1. Introduction
It is important to assess how well global circulation models (GCMs) capture the probability distribution, and in particular extremes, of climate variables to determine, for example, how suitable they are for event attribution studies. Here, we
- assess the role of horizontal resolution in an atmospheric GCM (AGCM), whose resolution is increased from ~135 to ~25km, for the representation of European mean, and extreme 1-day precipitation over large European river basins.
- examine the reasons for the sensitivity of the simulated precipitation to model resolution.

2. Extreme value analysis
- Apply the Block Maxima method. Here, a block is comprised of 1-day precipitation values in a river basin throughout a season in one year.
- Fit a Generalised Extreme Value (GEV) distribution to the block maxima.
  3 parameters: location $\mu$, scale $\sigma$ and shape $\xi$.
- Fig. 1 illustrates the effect of the location $\mu$, scale $\sigma$ and shape $\xi$ parameters in a Gumbel diagram.

3. AGCM and simulations, observations
HadGEM3-GA3
- Project UPSCALE (Mizielski et al. 2014)
- 85 levels
- OSTIA SSTs
- Different resolutions, otherwise very similar


4. Model evaluation: mean precipitation
- DJF
- MAM
- JJA
- SON

5. Model evaluation: extreme precipitation
- DJF
- MAM
- JJA
- SON

6. Discussion of mechanisms
Is the North Atlantic stormtrack better represented at higher resolution, and does this cause the improved representation of European precipitation? This has been shown for a different model where resolution has been increased in a similar way (EC-EARTH version 2.3, van Haren et al. 2015, J. Climate).

6. Conclusions and outlook
HadGEM3-GA3 simulates European mean, and daily extreme precipitation over large river basins more realistically as the resolution is increased from ~135 to ~25 km. In HadGEM3-GA3, this resolution sensitivity is more strongly associated with the better resolved orography in the higher-resolution model than has been shown in a previous study for a different model (EC-EARTH), for which resolution sensitivity in the North Atlantic stormtrack is more important. These results highlight the importance of multi-model studies into the role of resolution. Simulations currently carried out in CMIP6-HighResMIP, e.g. the PRIMAVERA project, will enable such multi-model studies.