

Supplementary Figures

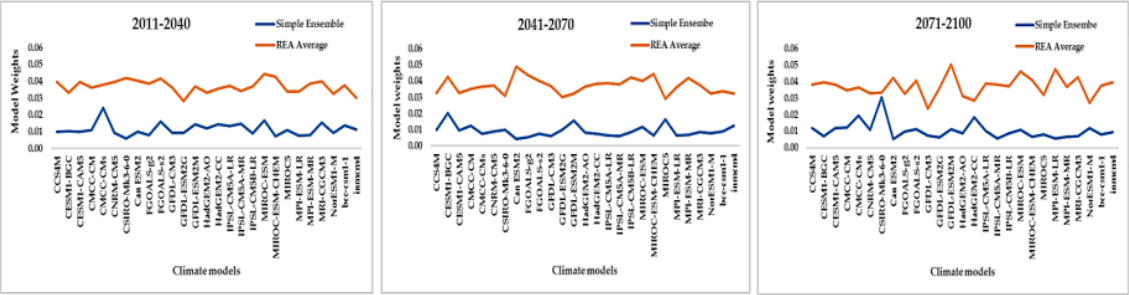
Ensemble Mean and Uncertainty for Future Duration

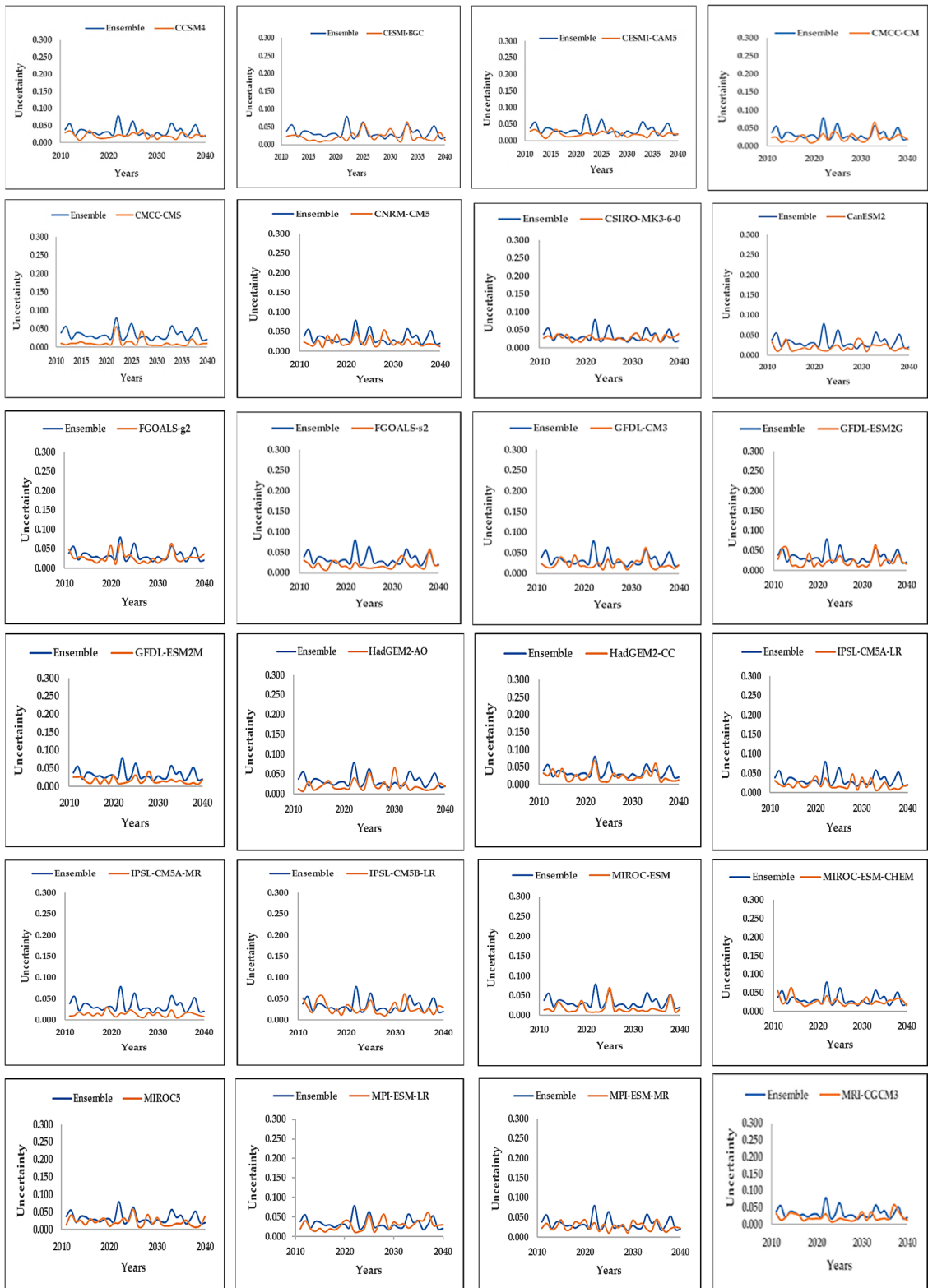
Projections hinge on climate model ensembles often reckon that each individual model simulation is of equal value. The uncertainty considered in this study is intermodal variability. Future projections were analyzed in terms of weight uncertainty and the ensemble mean for the downscaling methods using 27 GCMs and three future periods (2011-2040, 2041-2070, 2071-2100) under RCP 4.5. The weighting methodology is usually hinge on model performance differences, may be applied, and lead to some improvement in the projected mean. The REA uncertainty shows similar ensemble average of the future projected annual mean as shown in Figure 1a, b and c. The changes projected by the three future periods varies according to the model and projected years. Here, the weights accounts for model performance. The performance weights are inversely proportional to each simulated RMSE. In Figure 5, it was established that the annual averaged RMSE of nearly all climate models did not increase substantially during the 30- year long period of simulations. Applications of these weights to the ensemble mean is forthright. Prediction is made by comparing the ensemble mean weights for the three-30-year periods in Figure 1a, b and c it is established that the model weights are homogeneous but not exact. This is an interesting phenomenon that the simpler approach and Reliability Ensemble Averaging achieve related results even though the ensembles derive various weights across these two-ensemble approach.

Moreover, in Figure 1a, b and c it shows that annual ensemble mean approach can improve the uncertainty results compared to a single individual model. It stipulate that the uncertainty spawn from the individual models are smaller compared to the ensemble as thus: In figure 1a, the following models produces the smallest uncertainty when compared to the ensemble, IPSL-CM5A-MR, CCSM4, CanESM2, CSIRO-MK3-6-0 while in Figure 1b, Inmcm4, CCSM4, bcc-CSM1-1, CESM-BGC, MICRO5 and in Figure 1c, MICRO-ESM-CHEM, CSIRO-MK3-6-0, CMCC-CAM5 and CCSM4 respectively. Furthermore, the study confirms that uncertainty performances of the ensembles are preferable to that of any single model. Therefore, a single model's output is not adequate accuracy which again rationalize the expansion of multi-model ensemble scenario. Hence, the evaluation of the uncertainties from climate models ensemble gives an essential evaluation of overall climate projection uncertainties. In summary the ensemble mean tends to perform better than any individual model as averaging across models reduces errors in both mean climate and when variability is considered.

Prior to explore this result further this study and as a base for the REA method a simpler approach of ensemble means and the related uncertainty range for weights uncertainty was conducted in this study. (Equation 1 &2). However, the ensemble mean does not distinctly take into consideration the reliability criteria and weights equally all models. The Simpler Approach

was compared to the Reliability Ensemble Averaging approach to show the improvement the models uncertainty of the study. It is worthwhile to note that, the uncertainty herein is only as a result of various projections of the ensemble models and other sources of uncertainty are not influenced by the predictions used herein. In Figure 2a, b and c, the Reliability Ensemble Averaging projected higher ensemble of uncertainty than that of the Simpler Approach and projection in uncertainty can be seen to increases towards the 21st century.





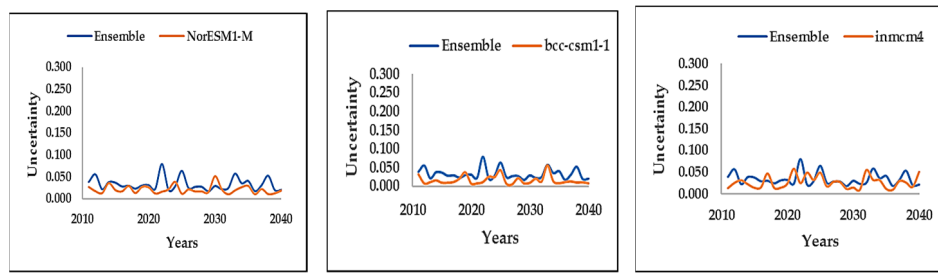
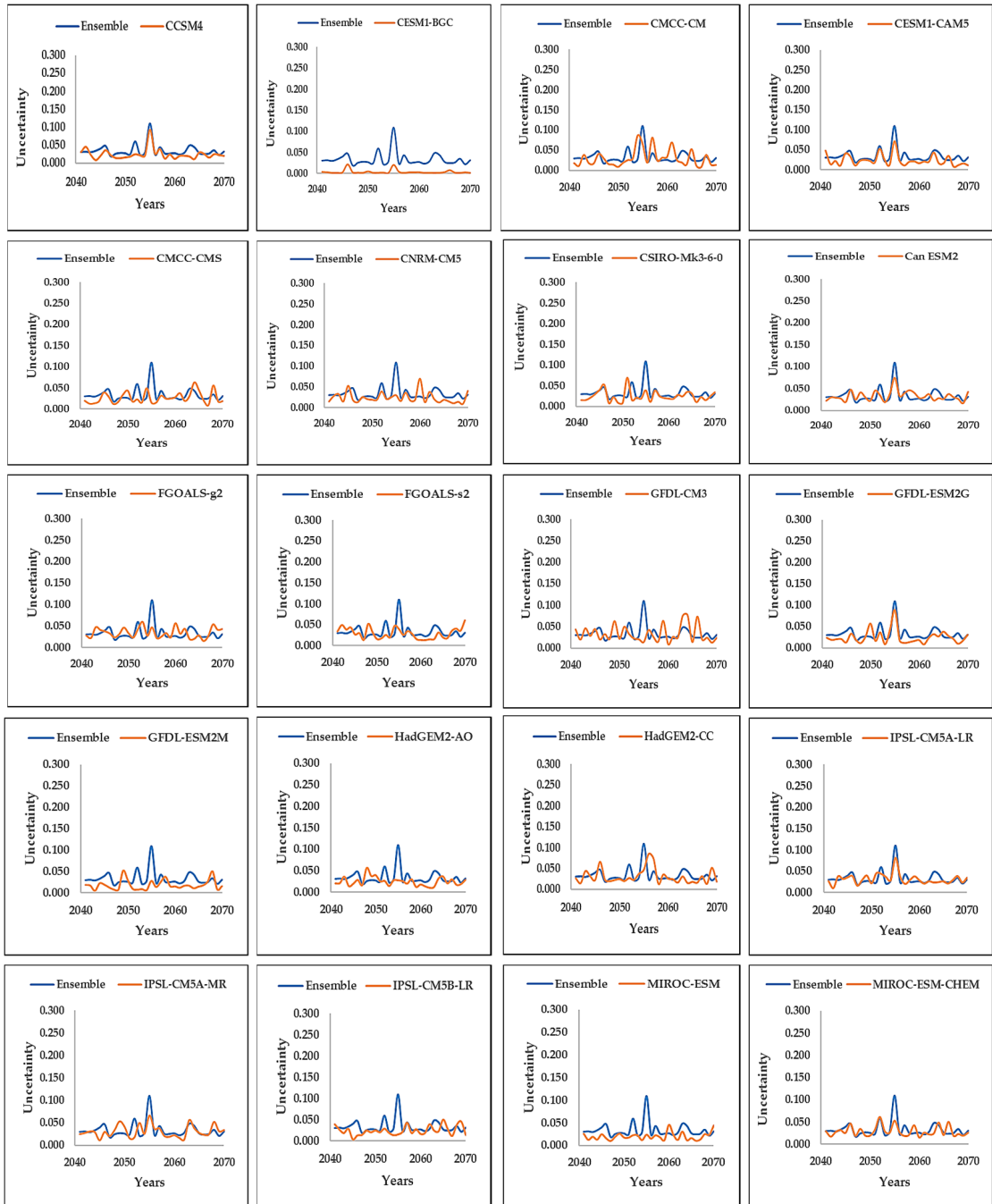


Figure 1a. Ensemble uncertainty of annual climate results with 30-year mean (2011-2040).



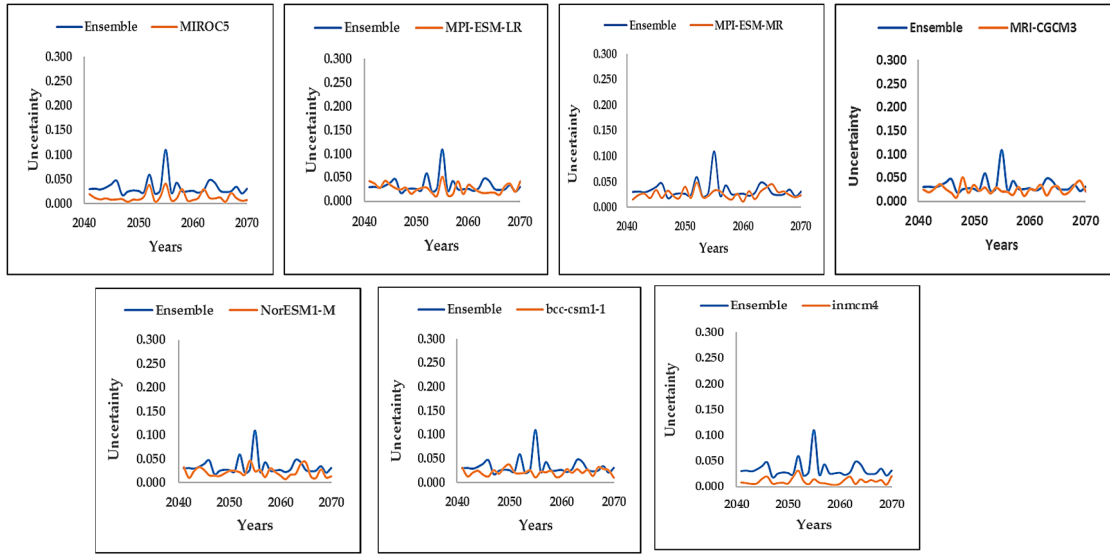
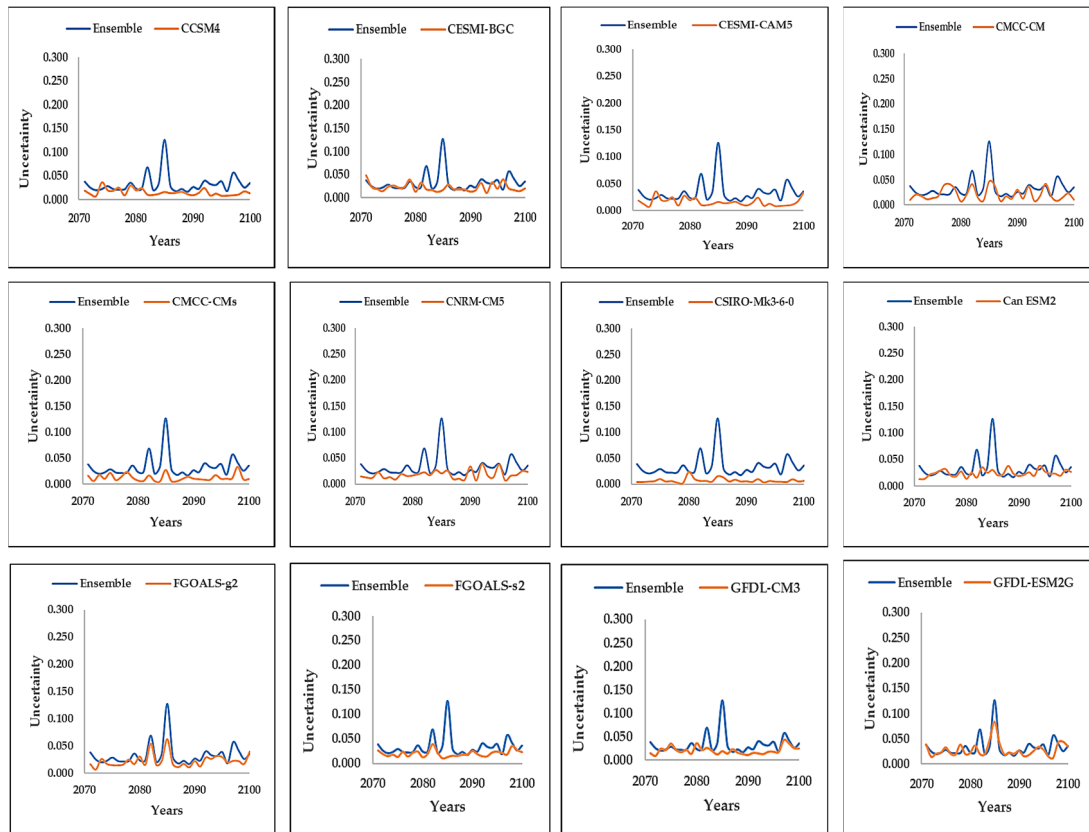


Figure 1b. Ensemble uncertainty of annual climate results with 30-year mean (2041-2070)



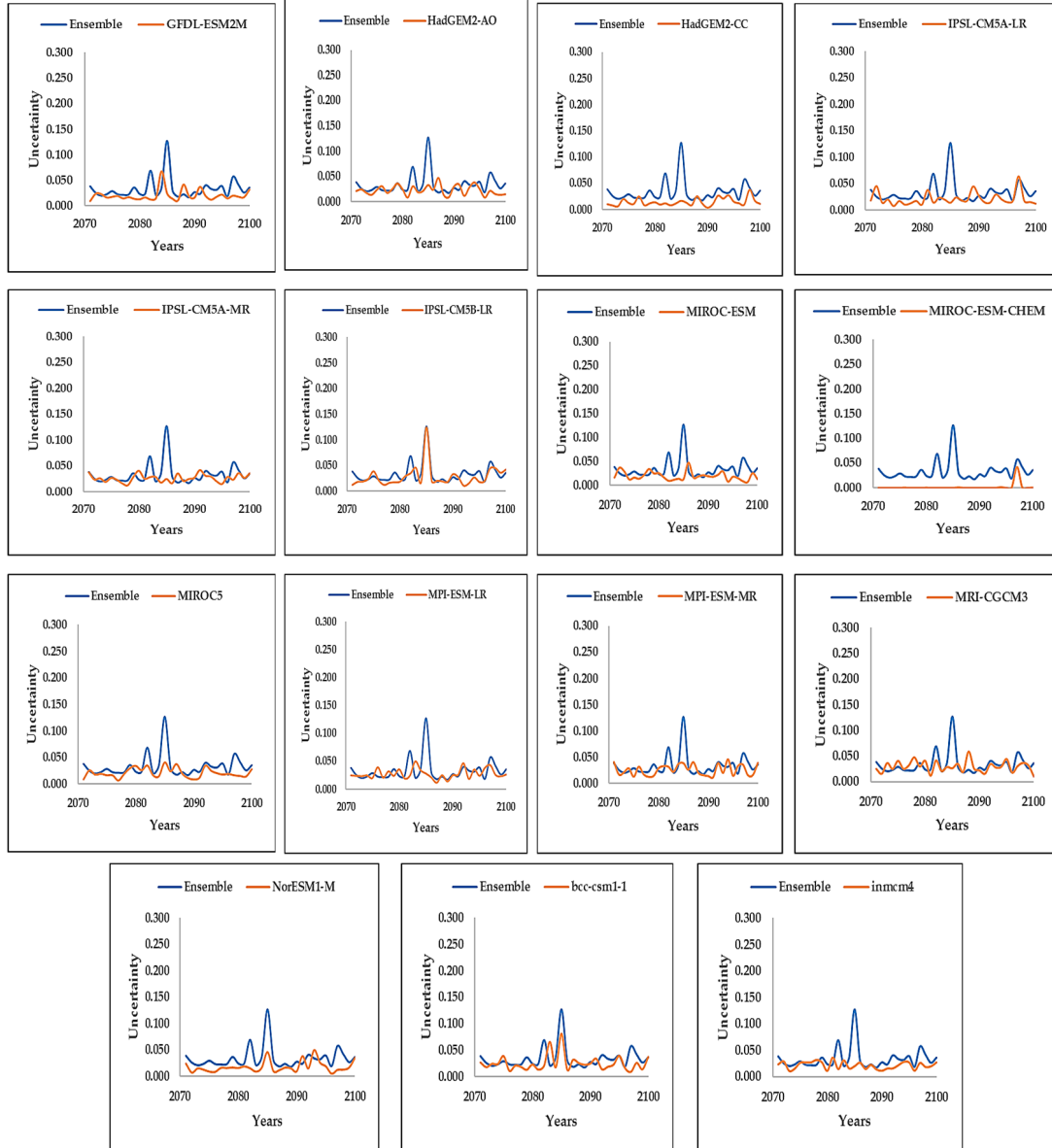


Figure 1c. Ensemble uncertainty of annual climate results with 30-year mean (2071-2100)

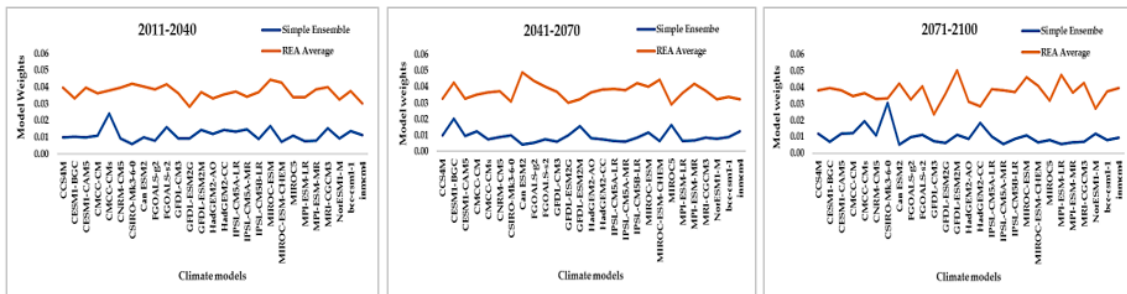


Figure 2. Comparison of climate models uncertainty weights obtained by Simpler Approach and Reliability Ensemble Averaging for three Future periods under RCP 4.5.