

# Assessment of the multimodel forecast skill of precipitation over New Caledonia (SW Pacific) at the subseasonal time scale

Damien Specq (damien.specq@meteo.fr), Lauriane Batté and Michel Déqué

CNRM, Université de Toulouse, Météo-France, CNRS, Toulouse, France

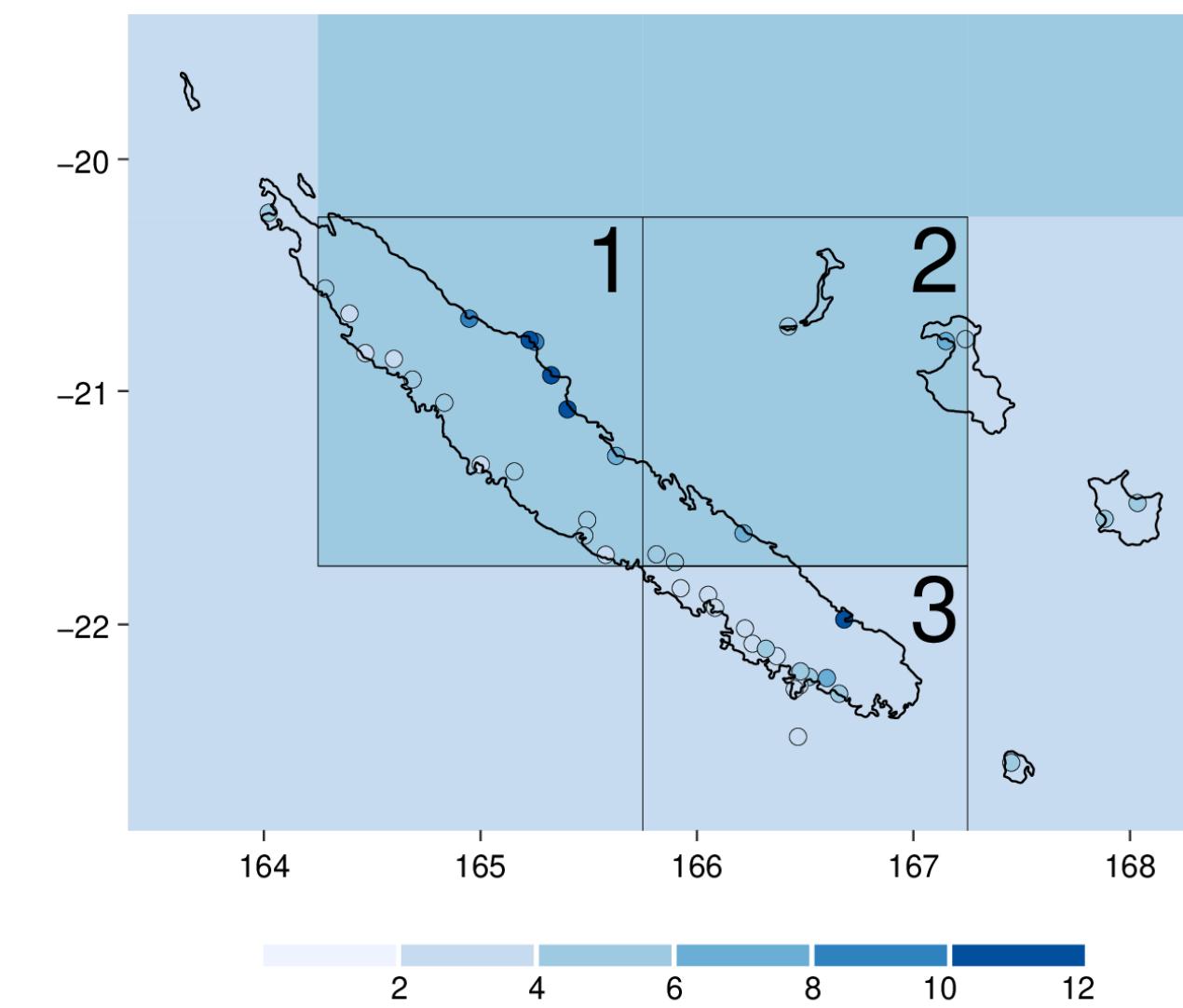
## INTRODUCTION

New Caledonia (SW Pacific) is prone to heavy rainfall events that are likely to exhibit some subseasonal predictability owing to the influence of large-scale drivers (ENSO, MJO).

We assess the skill of models from the S2S database in predicting precipitation over New Caledonia, with a focus on the potential benefits of a multimodel approach. Balanced multimodel reforecasts of rainfall over New Caledonia for the 1996-2013 DJF period are constructed using 6 S2S models.

In order to account for observation uncertainties, verification is carried out on a multi-observation dataset mixing together 3 gridded precipitation datasets and upscaled rain gauge data. We focus on the occurrence of intense rainfall events within a weekly window.

## A MULTI-OBSERVATION DATASET



- ▶ Verification on 3 grid points
- ▶ 4 data sources :
  - MSWEP (GTS rain gauge, satellite, reanalysis)
  - GPCP (GTS rain gauge)
  - CPC daily analysis (GTS rain gauge)
  - Météo-France rain gauge data aggregated at grid point level
- ▶ Model data simultaneously verified four times against each observation dataset

Fig. 1 : Average DJF precipitation (mm/day) for MSWEP and the 42 selected rain gauge stations in the 1993-2014 period

## VERIFICATION FRAMEWORK

- ▶ Deterministic verification : correlation at each grid point and spatial mean of correlations
- ▶ Probabilistic verification :
  - Definition of a daily event : precipitation > 25 mm/day at grid point
  - Quantile-quantile correction to adjust model and observations
  - Probability that the daily event occurs at least once during a weekly window
  - Verification with ROC skill score and Brier score (focus on reliability)
- ▶ 25 mm/day : significant contribution to monthly and seasonal amounts, important for hydrological applications

## SKILL OVERVIEW OVER THE PACIFIC BASIN

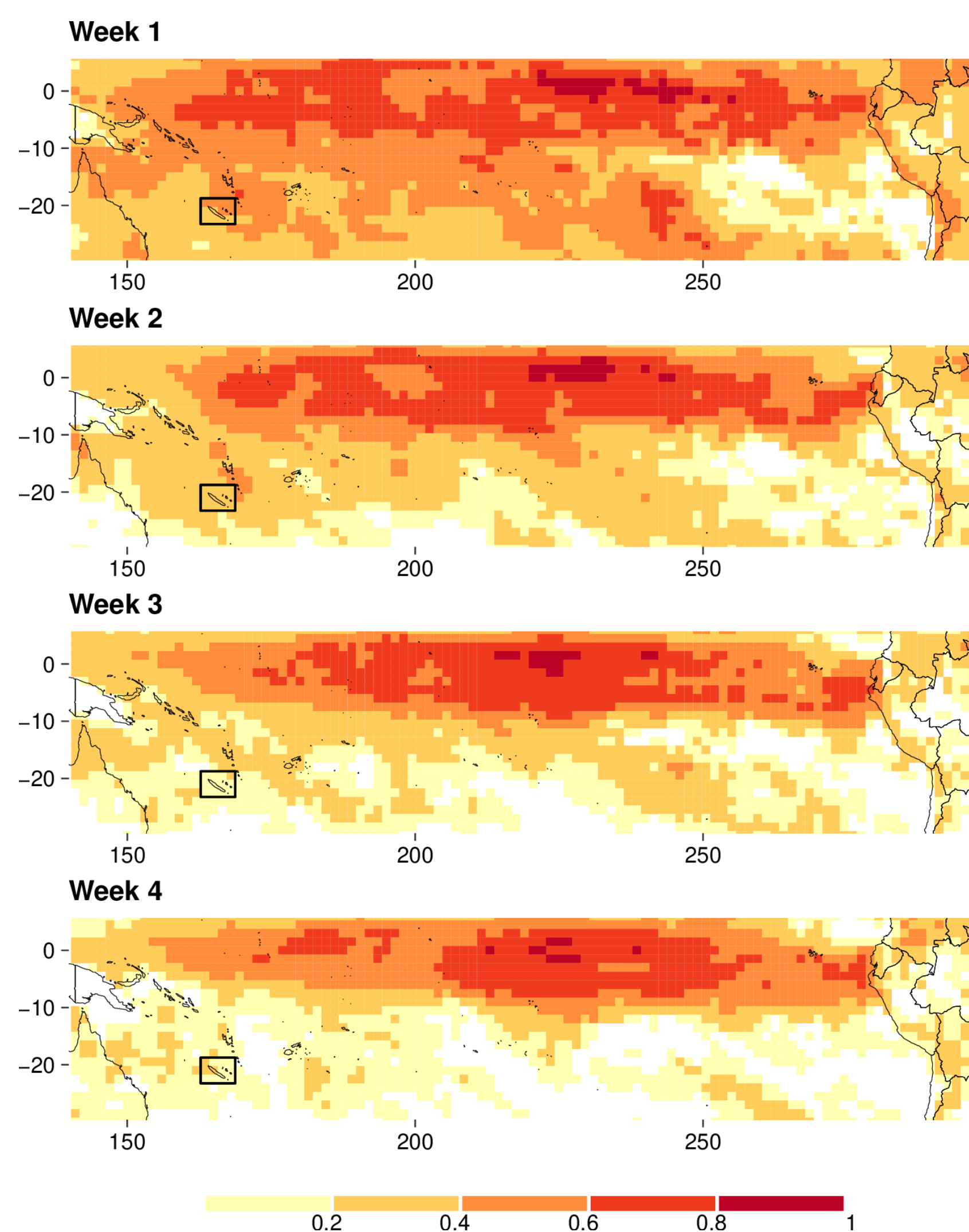


Fig. 3 : Correlation maps between Météo-France S2S model precipitation ensemble mean and MSWEP precipitation for 1993-2014 DJF start dates at lead times week 1 to week 4 (correlation not exceeding 95% significance threshold in white).

## MULTIMODEL CONSTRUCTION

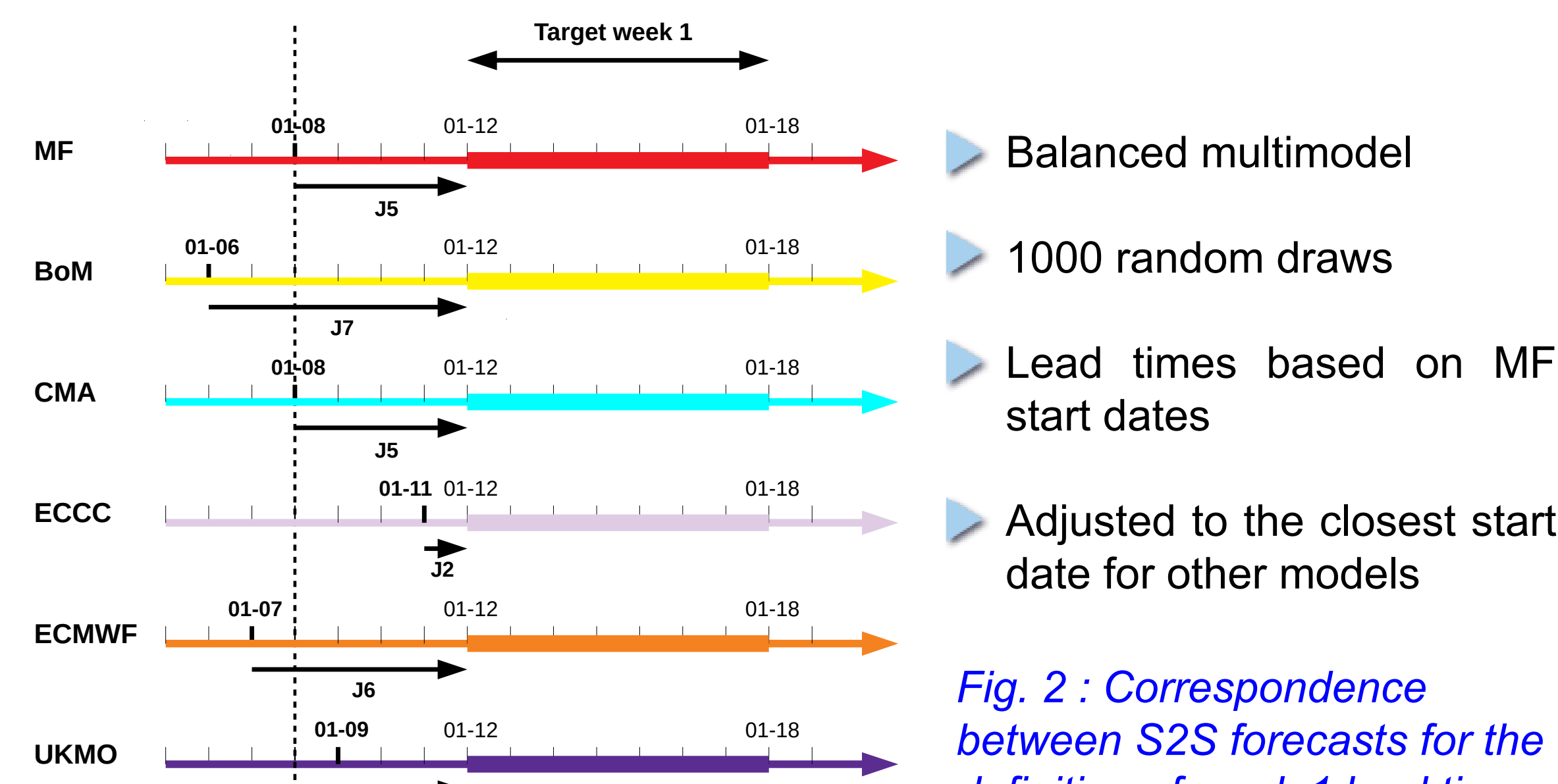


Fig. 2 : Correspondence between S2S forecasts for the definition of week 1 lead time in the multimodel (example of January 8 start date)

## COMPARISON MULTIMODEL VS INDIVIDUAL MODELS

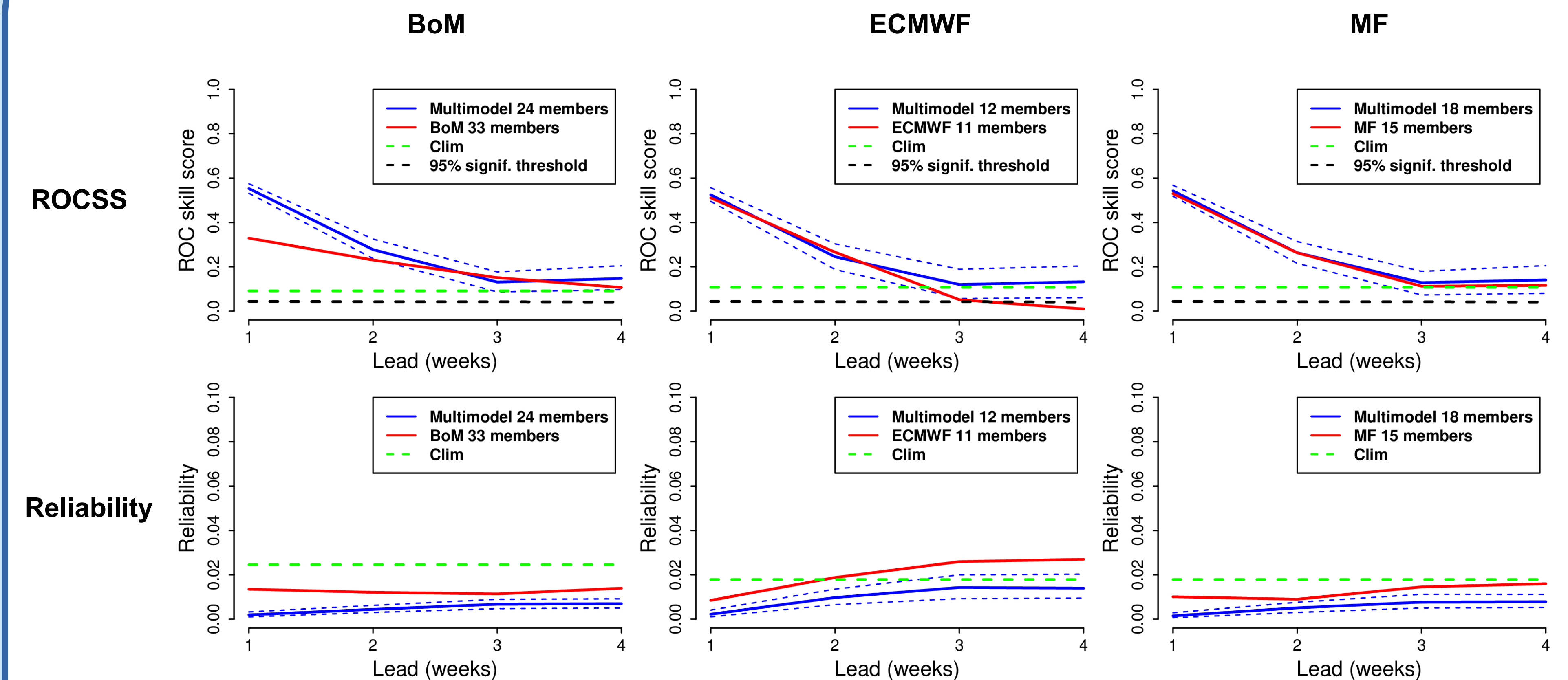


Fig. 5 : Comparison between multimodel and BoM, ECMWF and MF models for ROC skill score (upper row) and reliability (lower row), for the probability that at least one day in the week exceeds 25 mm. The dashed blue lines represent the 90% confidence interval around the multimodel score based on bootstrapping.

## MULTIMODEL FORECAST SKILL

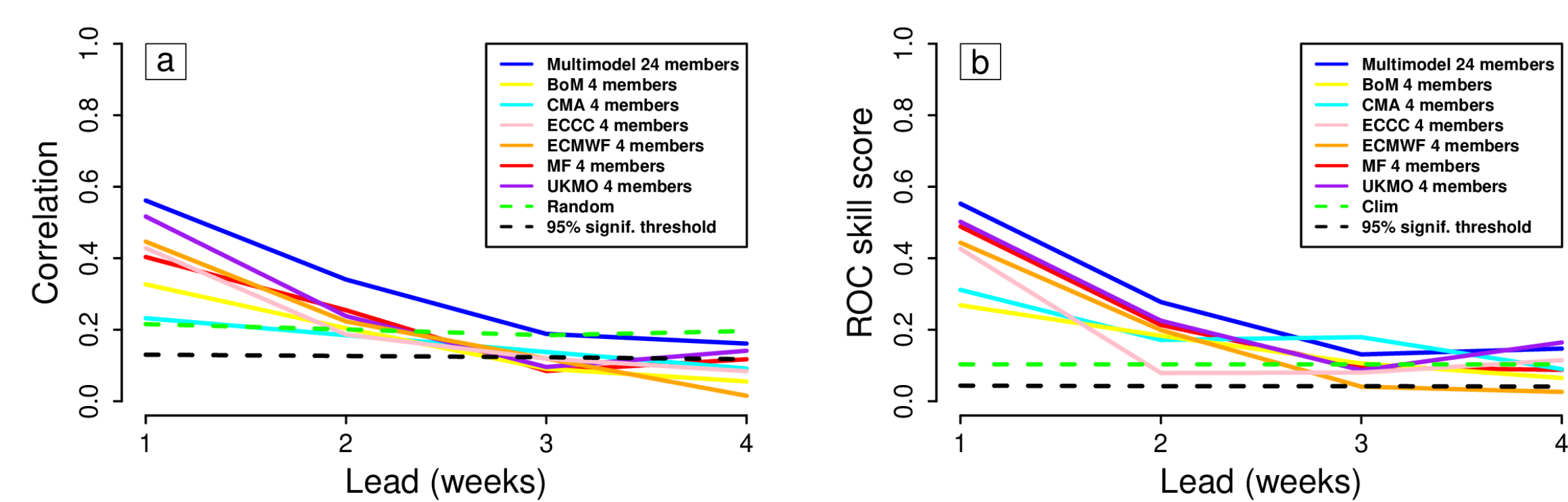


Fig. 4 : (a) Spatial mean of correlation for weekly average of rainfall over New Caledonia, (b) ROC skill score of the probability that at least one day in the week exceeds 25 mm, as a function of reforecast lead time, in the 24-member multimodel and 4-member individual models.

## CONCLUSIONS

- ▶ Skill extends up to week 2-3 compared to simple statistical forecasts
- ▶ The multimodel improves the forecasts in terms of score and reliability, but does not extend the predictability horizon
- ▶ The multimodel offers the opportunity to build larger ensemble forecasts for which scores are statistically better and uncertainties lower

## REFERENCES AND ACKNOWLEDGEMENTS

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Analysis of re-forecast skill was performed using the R library s2dverification (Manubens et al. 2018).