STAtistical and Regional dynamical Downscaling of EXtremes for European regions: some results from the STARDEX project

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STARDEX general objectives

- To rigorously & systematically inter-compare & evaluate statistical and dynamical downscaling methods for the reconstruction of observed extremes & the construction of scenarios of extremes for selected European regions & Europe as a whole

- To identify the more robust downscaling techniques & to apply them to provide reliable & plausible future scenarios of temperature & precipitation-based extremes

Consistent approach:

e.g., indices of extremes

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# STARDEX Diagnostic extremes indices software

- Fortran subroutine:
  - 19 temperature indices
  - 35 precipitation indices
  - least squares linear regression to fit linear trends & Kendall-Tau significance test

- Program that uses subroutine to process standard format station data

- User information document

 **http://www.cru.uea.ac.uk/projects/stardex/**

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STARDEX core indices

- 90th percentile of rainday amounts (mm/day)
- greatest 5-day total rainfall
- simple daily intensity (rain per rainday)
- max no. consecutive dry days
- % of total rainfall from events > long-term P90
- no. events > long-term 90th percentile of raindays

- Tmax 90th percentile
- Tmin 10th percentile
- number of frost days Tmin < 0 degC
- heat wave duration

1958-2000 trend in frost days
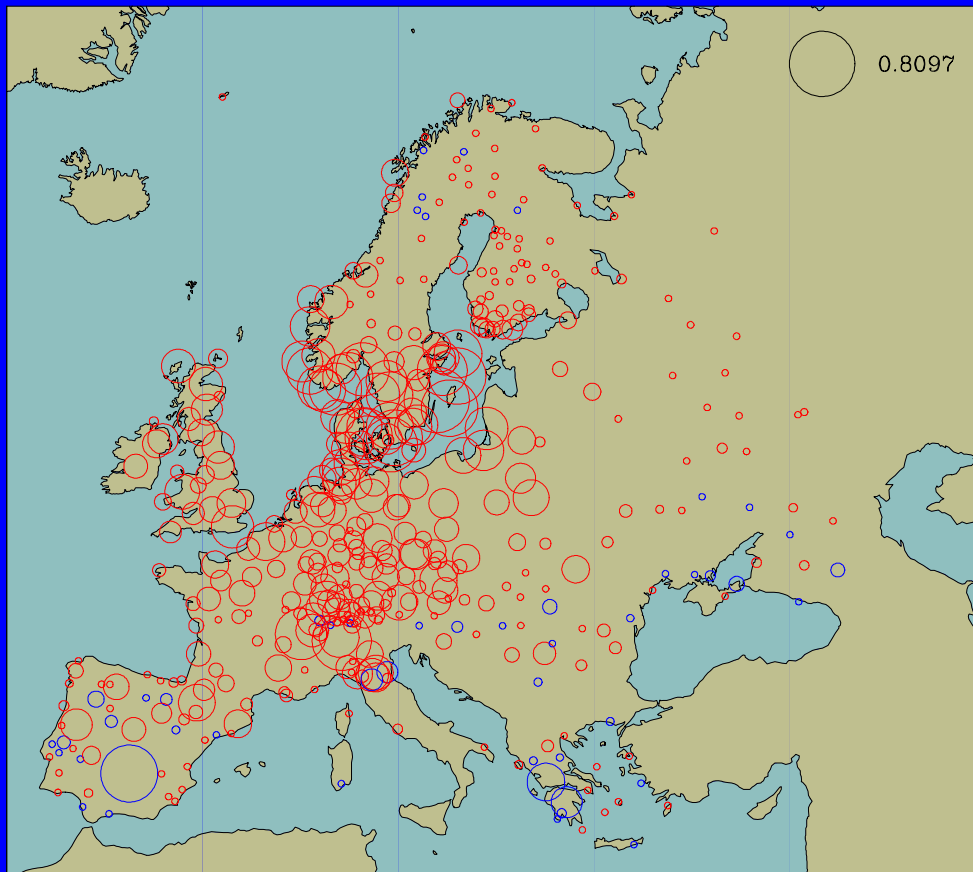
Days per year
Blue is increasing

1958-2000 trend in summer rain events > long-term 90th percentile

0.1024
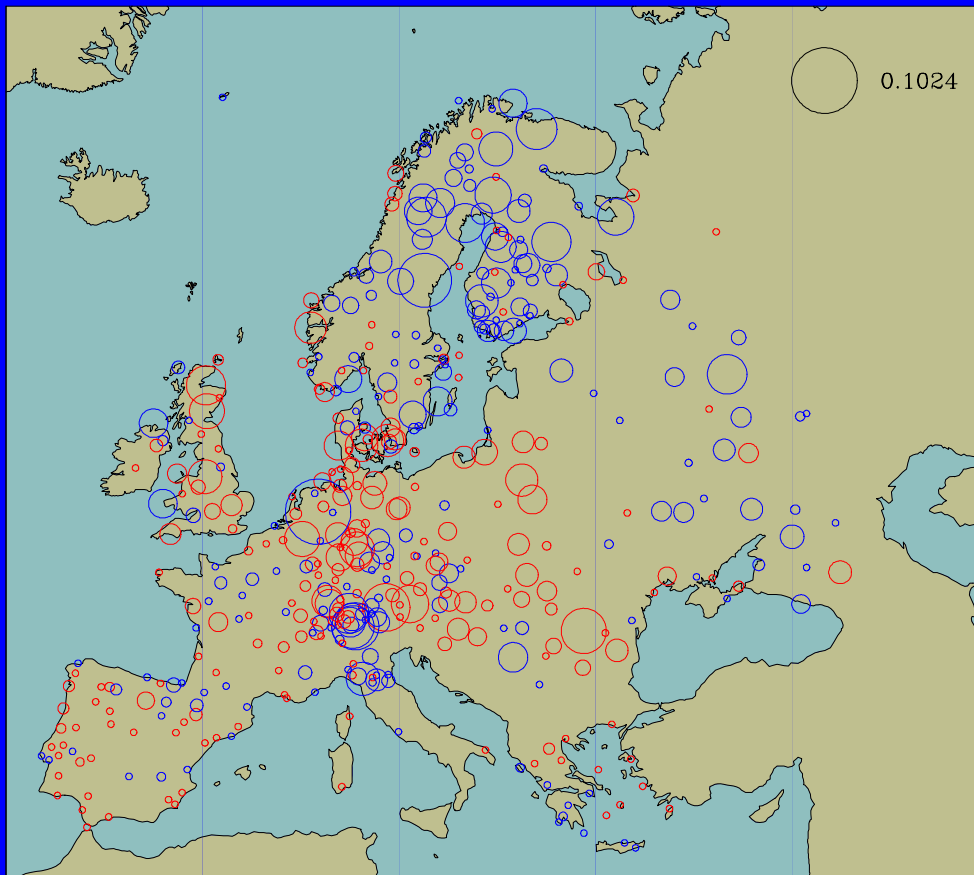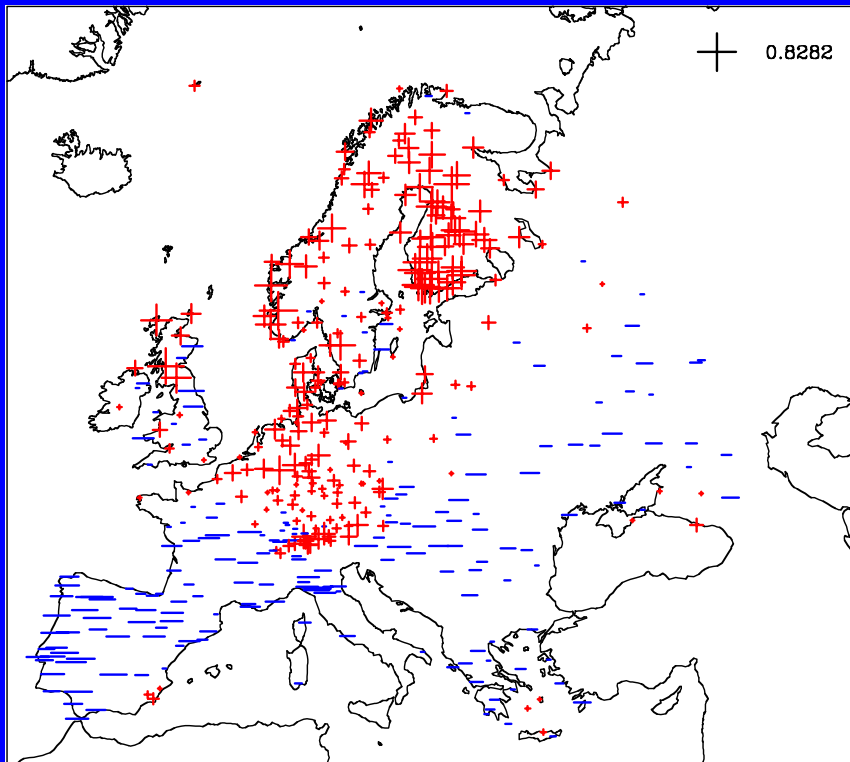
Scale is days/year
Blue is increasing

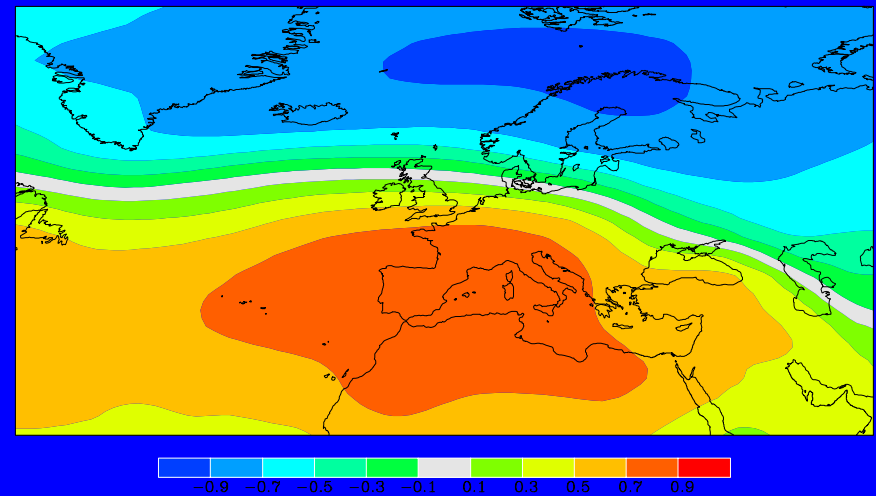**Investigation of causes, focusing on potential predictor variables**

e.g., SLP, 500 hPa GP, RH, SST, NAO/blocking/ cyclone indices, regional circulation indices

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Winter R90N relationships with MSLP, Malcolm Haylock
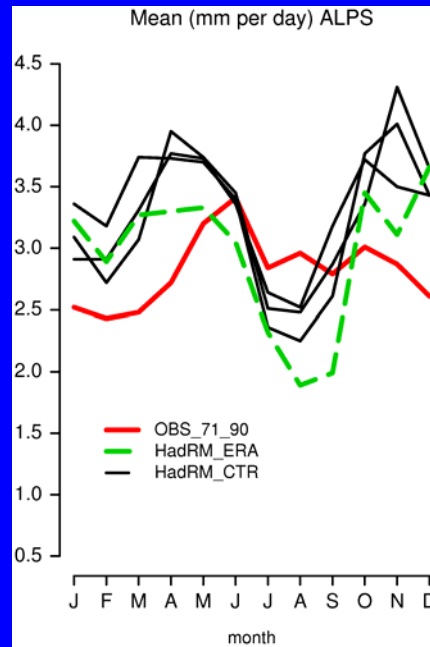
R90N Canonical Pattern 1.
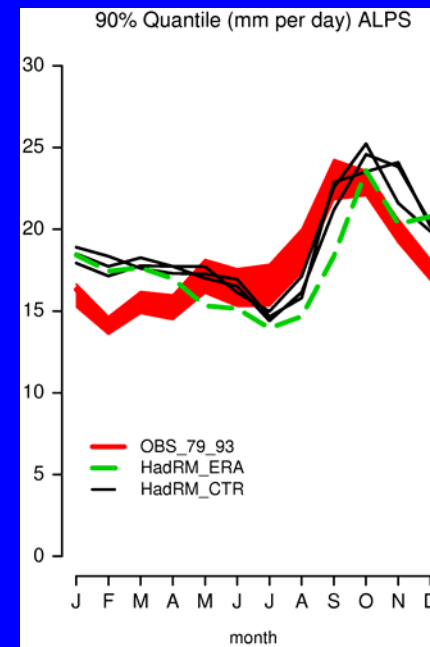Variance = 11.3%.

MSLP Canonical Pattern 1.
Variance = 44.4%.

Analysis of GCM/RCM output & their ability to simulate extremes and predictor variables (and their relationships)

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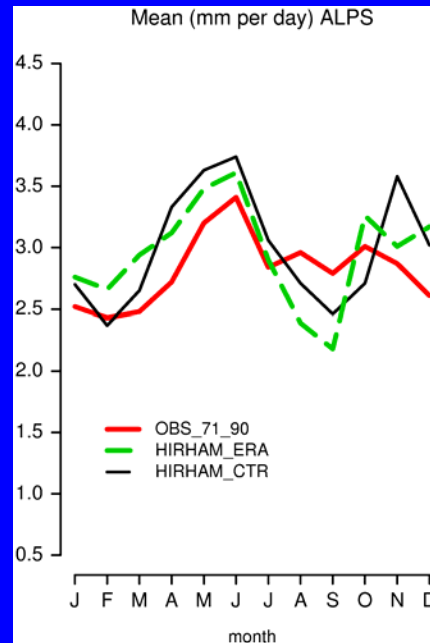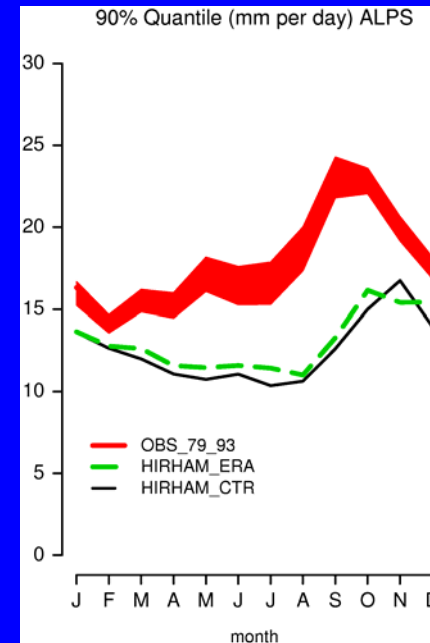
Mean **90% quantile**

HadRM3

HIRHAM

Christoph Frei, ETH

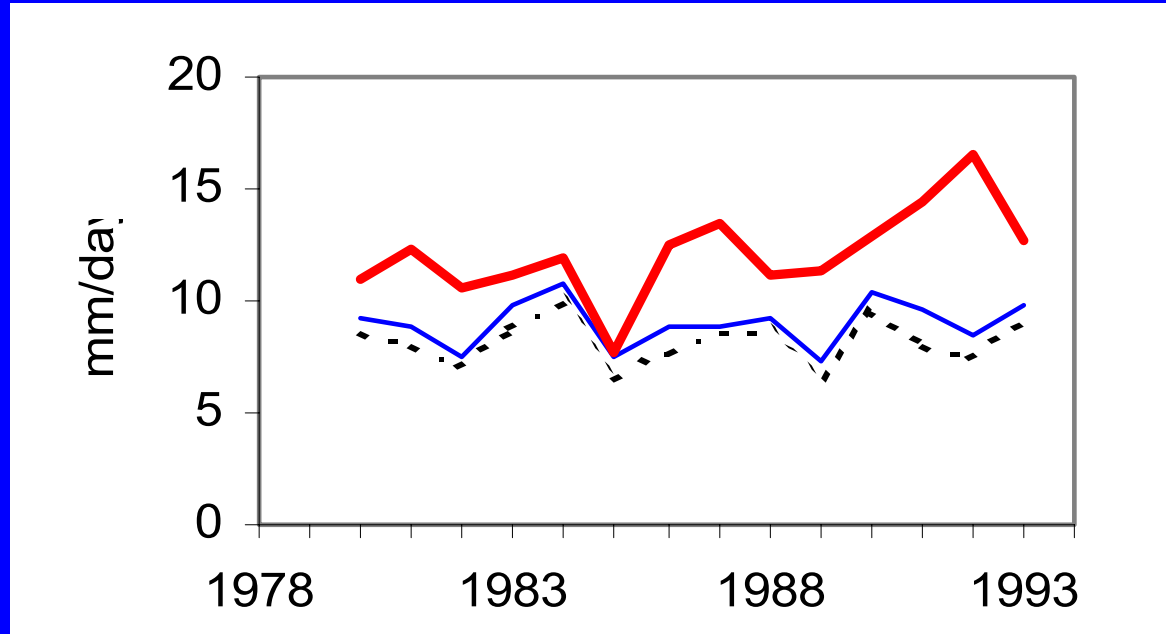# Inter-comparison of improved downscaling methods with emphasis on extremes

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Radial Basis Function: Colin Harpham/Rob Wilby

NW England, 90th percentile for DJF

Validation period: 1979-1993

Red: observations

Blue: predictors selected using stepwise regression, r=0.34

Black: predictors selected using compositing, r=0.24

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At the end of the project (July 2005) we will have:

- Recommendations on the most robust downscaling methods for scenarios of extremes

- Downscaled scenarios of extremes for the end of the 21st century

- Summary of changes in extremes and comparison with past changes

- Assessment of uncertainties associated with the scenarios

http://www.cru.uea.ac.uk/projects/stardex/
http://www.cru.uea.ac.uk/projects/mps/

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