Current Development of Multi-Variate Bayesian Processor of Ensemble and its future applications

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This study follows the previous works of applying Bayesian Processor of Ensemble (BPE) as a statistical post-processing (SPP) method to calibrate and downscale raw ensemble model to specific locations over Taiwan. This study focus on extending the single-variable BPE system to a multi-variable one, opening up few possibilities for future study and applications. We will introduce the mathematical structure and the algorithm of multi-variate BPE, and possible applications that are now under active investigation: (1)Incorporating large scale indices as predictors in addition to ensemble mean to further improve the skill of the probabilistic forecast and (2)Incorporating wavebands derived from the decomposition of a deterministic model using spherical harmonics, aiming to reduce resources required to generate large, resource-hungry ensemble hindcast sets for SPP. Our validation results shows that (1) Selecting the correct large scale predictor could indeed boost the skill of probabilistic over single-variate BPE (2) Incorporating waveband could yield satisfactory skills, albeit the skills are slightly worse than just using ensemble mean as the predictor. However, this trade-off could be acceptable considering the cost of generating ensemble hindcast set under practical scenarios.

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