EGU2018: Notes on some interesting talks I heard

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Session: Advances in statistical post-processing for deterministic and ensemble forecasts. (Wednesday)

0.1 A Bayesian approach to statistical post-processing

R. Krzysztofowicz (University of Virginia)
Three objectives of statistical pp of NWP outputs are 1) Combine all predictive info into a single guidance product, 2) calibrate such guidance, 3) provide additional info beyond that carried in NWP forecasts. They designed a method called the Bayesian processor of ensemble (BPE) to do that.
Skills used to assess the data include; CRPS and reliability.

0.2 A Bayesian framework based on the ensemble Kalman filter for flow-dependent integration of weather radar extrapolation nowcasts and NWP precipitation fields

D. Nerini (MeteoSwiss)
Forecasting precipitation in the nowcasting range (0 to 2 hours). An extrapolation nowcast can be produced by exploiting the persistence of precipitation echoes derived from weather radar observations.

0.3 Post-processing of spatial extremes

P. Friederichs, Sabrina Wahl, Sebastian Buschow (University Bonn, Meteorological Institute, Bonn, Germany).
Use extreme value theory to formulate a post-processing approach for the spatial prediction of wind gusts. Predictors are provided by the COSMO-DE-EPS ensemble prediction system over a period of 5 years. Multivariate extreme value theory and practice breaks down into two parts. 1) PP marginal distribution of each component of the multivariate extremes - constitutes the statistical post-processing at each station location conditional on the ensembles forecasts. 2) Spatial interpolation of PP - the description of the spatial dependence using a max-stable Brown-Resnick process. The observed and simulated residuals show non-negligible spatial dependence, with stronger dependence in the model than in the observations. Their approach takes into account and corrects for the spatial

dependence in extremes, and thus provides a post-processing model for spatial wind gust forecasts.

0.4 Statistical post-processing and multivariate structuring of high-resolution ensemble precipitation forecasts

Chiem van Straaten, Kirien Whan, and Maurice Schmeits (KNMI)
A calibrated radar data set is used to post-process and downscale forecasts from the short-range Grand Limited Area Model Ensemble Prediction System (GLAMEPS) - probabilistic precipitation forecasts for 3-h accumulation periods. Verification performed using variogram score, spatially aggregated CRPS. Different methods of PP are better in different seasons/ time of day.

0.5 Probabilistic Forecasting of Thunderstorms in the Eastern Alps

Thorsten Simon et al., (University of Innsbruck).
Lightning is taken as a proxy for thunderstorms. The statistical model is a generalized additive model framework, which is estimated by Markov chain Monte Carlo simulation.

0.6 Verification of probabilistic forecasts: comparing proper scoring rules.

Thordis L. Thorarinsdottir and Nina Schuhen (Norwegian Computing Center, Oslo, Norway) Use error bars. Use a combination of scores.

Session: Energy meteorology and spatial modelling of renewable energies. (Thursday)

Solar Power Meteorology

0.7 Modelling of solar energy potential in urban areas from a local to a global scale

Nahid Mohajeri et al. (Department for Continuing Education, University of Oxford)
Urban roof PV. 800kWh/m^2 usually taken as useful threshold. The ratio of building footprint = useful PV area. Depends on pitch etc of the roof.

0.8 Short-term forecast of solar surface radiation using satellite imagery

Isabel Urbich and Richard Müller (DWD, Germany)
A short-term forecast of solar surface radiation can be obtained by the application of an optical flow method on the effective cloud albedo determined from visible satellite imagery by MSG (Meteosat Second Generation). Optical flow is an open source OpenCV. There are no boundary conditions, so the boundary just moves across with forecast lead time. Only a displacement model – no physics so max up to 2-3 hours.
Q's: How do you deal with different cloud layers moving different directions? They don't

yet.
Suggestion to link it to the numerical model – it might help with convective clouds.

0.9 Assessing regional reanalysis data sets for planning small-scale renewable energy systems

Felix Nitsch, Katharina Gruber, Luis Ramirez Camargo, and Wolfgang Dorner. (Institute of Applied Informatics, Technische Hochschule Deggendorf, Freyung, Germany).
From the Cross-Energy research group. Using COSMO-REA6 and COSMOS-REA2 regional reanalysis compare horizontal global radiation or cloud coverage (depending on data availability from the weather stations) and wind speeds at 10 meters height. Skill scores include: MAE, MAEa, ρ, R2, RMSE, etc. REA2 does not perform significantly better than REA6 despite higher-res.
Q's: Use 100m winds? Can't validate with obs.
Compare to global low-res? They are better than low-res (I think?!).
There is a post-processed version of the model now available. And a new paper published on it.

0.10 Development of Diagnostic Index for Forecast Busts on Surface Solar Radiation using Multi-Center Grand ensembles

Fumichika Uno et al., (National Institute of Advanced Industrial Science and Technology, Research Center for Photovoltaics, Tsukuba, Ibaraki, Japan)
Examining large forecast error (forecast busts) events. *Uno et al., 2018.*

0.11 Mapping minimum technical requirements for electricity self-sufficiency of single family houses using regional reanalysis data and satellite imagery derived data

Wind Power Meteorology

0.12 Statistical postprocessing of turbulence resolving wind power forecasts

Jakob W. Messner, (Technical University of Denmark)
High-resolution forecasts unfortunately often exhibit spatial and/or temporal displacement errors so that, when regarding measures such as mean absolute or squared errors, they often perform worse than smoother forecasts from lower-resolution models. Looking at off-shore wind farms. It is shown that temporal and/or spatial smoothing of the forecasts clearly improves their skill, even though potentially valuable high-frequency information is lost. Increasing the time window of the moving average improves the score (best at 8 hours). PP includes bias correction. Opposite results for power forecasts. Error in different wind speed bin which converts to error of wind conversion to power.

0.13 Do current and near-term future wind turbine deployments have a substantial impact on regional climate?

Sc Pryor, Rj Barthelmie, and Tj Shepherd (Cornell University).
Looking at 4 times the installed capacity to produce 3-6 times the power production. Modest impacts on climate largely confined to wind turbine grid cells and do not scale with installed capacity. In the wind turbine grid: Median summer T2m -0.25°C and in winter T2m +0.1°C. Land use to land cover changes climate to date.

0.14 A new look at interannual variability of observed winds from operational meteorology and tower observations

Clive Wilson (Met Office)
Well-maintained long-term conventional meteorological observations are examined, including surface (10m) winds, upper air winds from radiosondes, and tower observations. Although there is support for the industry standard of 6% at some locations this is not universally true. Also, there can be significant differences in IAV with elevation so that the 10m variation may not be representative of greater heights typical of wind turbines. Over the UK a decreasing wind speed trend is found at 10m, but this is not supported by the radiosonde measurements. Wind at height measurements from Cardington (UK) 2005-2017; 10m, 25m, 50m.

0.15 Identifying, characterising and forecasting large ramps in offshore wind farm power output

Daniel Drew, Janet Barlow, Phil Coker, and Tom Frame (University of Reading)
This study uses metered generation data from the cluster of wind farms in the Thames Estuary to determine the ramps in power for three temporal scales which are critical for managing the power system (30 minute, 60 minute and 4 hours). extreme 4 hour ramping events was caused by the passage of a cyclone and the associated weather fronts. On shorter time scales, the largest ramping events over 30 minute and 60 minute time windows were 21.3% (or 360 MW) and 57.9% (or 985 MW) respectively. The extreme events on these time scales were caused by three main meteorological mechanisms; (1) very high wind speeds associated with a cyclone causing turbine cut-out (2) gusts associated with thunderstorms and (3) organised band of convection following a front.
Q's: How much time do the national grid need as a warning for ramps? As much as possible, 9+ hours would impact electricity price.

0.16 Linking meteorological conditions to extreme power system impacts

Hannah Bloomfield, David Brayshaw, Len Shaffrey, Phil Coker, and Hazel Thornton. (University of Reading).
This study investigates the meteorological conditions associated with three GB power system impacts, and how the conditions associated with these impacts change with increasing amounts of installed wind power generation. This study allows for the improved

use of seasonal forecasts of near-surface temperature, wind speed and the NAO within the energy sector. Used Thornton et al 2017 for peak demand, Grams et al., 2017 for wind power generation, Taylor and Buizza, 2013 for demand model and Cannon et al, 2015 for wind power model. Paper submitted to ELR – "The changing sensitivity of. . . "

0.17 Offshore Extreme Wind Atlas Using Wind-Wave Coupled Modeling

Xiaoli Larsén et al. (Technical University of Demark)

0.18 Micrometeorological Impacts of Offshore Wind Farms as seen in Observations and Simulations

Simon K. Siedersleben et al. (Institute of Meteorology and Climate Research, (IMK-IFU), KIT, Garmisch-Partenkirchen, Germany)

Session: Innovative Evaluation and Prediction for Large Earth Science Datasets. (Thursday)

0.19 Towards a Framework for Parallelized Post-Processing and Evaluation of Ensemble Forecasts

Robert Redl et al. (LMU Munich, Meteorological Institute, Munich, Germany)
Create a portable open source Python package for ensemble forecast evaluation and post-processing called "Ensemble Tools". The foundation of the package is a unified interface to the most common model output formats netCDF, grib1, and grib2. This interface enables parallelized and distributed I/O based on the increasingly popular xarray and dask libraries. On top of that standard methods of statistical model evaluation like the continuous ranked probability score (CRPS), advanced process-oriented diagnostics like the analysis of Rossby Wave Packets as well as auxiliary utility functions like interpolation between different grids are implemented.