

30th Annual Conference of South African Society for Atmospheric Sciences (SASAS), Potchefstroom, 1-2 October 2014

Influence of horizontal resolution and ensemble size on model performance

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Abstract

Computing costs increase with an increase in global model resolution and ensemble size. This paper strives to determine the extent to which resolution and ensemble size affect seasonal forecast skill when simulating mid-summer rainfall totals over southern Africa. Furthermore a comparison is made between forecast skill of the 850 hPa geopotential heights and raw model rainfall outputs. The determination of skill was done by way of empirical post-processing procedures in order to project ensemble mean model forecast fields onto observed gridded mid-summer rainfall over South Africa. Spearman rank correlations are initially used to compare the performance of models with varying horizontal resolution as well as ensemble size. Further verification is also done on a set of probabilistic hindcasts through ROC scores and reliability diagrams. Skill increases with an increase in ensemble size and an increase in model resolution when 850 hPa geopotential heights are used to downscale to gridded rainfall, but when raw model rainfall is used for the downscaling similar improvement in skill is not observed. Finally, even with the best configuration (increased resolution and ensemble size) forecasts tend to be over-confident for both wet and for dry conditions notwithstanding their ability to discriminate.