

Characteristics of increased future autumn-winter extreme precipitation identified by cluster analysis

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1. Motivation and methods

- Autumn-winter (SONDJF) extreme precipitation on the Norwegian coast mostly driven by low pressure systems in the North Atlantic
- We apply k-means cluster analysis to sea level pressure (SLP) data of days when extreme precipitation is observed in coastal stations during SONDJF months

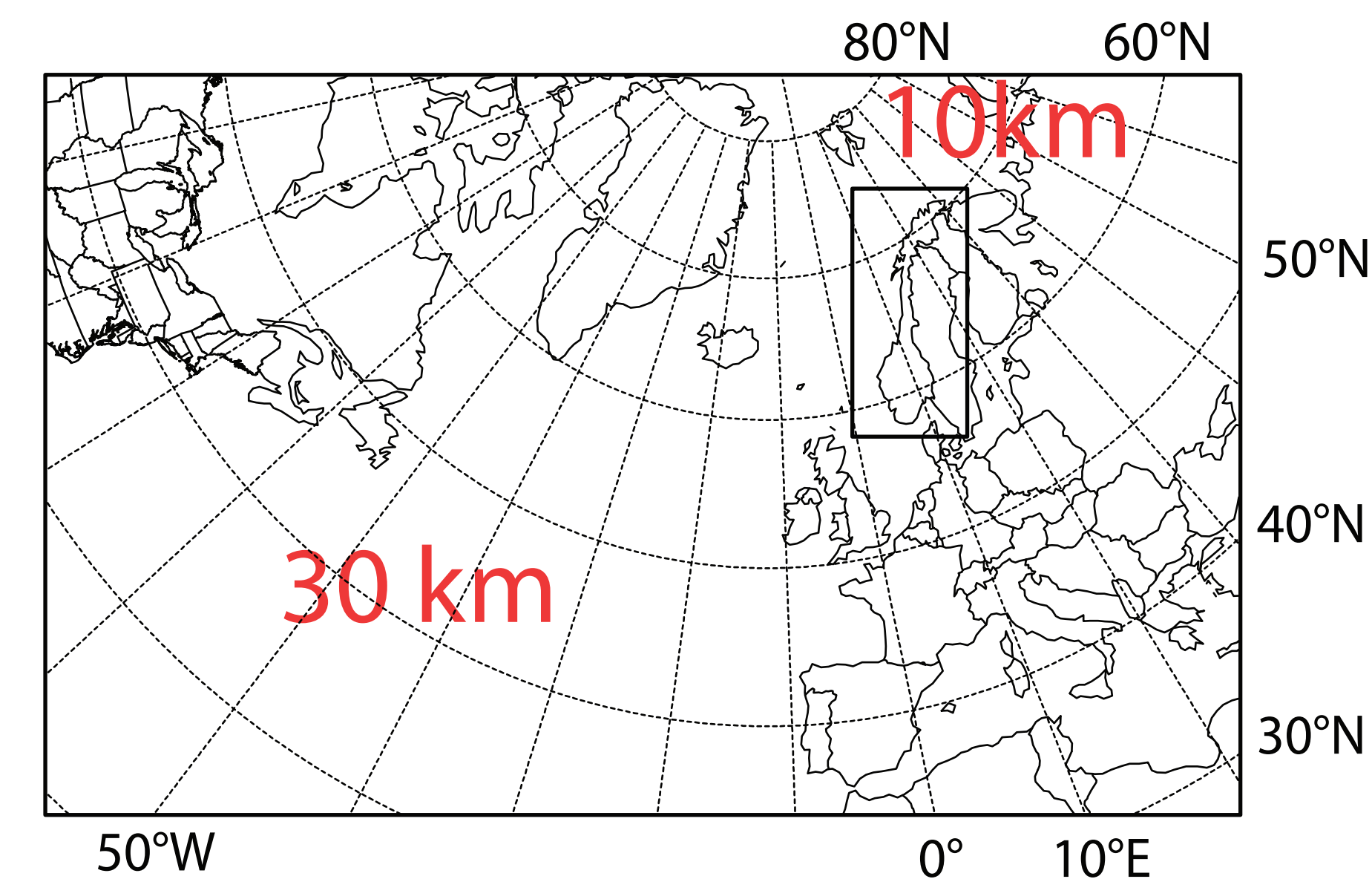
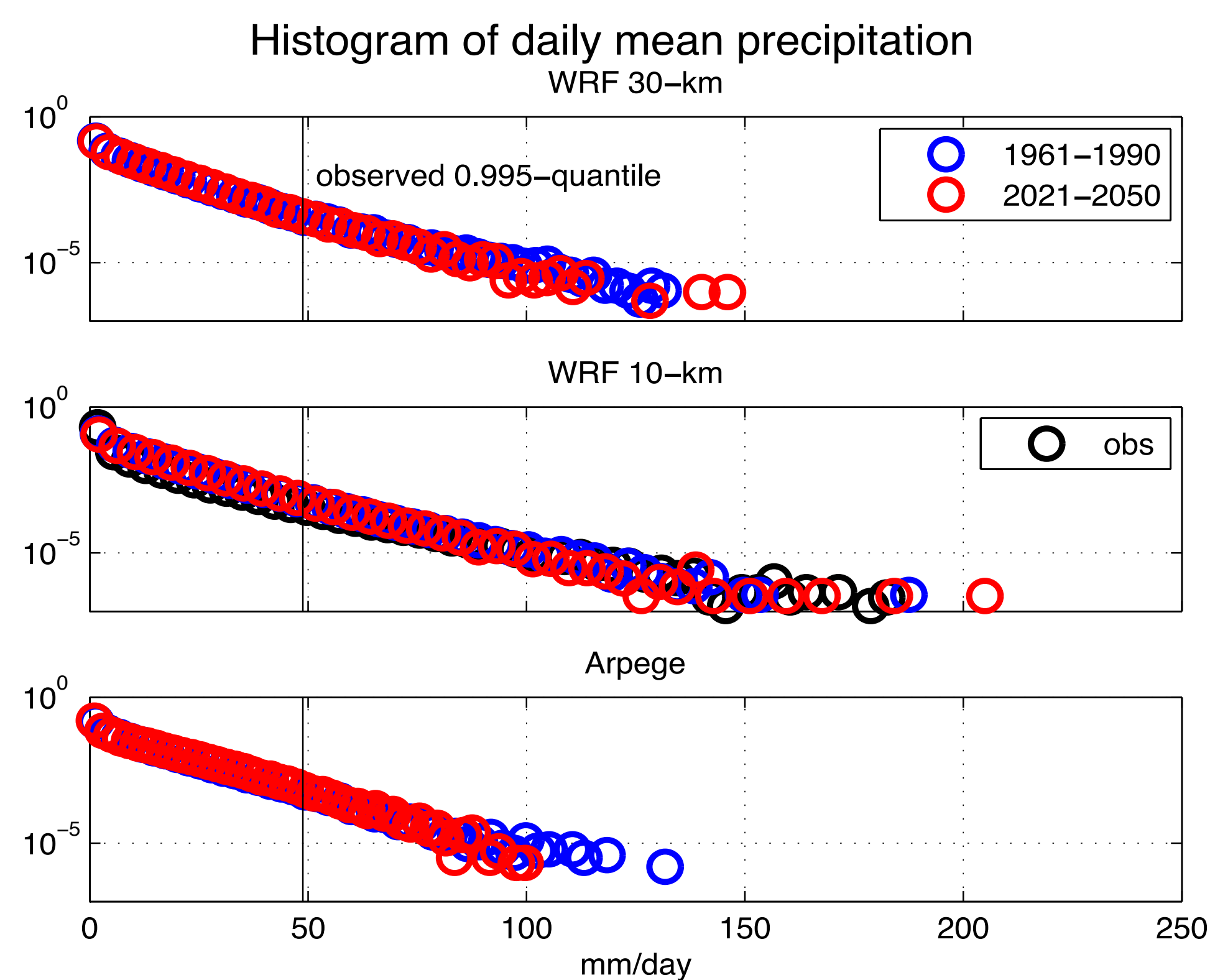


Figure 1: WRF model domain

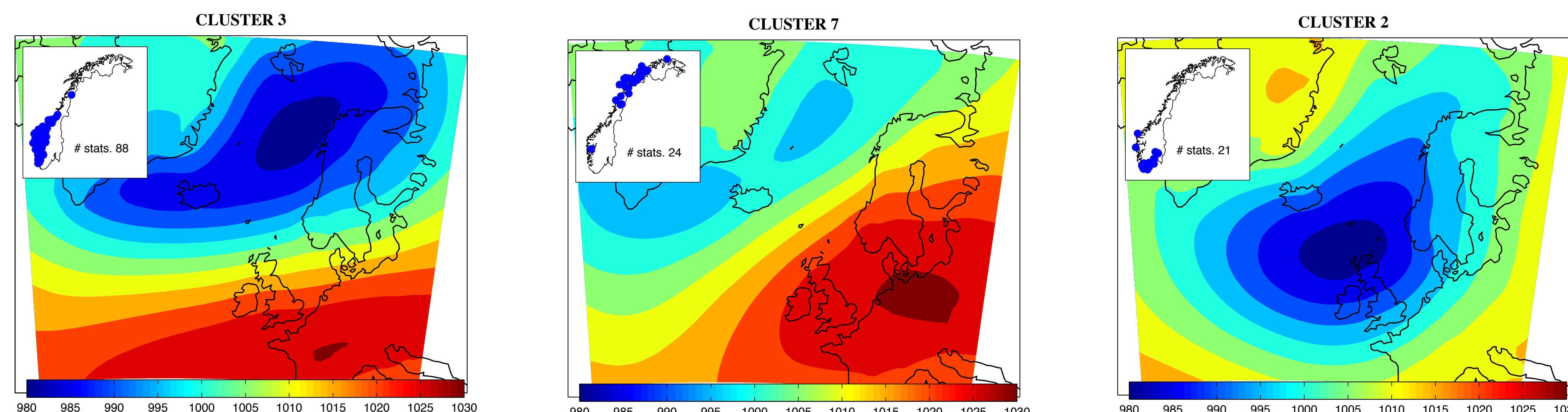
2. Data: observations and models



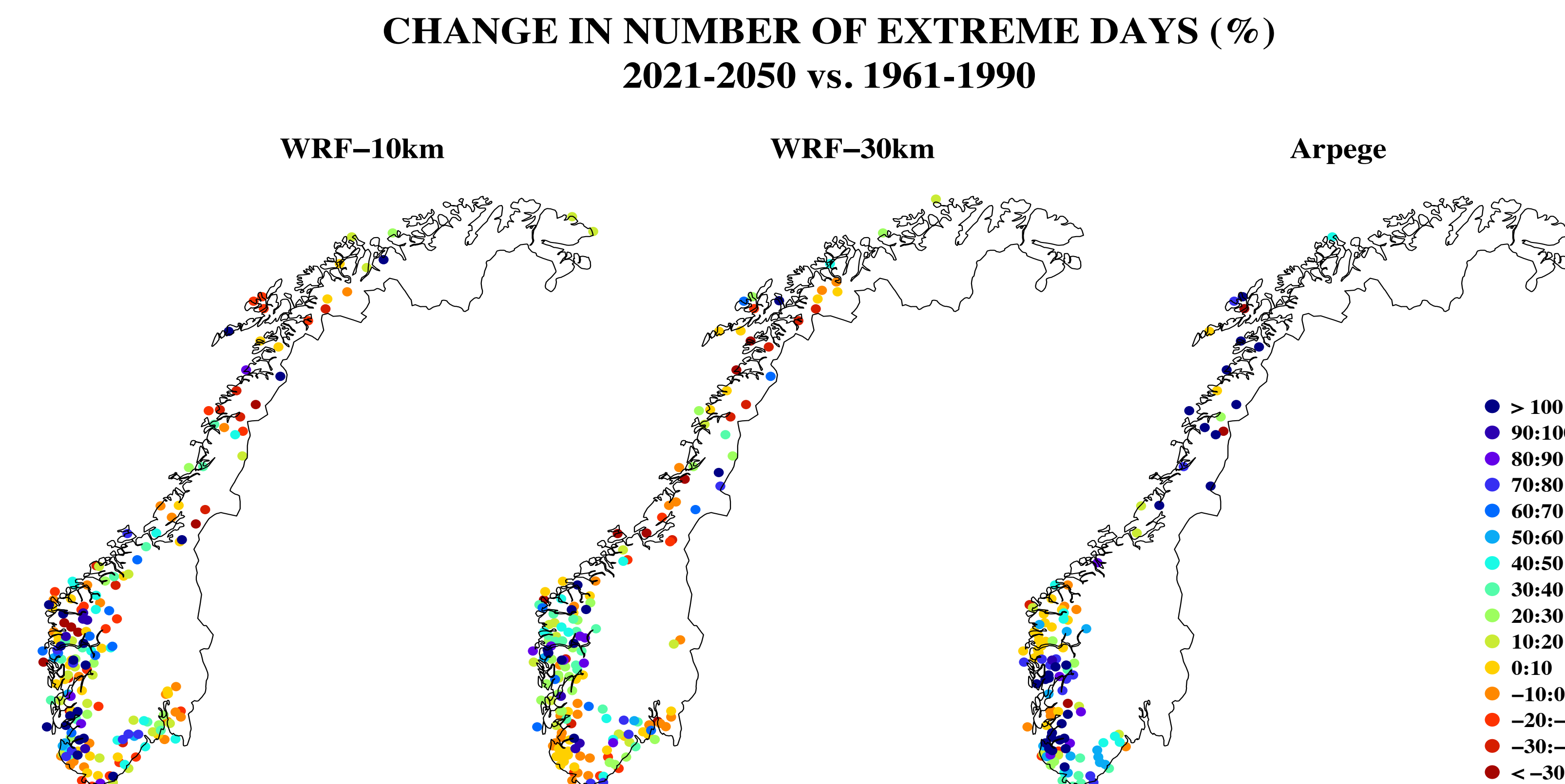
- Validation of method (1961-1990):
 - daily SLP from ERA-40
 - daily precipitation station data
- Future (2021-2050) and present (1961-1990):
 - Arpege global atmospheric model (ca. 40km)
 - WRF downscaling of Arpege to 30 km and 10 km (in Norway only), Figure 1

3. Validation of method using observations

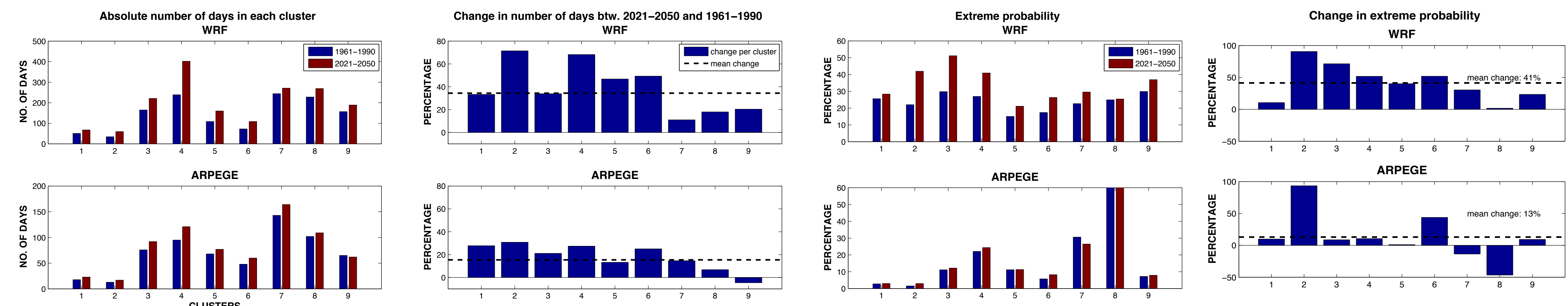
Three significant clusters found based on observations



4. Applying the observed clusters to model data



- Stations shown where most of the extremes (0.995 quantile) observed during SONDJF
- Number of extreme days larger in WRF than Arpege due to higher resolution



Change in extreme days per cluster not significant =>
Definition of extreme probability: # of extreme days per cluster / # of total days per cluster

5. Conclusions

- Typical circulation patterns responsible for SONDJF extremes on the Norwegian west coast identified using k-means cluster analysis
- Cluster analysis not robust enough to identify shifts in clusters between present and future climate
- Cluster analysis suggests that the circulation patterns are not likely to change in the near future but the number of extreme days associated to them is going to increase