EMS Annual Meeting Abstracts
Vol. 20, EMS2023-172, 2023, updated on 14 Aug 2024
https://doi.org/10.5194/ems2023-172
EMS Annual Meeting 2023

Community Climatology – Towards a new social contract in climate research?

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Question. Starting from the mid 20th century, one might say that there has been a social contract between society and science: in most cases, society provides science with funding and a large amount of autonomy, while science provides society with authoritative research conclusions and recommendations (Gibbons, Nature, 1999). However, we might build a more meaningful partnership between society and science if we find and expand alternative ways of structuring this social contract. We expect that by finding more and new ways of collaborating directly with society on the content level, we can help create a situation of partnership. Importantly, such partnership can result in an increased shared feeling of ownership and responsibility for next generation climate research.

From this line of thought, for example, we can make the best use of observational data collected by national meteorological services (NMSs) in combination with crowd-sourced data like collected by the Weather Observations Website (WOW-NL) network. Presently, we investigate if including such crowd-sourced data, provided by society, can enable us to deliver high-volume high-resolution gridded climate data sets, zooming in to local and urban scales.

Approach. In the Community Climatology approach, we use multi-fidelity regression kriging to blend official NMS observations with crowd-sourced observations and high-resolution covariates. We think this can evolve into a new partnership between society and science, where volunteers find a meaningful way to directly contribute to improved monitoring capabilities of climate change and the quantification of extreme events.

The development of our approach has been done in close collaboration with end users, so that we provide these high-resolution gridded data sets in a way that caters to their needs. An important lesson we already learned here is that providing gridded uncertainty estimates is one of the essential requirements of various end users.

On a technical level, we consider the significant bias and noise in the volunteer observations. We include a simplified observation model description in the likelihood of our Bayesian updating process. Using cross-validation, we tune this observation model to the data under consideration. As such we exploit data-driven estimate of observational error, since we learn the bias and noise of the observations in each time slice.

Results. Although we are in the early stages of applying this approach to longer time spans and a variety of variables, we already see that the contribution from volunteer observations is indeed a meaningful addition to these gridded data sets, for five different user-requested climate variables in the Netherlands. We provide this data set at a spatial resolution of 0.01 x 0.01 degrees (approximately 1 x 1 km) and at an hourly time resolution. Initial results show a significant increase of accuracy of these data sets due to the blending approach.