

Novel datasets of energy-relevant climate variables based on ERA-Interim reanalysis

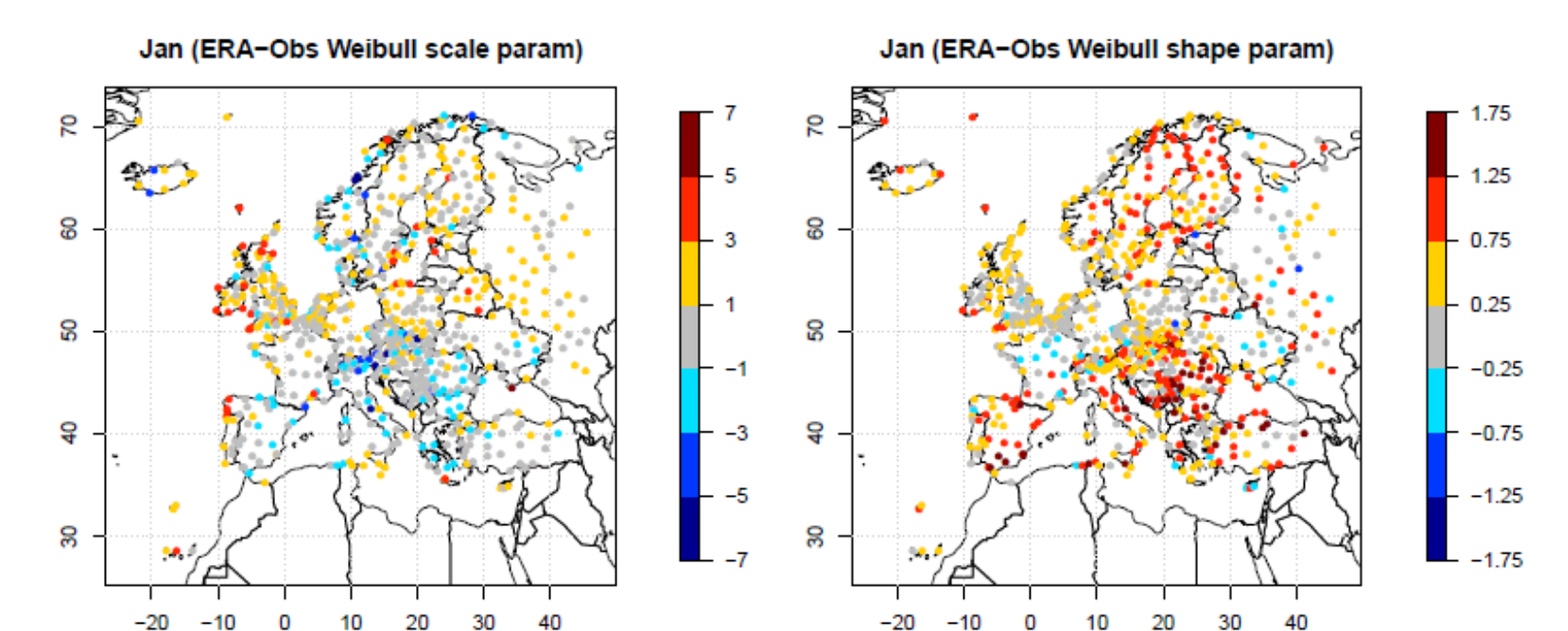
Rationales

- Meteorological reanalysis datasets are being widely used in a number of studies relating to the climate impact on energy.
- Reanalyses have the specific advantage of being complete through the process of physical/dynamic representation of the climate system which provides internally consistent fields across most surface atmospheric variables as well as in the atmospheric column up to the stratosphere.
- The European Climatic Energy Mixes (ECM) project is primarily focused on users in the energy sector.
- Interest in sub-daily and daily variability of near surface variables : air temperature, dewpoint temperature, precipitation, solar radiation, wind speed and relative humidity.

Reanalysis outputs differ from station observations

There are differences between estimates from the reanalysis and station observations.
Bias adjustment is a process to adjust the reanalysis onto observational distributions

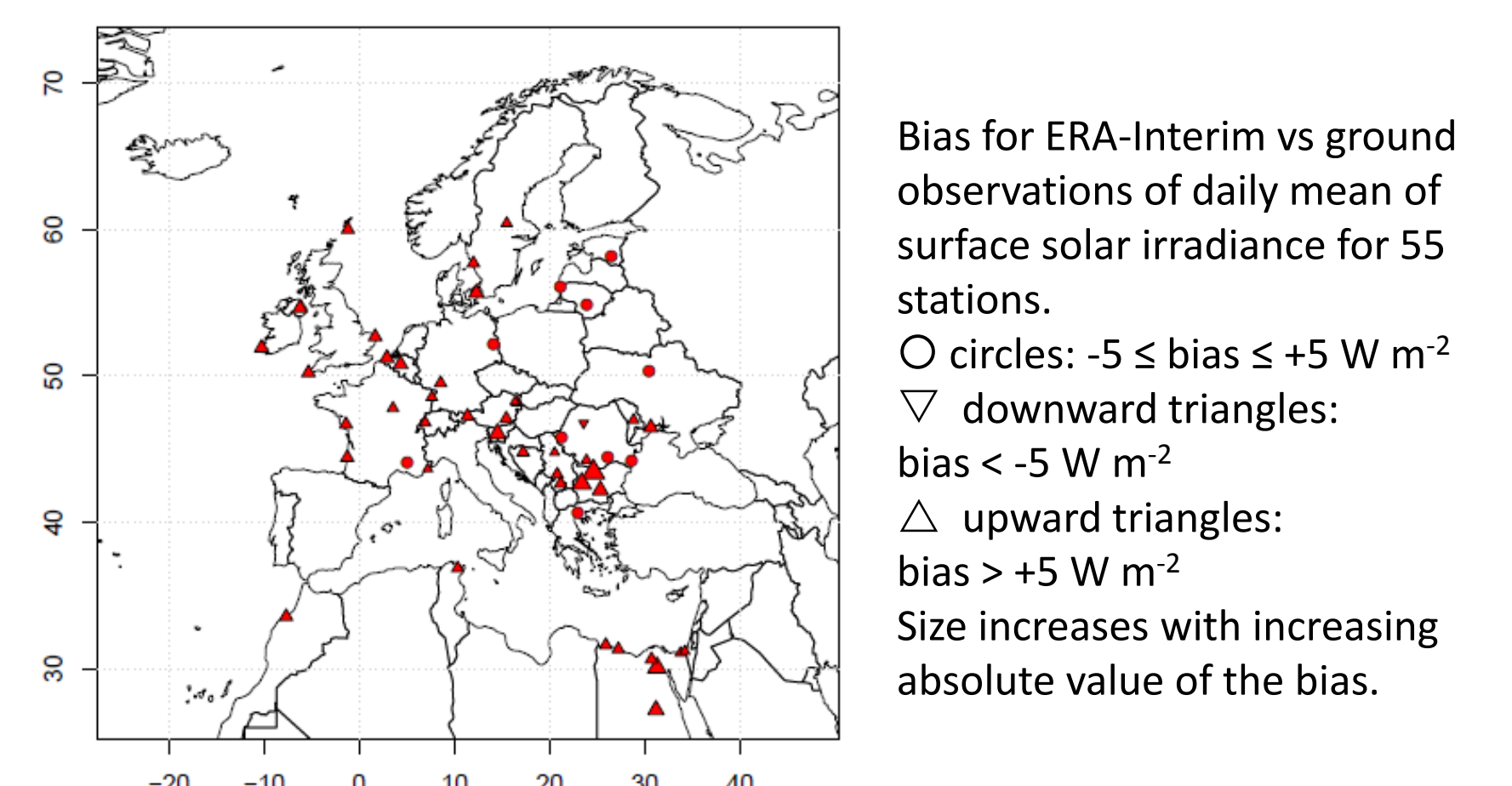
Construct a novel bias-adjusted datasets of the energy-relevant climate variables



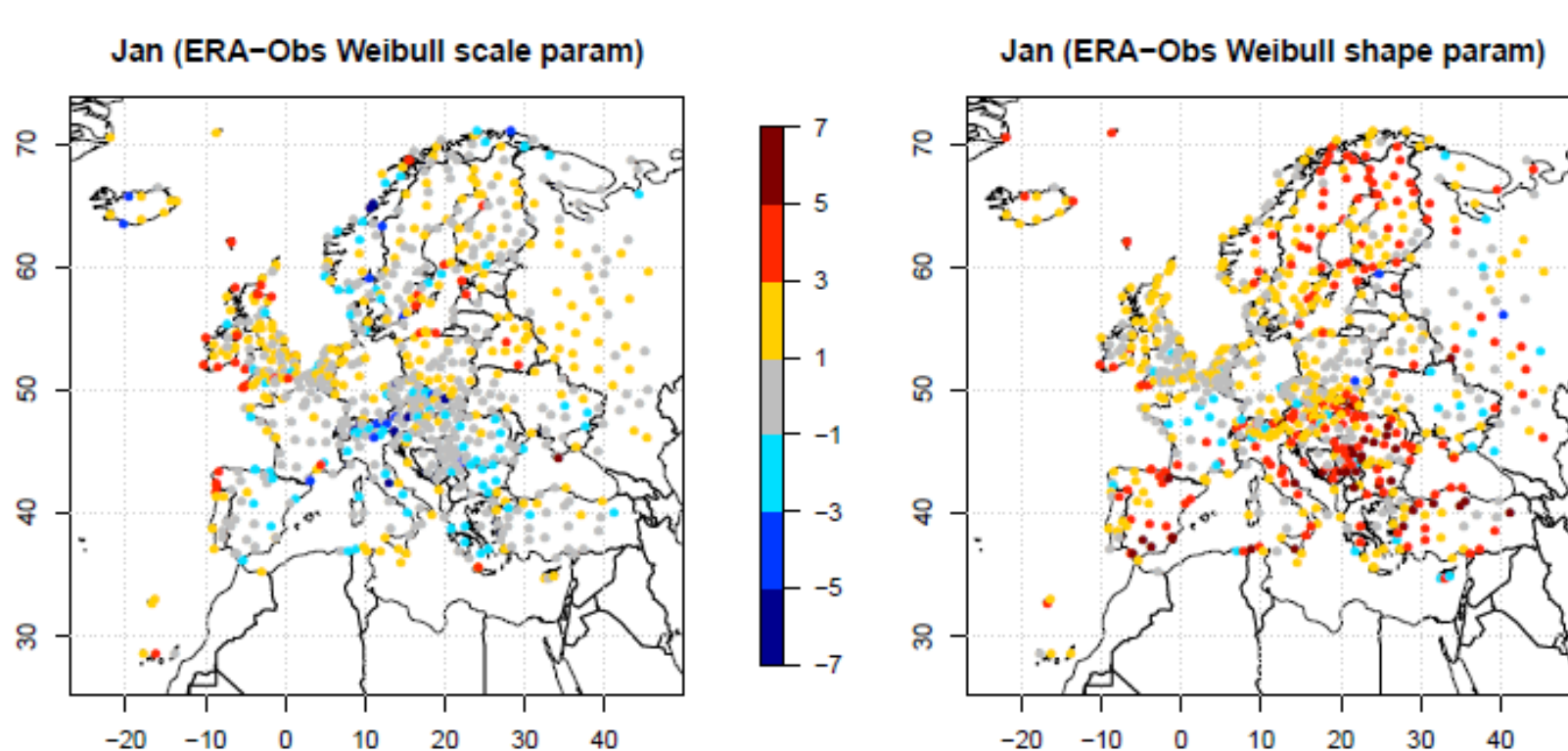
Correction of bias

Interest of users in energy sector is in the extremes of the distribution. Hence, the whole ERA-Interim distribution is adjusted onto observations in the HadISD or E-OBS or HelioClim-3v5 datasets, using a different statistical distribution for each variable.

- Wind speed: adjust the two-parameter Weibull distribution
- Dewpoint and air temperature: adjust means and standard deviations (relative humidity is computed from these two quantities)
- Precipitation daily totals: adjust gamma distribution
- Surface solar irradiance: adjust the whole distribution of the clearness index (quantile mapping)



Comparing bias-adjusted datasets to observations

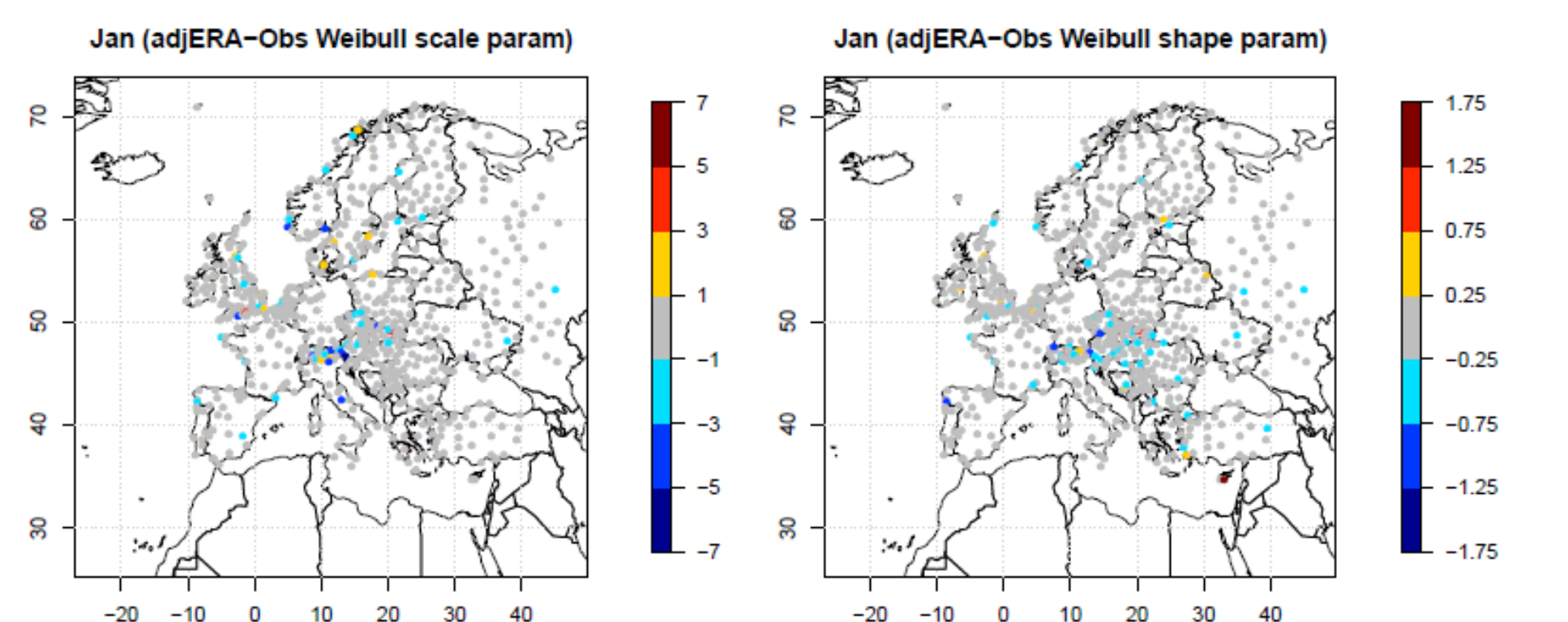


Examples of differences in scale and shape parameters of the Weibull distribution between

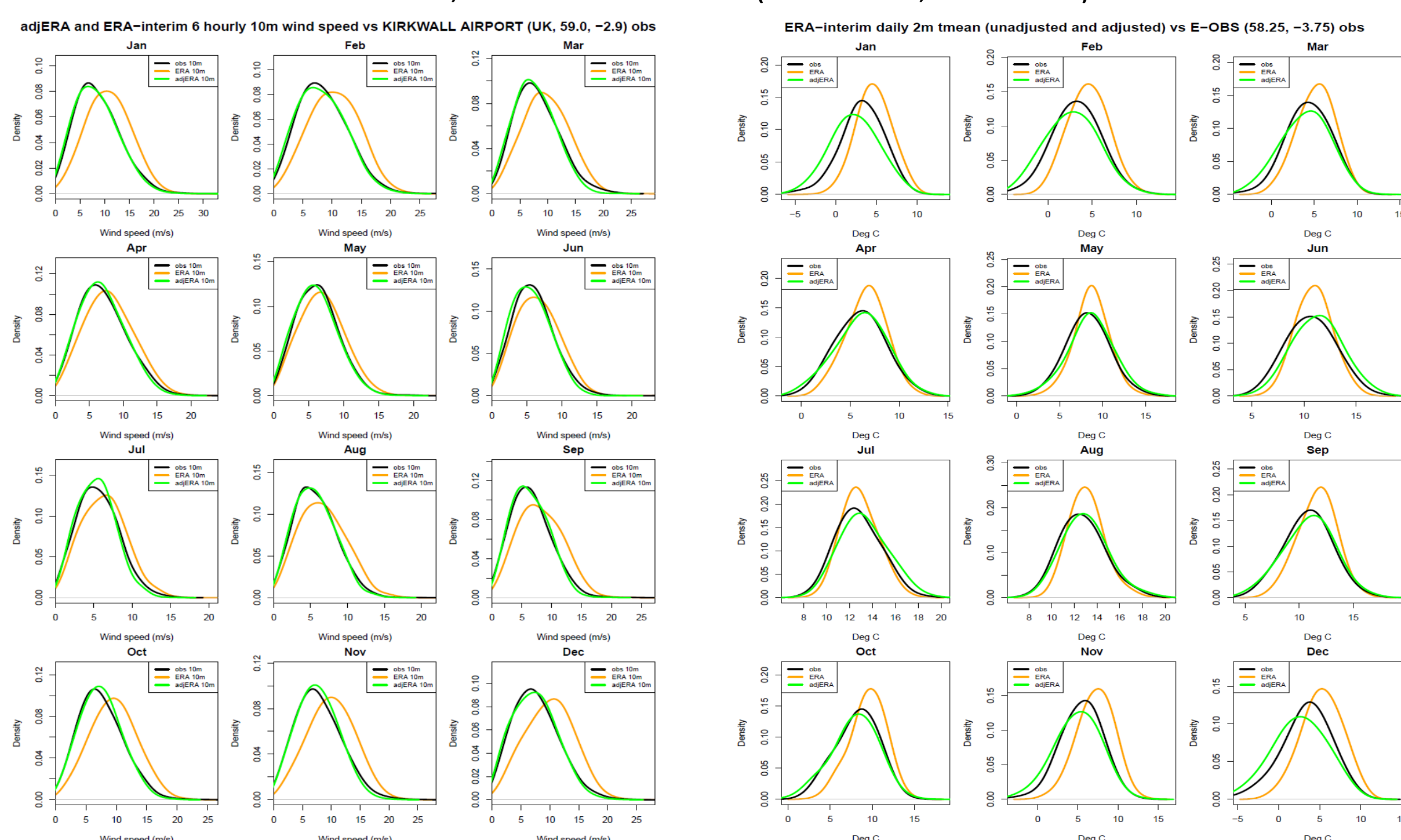
left: between ERA-Interim and HadISD station observations for wind speed at 10 m,

right: between bias-adjusted ERA-Interim and HadISD.

Based on all 6 h data for January for 1981-2010



Kirkwall, Northern Scotland (lat: 58.25°; lon: 3.75°)

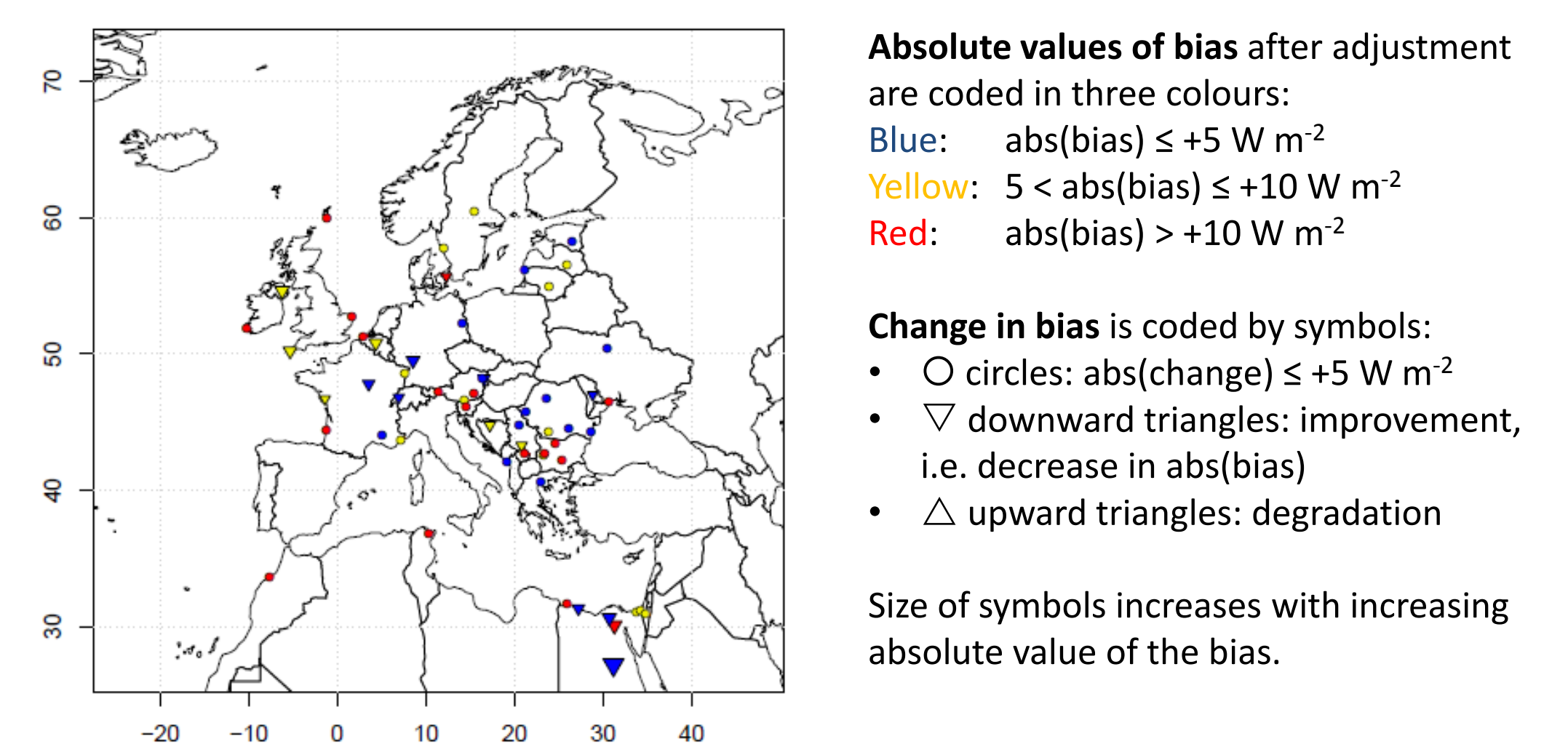


Wind speed – Air temperature

Examples of comparison of statistical distributions for observations (black), ERA-Interim (orange) and bias-adjusted ERA-Interim (green), based on all 6 h data for the 1981-2010 period

- wind speed at 10 m
- surface air temperature

Bias is improved for daily mean of surface solar irradiance
22 stations out of 55 exhibit a bias less than 5 W m⁻² in their absolute values, compared to 12 stations for the original ERA-Interim data



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Conclusion

The comparison between initial and bias-adjusted data against station observations and gridded observation products has demonstrated the benefit of performing bias-adjustment and has provided an assessment of the quality of the novel datasets.

These datasets are available to anyone this ftp site: <http://ecem.climate.copernicus.eu>.

More in the following paper: Jones, P., Harpham, C., Troccoli, A., Gschwind, B., Ranchin, T., Wald, L., Goodess, C., and Dorling, S.: Using ERA-Interim Reanalysis for creating datasets of energy-relevant climate variables, Earth System Science Data, 2017.