

# Latest progress and ongoing work in HCLIM

Oskar Landgren (project lead)  
and the HCLIM community



## National meteorological institutes



## Universities



**HCLIM**  
HARMONIE-Climate

# Working groups in HCLIM

- Aerosols
- AI/ML
- Coupling
- Documentation and website
- Evaluation
- Pan-European experiments
- Polar and snow
- Pseudo-global warming & climate attribution
- System

# Evaluation

Contact: Fuxing Wang, SMHI

Recent tests for 2009 (+2008 for spin-up) over NORDIC3, 2010-2014 (2009 spinup) over EUR11:

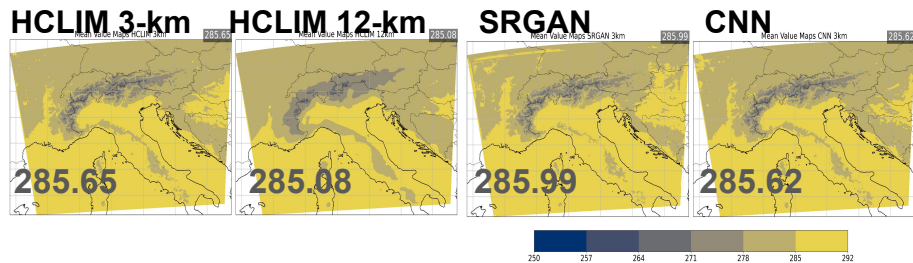
- Default setup in HCLIM46:
  - Dry soil layer (surface soil resistance for bare soil evap.)
  - NHINCSOL = 4 (CMIP6 values for incoming solar radiation)
  - Transient monthly aerosols (from MERRA2, for radiation only)
- Ongoing test:
  - ECUME vs ECUME6 (ECUME6 leads to increased latent heat flux over ocean)
  - NPATCH=3 vs 2 (small diff NORDIC3, but larger cold bias DJF & warm bias JJA EURO11)
  - ECOCLIMAP SG 0.1 vs 1.2 (small differences, EUR11 & NORDIC3)
  - GLO-90 vs GMTED2010 (small differences, EUR11 & NORDIC3)
  - T2M diagnostic (tas/tasmin/tasmax not improved (?), checking tas over patch ongoing)

# AI/ML

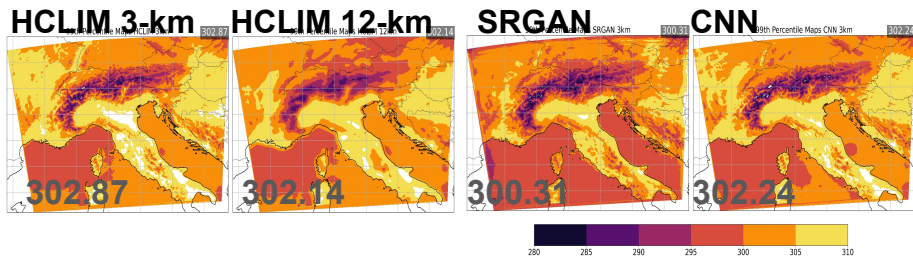
Contact: Yi-Chi Wang, SMHI

## Validation with Mean and Extremes

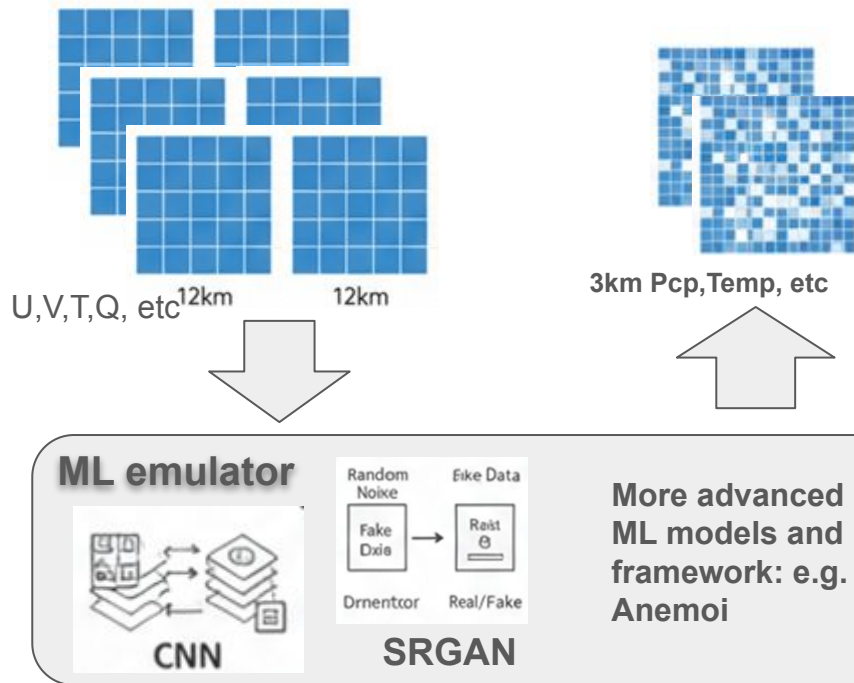
Averaged Temperature: Year 2009



Extreme Temperature (> 99 percentile): Year 2009



## ML emulator Super-resolution example: Mapping HCLIM-12km to HCLIM-3km



+ STRIDE model for CPM to CPM (5 to 2.5 km) emulation tests (Met Éireann)

# Coupling

Contact: Juan Carlos Sanchez Perrino, AEMET

Ongoing implementations:

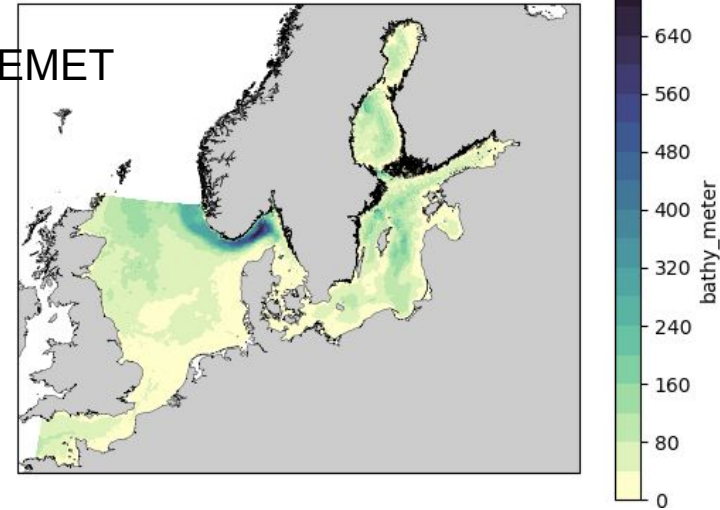
- Hydrology: CTRIP (tested in Iberian Peninsula)
- Ocean: NEMO (tested in Baltic Sea)
- Sea ice: SI3 (part of NEMO)
- Waves: WaveWatch (Not tested)

In the long term: any combination.

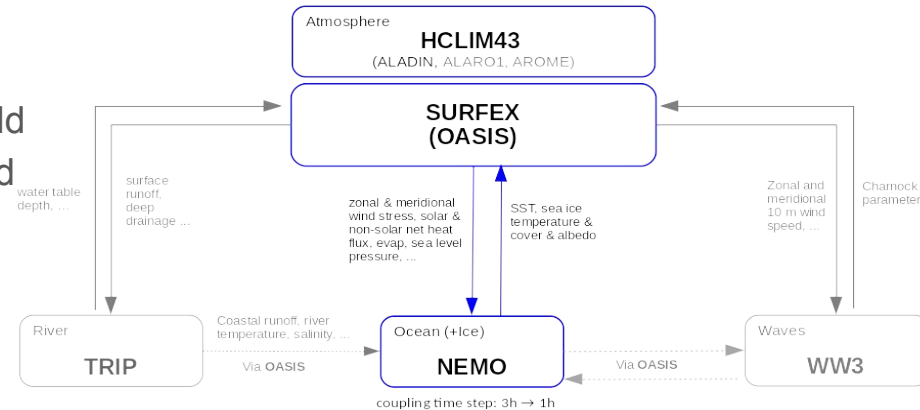
Short term priority: Ocean and Hydrology.

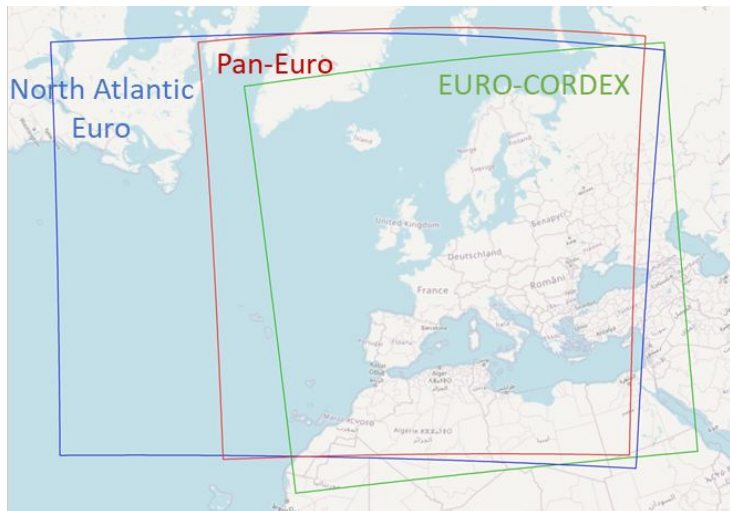
Technically working but results are not good (strong cold bias in the Baltic). Performance is good but storage and conversion times are a bottleneck currently. Not yet feasible for long simulations.

**Working week in Madrid, May 11-14.**

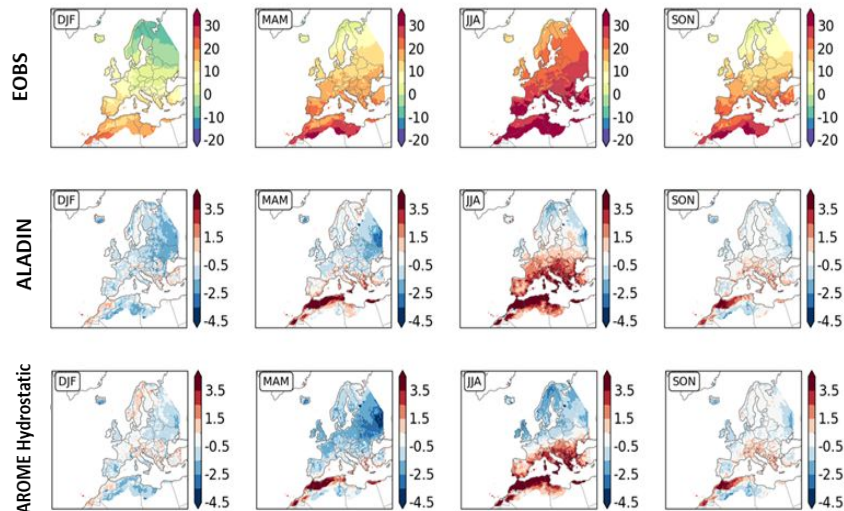


## HARMONIE - NEMO coupling





tasmax [°C] | mean | 2000-2023 ANN



## Two Key Questions:

- 1) Pan-Euro Domain: Can AROME in hydrostatic mode replace ALADIN hydrostatic?
- 2) NA-Euro Domain: Does 12km GCM downscaling with HCLIM correct well-known biases (e.g. too zonal storm track)?

## 1) AROME Hydrostatic vs ALADIN Hy:

For 12km ERA5-driven simulations for 2000 - 2023 find:

- Bias in cloud cover, independent of resolution.
- Stems mostly from low clouds -
  - Leads to negative bias in temperature.
- AROME overestimates precipitation.
- ALADIN has a drizzle problem, as per most RCMs.

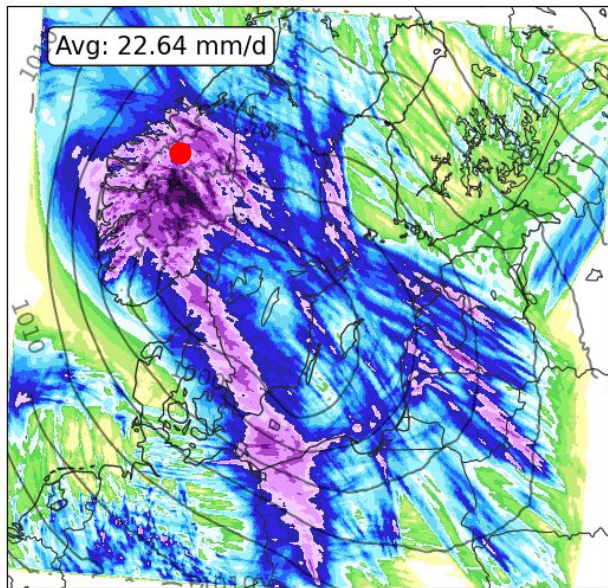
# Pseudo-global warming and climate attribution experiments

Contact:  
Geert Lenderink, KNMI

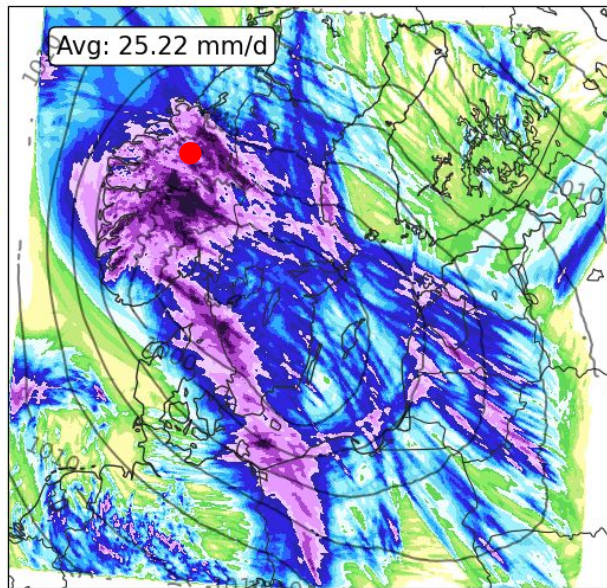
2023.08.06 - 2023.08.08

See also [poster by Hilke Lentink](#)

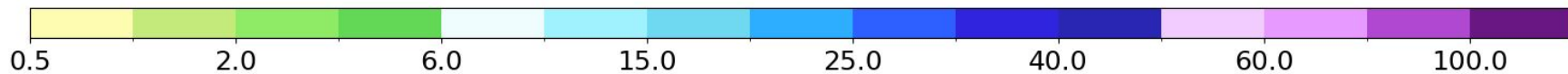
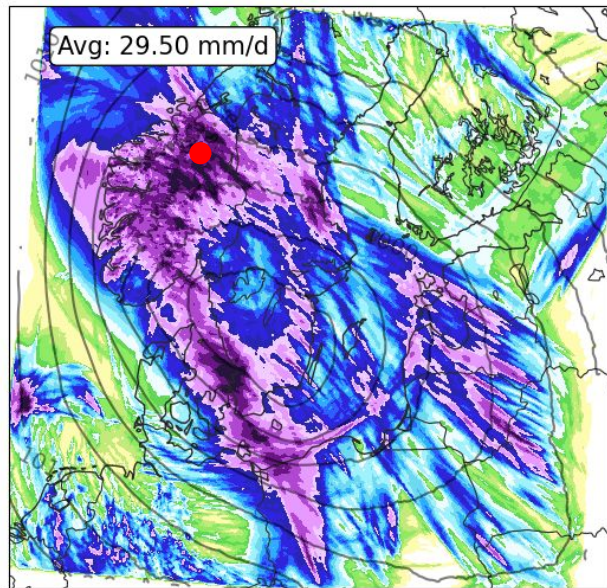
HCLIM INI3D



HCLIM INI3D 2C



HCLIM INI3D 3C



## Examples of collaboration topics:

- Discussing and evaluating 4-6 km simulations from different models.
- Technical tools, e.g. CMORization, post processing, bias correction.
- Improving consistency between models on e.g. treatment of future aerosols
- Adapt Tactus script system to climate mode simulations (HARMONIE-AROME, MeteoFrance-AROME and ALARO-1):  
longer simulations, handling of GCM boundary files etc.