.

## COLLABORATION

The RCM output is already distributed within and beyond the DFG/NSFC-joint funding program, ...

- DFG-project: 'Integrated modeling of the response of aquatic ecosystems to land use and climate change in the Poyang Lake region, China' Linking hydrological and biological models, improves our understanding, how climate and land use influence freshwater ecosystems at the catchment scale. (contact: B. Schmalz, N. Fohrer / CAU; M.Kümmerlen, S. Jähmig / Senckenberg Research Institute)
- DFG/NSFC-project: 'Integrated water resources modelling and its uncertainty analysis for coastal watersheds under climate and land-use change' An integrated model has been developed to simulate hydrology at the Luanhe Basin in northern China. (contact: D. Zhang, Y. Zheng / Beijing University; S. Kollet / University of Bonn)
- IFAD-project: 'WATERCOPE – Supporting national research capacity and policy development to cope with dwindling water resources and intensifying land use in the transborder Altay-Dzungarian region of Mongolia and China' (contact: O. Byambaa, N. Soninkishig / National University of Mongolia; C. Simmer / University of Bonn)

## FURTHER INFORMATION

D.Wang, C. Menz, T. Simon, C.Ohlwein, C.Simmer (2013): *Regional dynamical downscaling with CCLM over East Asia*, Meteorology and Atmospheric Physics

T. Simon, A. Hense, B. Su, T. Jiang, C. Simmer, C. Ohlwein (2013): *Pattern based statistical downscaling of East Asian summer monsoon precipitation*, Tellus A

Please check online version of this poster for contact details of collaborators.



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