ABSTRACT

SIMULATION OF SEASONAL RAINFALL IN THE PHILIPPINES USING A REGIONAL CLIMATE MODEL

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A Regional Climate Model Version 3 (RegCM3) was used to simulate the seasonal rainfall (June, July August and September 2001). The model performance was assessed on a smaller domain covering the Philippines using subjective analysis of rainfall pattern and computation of skill scores. The model was tested by shifting the domain 10 degrees to the left of the Control run, ShL, and to the right, ShR. ShL covers more landmass than bodies of water while ShR include more ocean than the control run. ShL and ShR were used to determine the effect of changing the boundary position. The model was then tested using different cumulus parameterization schemes: Grell with Fritsch Chappel closure (FC), Grell with Arakawa-Schubert closure (AS) and Kuo. Assessment of the model performance was first based on subjective analyses of the maps in order to determine how well the rainfall patterns were simulated. The model was then assessed according to bias or anomaly, root mean square error and measures of forecast skills: Bias, % Bias, Bias Score and Hit rate. The bases for comparison were the monthly rainfall observations of 44 PAGASA stations and Tropical Rainfall Measuring Mission (TRMM). The contingency table used to determine the skill scores were grouped into four threshold levels: 0-100 mm, 100-300 mm, 300-500 mm and >500 mm. Subjective analyses of the rainfall maps reveal that the domain shifted 100 to the left performs better than Con and ShR with ShR a close second. Using areal rainfall instead of point rainfall, shifting the domain reveals that ShL estimates better the rainfall. On the other hand, the choice of cumulus parameterization schemes affects greatly the model's performance. Subjective analyses show that FC generally overpredicts while AS underpredicts. Nevertheless, it is not distinct whether FC and AS have an edge over the other. Regarding determination of rainfall contribution of convective and non-convective or stable rainfall produced by RegCM to the total rainfall (TPR), the study was able to show that cumulus convection contributed much to the TPR except for some occasion wherein stable rainfall is greater than convective rains. The use of RegCM for simulating seasonal rainfall is promising. The rainfall pattern and the rain-causing synoptic weather systems were simulated or captured in most cases. However, the rainfall amount was found to be highly sensitive to cumulus parameterization. Kuo gives consistently poor performance and is not recommended for further use in RegCM3. More studies using other cumulus parameterization schemes is recommended and compared with FC. To further improve the model performance, other options such as changing some parameters in the biosphere-atmosphere transfer scheme should be investigated.