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Should we use quantile mapping to post-process seasonal GCM precipitation forecasts?

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Quantile mapping (QM) – the correction of cumulative distribution functions - has been widely used to correct biases in seasonal ensemble precipitation forecasts from coupled global climate models (GCMs). The literature commonly demonstrates QM's efficacy for bias-correction, particularly in climate change studies. A crucial difference between climate change projections and seasonal GCM forecasts is that seasonal forecasts are synchronous with observations. This opens the possibility for more sophisticated post-processing methods that 1) correct biases but also 2) correct ensemble spread and, crucially, 3) ensure forecasts are at least as skilful as climatology – a property termed 'coherence'. Coherence is a necessary precursor for forecasts to have economic value. Through a case study of precipitation predictions from the Australian POAMA GCM, we show that QM does not guarantee reliable ensemble forecasts, nor can it ensure 'coherent' forecasts. Further, we show that a formal statistical calibration using the Bayesian Joint Probability (BJP) modelling approach ensures unbiased, reliable and coherent forecasts. In choosing a post-processing method for GCM precipitation forecasts, the technical benefits of formal calibration methods over QM have to be weighed against their added complexity. In general, however, we caution against the use of quantile mapping to post-process GCM forecasts and recommend the use of more rigorous methods.