Karlsruhe Institute of Technology

Machine Learning for global probabilistic prediction of temperature and precipitation on sub-seasonal time-scales

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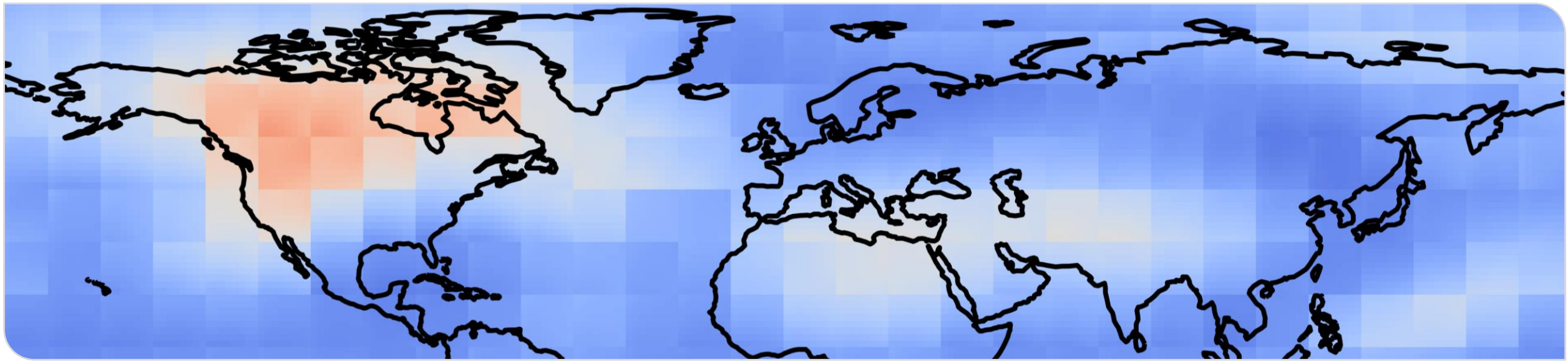
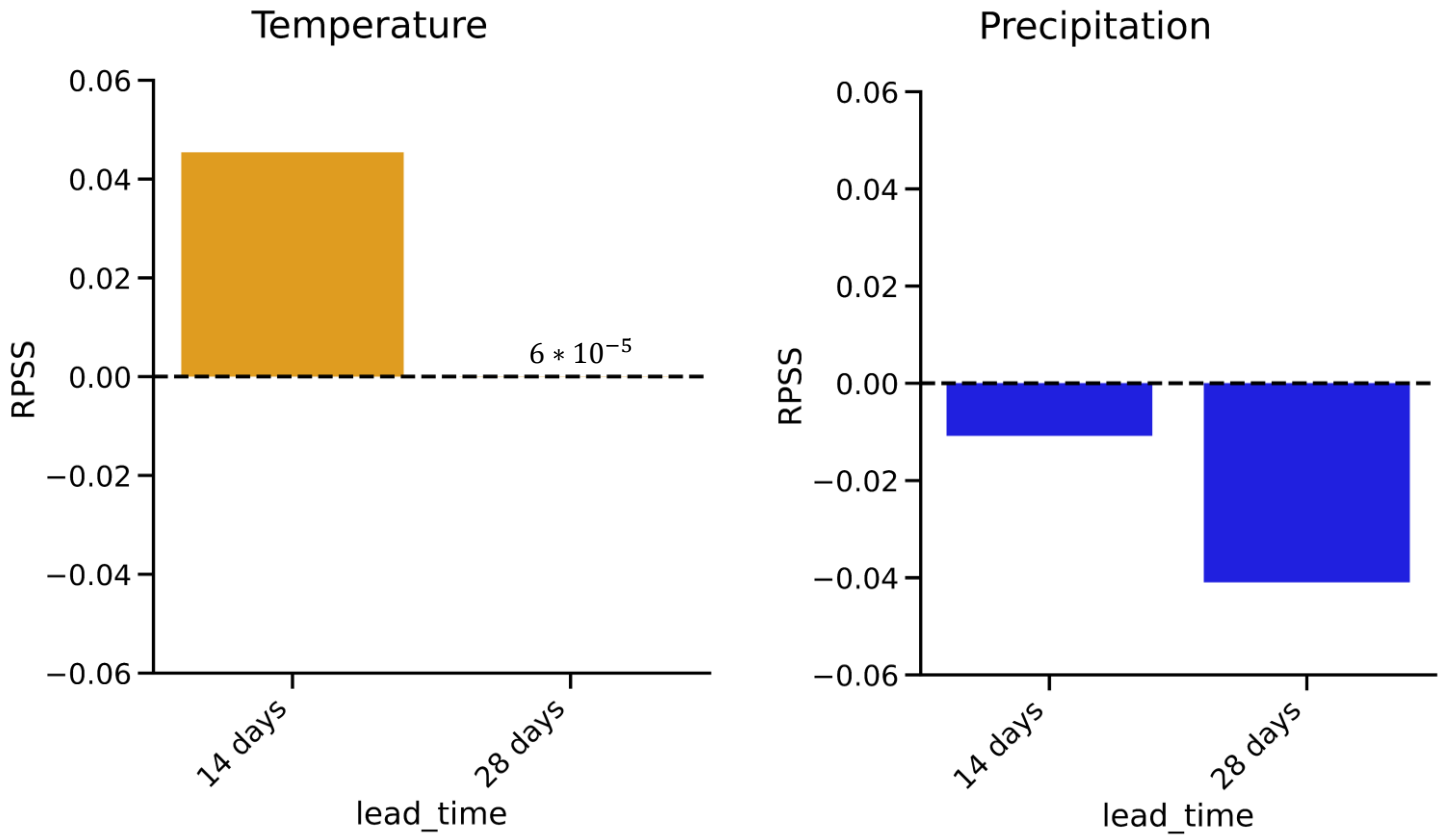


Challenge to improve Sub-seasonal to Seasonal Predictions using Artificial Intelligence (2021)

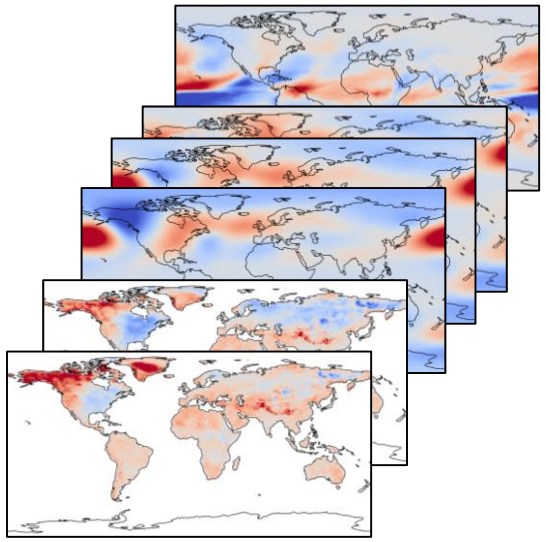


- Globally aggregated RPSS for all Thursday forecasts in 2020.
- RPSS > 0: forecast is better than climatology (random guessing).

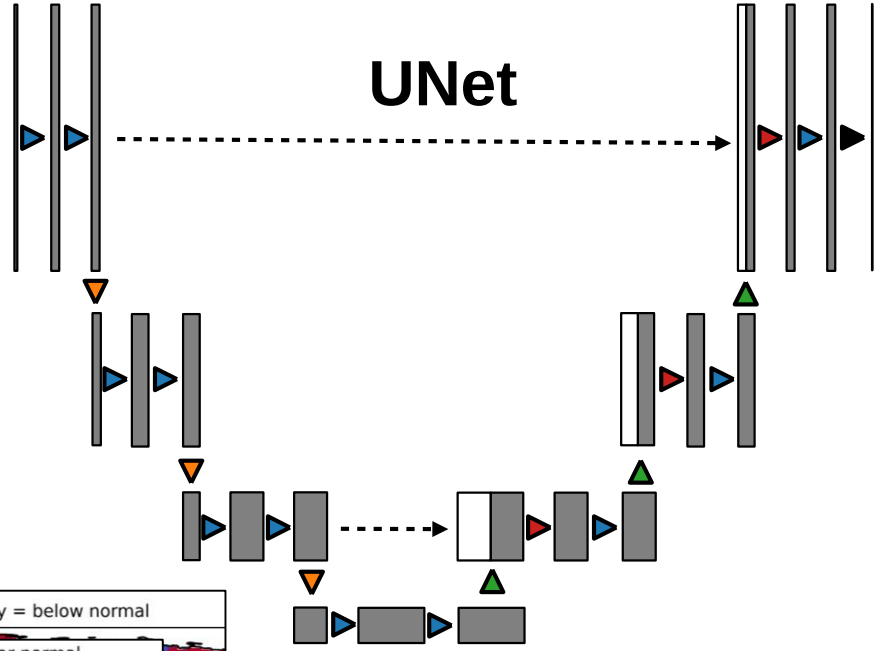
Task of the S2S AI challenge:

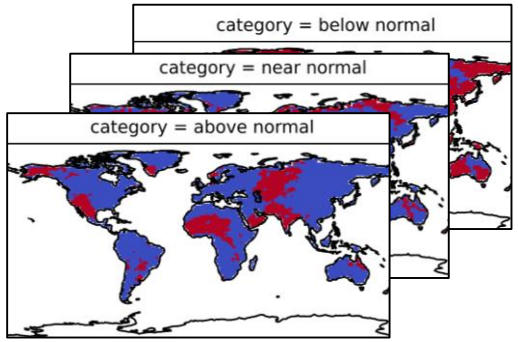
- Probabilistic predictions for terciles of
  - Average 2m-temperature
  - Accumulated precipitation
  - Aggregated over 2 weeks
- For 2 lead times:
  - 14 days: weeks 3-4
  - 28 days: weeks 5-6
- Spatial and temporal target:
  - Every Thursday in 2020
  - All land grid points globally
- https://s2s-ai-challenge.github.io/

Post-Processing with UNet architecture

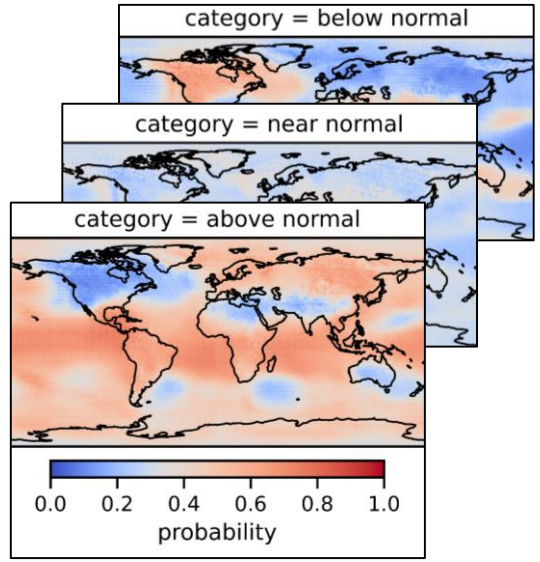


20 years of weekly ECMWF hindcasts



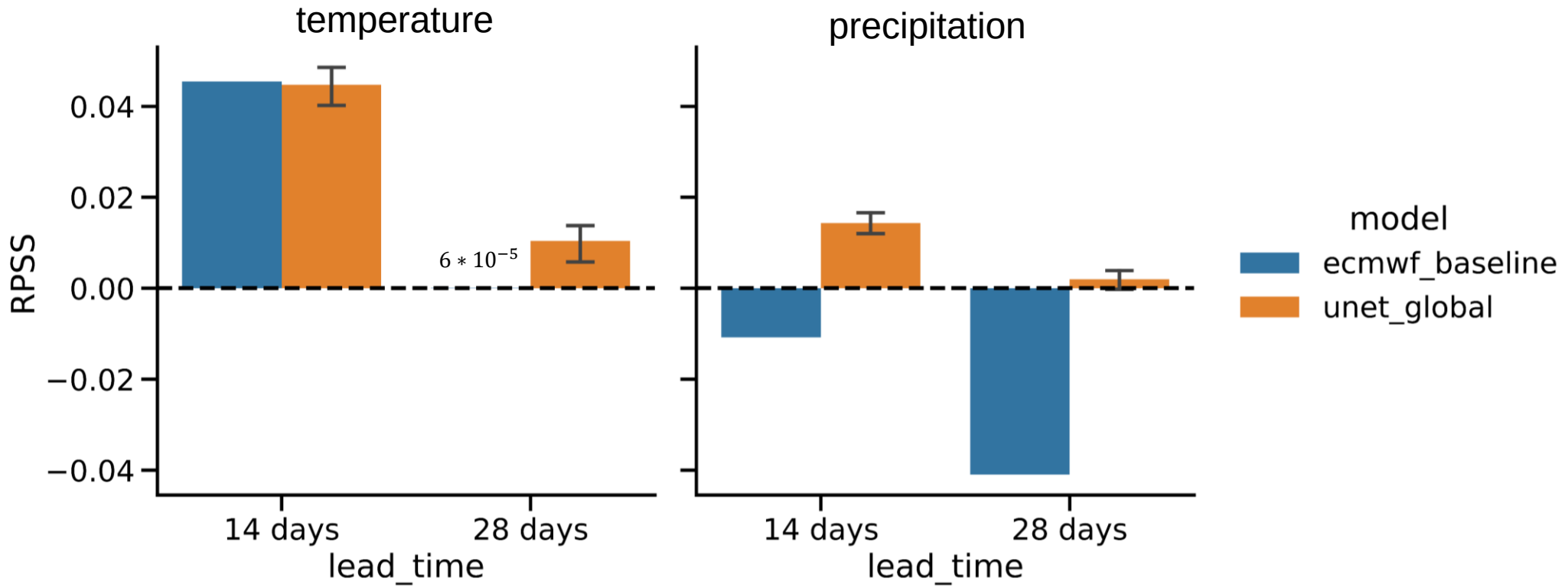


For training:
Gridded observations



Corrected probabilistic forecasts (for terciles)

Performance on test data (2020)



- Globally aggregated RPSS for all Thursday forecasts in 2020
- RPSS > 0: forecast is better than climatology (random guessing)
- Error bars: variability across folds (10-fold CV)

Conclusion

- UNet model is equally good or better than the calibrated probabilistic extended-range forecast of ECMWF.
  - Successfully transforms the ensemble mean forecast into a probabilistic forecast
  - Achieves positive skill where the ECMWF forecast has no skill
- Flexible post-processing method that can exploit spatial information and information from many different variables

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