#### A new spatially distributed Added Value Index for Regional Climate Models:

#### the EURO-CORDEX and CORDEX-CORE highest resolution ensembles

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#### Where is the Added Value?



# **Proposed Method**

- 1. Interpolate to common grid [ex. RCM]
- 2. Calculate distribution for each cell
  - Independent number of bins
  - Identical bin size [1 mm/day]
- 3. Calculate sum of absolute differences
- 4. Compare the differences
  - Empty bin  $\rightarrow$  AV +1



Relative Distribution Difference

$$D_{MOD} = \frac{\sum |N_M - N_O| \Delta v}{\sum N_O \Delta v}$$

for EACH grid-cell!

$$AV = D_{GCM} - D_{RCM}$$



# European Composite Observations (ECO)

Data-set	Region	Resolution	Period used	Reference
EURO4M	Alps	5 km	1995-2008	lsotta et al. (2014)
Spain02	Spain	0.11°	1995-2010	Herrera et al. (2015)
SAFRAN	France	8 km	1995-2013	Vidal et al. (2010)
ENG REGR	UK	0.11°	1995-2010	Perry et al. (2009)
KLIMAGRID	Norway	1 km	1995-2008	Mohr (2009)
PTHBV	Sweden	4 km	1995-2011	Johansson (2002)
CARPATCLIM	Carpathians	0.10°	1995-2010	Szalai et al. (2013)
REGNIE	Germany	1 km	1995-2014	Rauthe et al. (2013)
GRIPHO	Italy	12 km	2001-2014	Fantini (2019)



#### Focusing on Percentile Intervals







As GCM frequency switches from overpredicting to underpredicting,

> D(GCM) will be smaller,

hence AV(RCM) will be smaller for bins close to this intersection





0.8

0.9

Largest AV can be found at the 99-100 interval

When observing the performance of each model, we can see that the AV is strongly driven by the GCM

## **Downscaling Signal**

Difference between RCM and GCM anomalies,

compared with the corresponding region-average change in each model.

$$DS(\Delta P) = \left(\Delta P_{RCM_i} - \Delta \bar{P}_{RCM_i}\right) - \left(\Delta P_{GCM_j} - \Delta \bar{P}_{GCM_j}\right)$$



## Adapting for Downscaling Signal

Difference between RCM and GCM anomalies,

compared with the corresponding region-average change in each model.

 $DS(\Delta P) = \left(\Delta P_{RCM_i} - \Delta \bar{P}_{RCM_i}\right) - \left(\Delta P_{GCM_i} - \Delta \bar{P}_{GCM_i}\right)$ 

Giorgi et al. (2016)





95-100





Where these correspond with a high positive added value (top) of the historical data,

we can assume that the RCM is more reliable in these regions, and there is added value there too.



Added Value

-1 -0.9 -0.8 -0.7 -0.6 -0.5 -0.4 -0.3 -0.2 -0.1 0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1



# Thank You for your

# attention!

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