Practical exercise on probabilistic event attribution with climate*prediction*.net data – exercise 1 basics of Probabilistic Event Attribution

Data:
Daily precipitation and daily maximum and temperatures in January 2014 in Southern UK from ~1000 model simulations from an initial condition regional climate modelling ensemble (50km resolution, 19 vertical levels) and from ~1000 simulation of January 2014 as it might have been in a world without anthropogenic GHG and aerosol emissions.
The four files containing the data are regional averages over Southern UK with 1005 ensemble members times 30 days of data.

Exercises:

1. To get familiar with the data plot the data as a histogram. Can you see from just looking at the histograms whether or not there is a change in the distribution underlying the data?
2. You might notice a shift in the mean, but can you see what is going on in the tails of the distribution? To make this more obvious, fit a distribution to your data, if you have an idea what class (normal, …) of distribution function describes this data you can fit such a distribution or fit an empirical function. For now, stick to the whole data set just to get a feel for it.
3. A more straightforward way to visualise the tails of a distribution of a climatic variable is to look at return time plots instead of histograms. Plot the model data as a return time plot on a logarithmic x-axis. The important part of this exercise is to think through what is actually required to work out the return time if you do not use software packages that already do that. What are the units on the x-axis?
4. Plot the all-forcings and the "natural" ensemble data as two return time plots in one figure. How can you quantify the changes between the two distributions? To answers this question think about what a change in risk actually means in terms of the data you have got. Assume for now that the model simulations represent the world with and without anthropogenic climate change.
5. Determine the fraction of attributable risk FAR for a 1 in 100 year event in the "world that might have been" for each of the variables. What does this tell you? If you had to write a headline statement for your local newspaper how would you translate the FAR you have worked out in everyday language? E.g., A FAR of 0.25 means that the risk of such an event occurring has increased by ~25% due to climate change.