Assessment of the reliability and outcomes of GPCs or LCs-LRFMME products

Summary

The seasonal rainfall forecasting at ICPAC is usually a hybrid of statistical and dynamical products; the latter being derived from Global Producing Center Models (GPCs). Eight model outputs from GPC centers have been analyzed and assessed for short rain season (OND) over GHA region using gridded observations from Climate Research Unit, University of East Anglia (CRU). The statistical techniques employed are spatial analysis, correlation analysis, Model output Statistics (MoS), regression analysis, time series analysis and categorical statistical skill score.

The spatial patterns of the individual models output from the models of Washington, Montreal, Melbourne and CPTEC is close to the observations with spectacular simulations for extreme years driven by ENSO episodes. Averaging individual models yields a single model (ensemble) with better representation of individual model strength and weaknesses. Again the ensemble model skill is better for ENSO episodes. This is an indication of the time when the GPCs are most appropriate for climate prediction. In terms of geographical space, the skill is higher around Equatorial rainfall belt of GHA region; predominantly an ITCZ track which is a major semi permanent pressure cell over the GHA region. The models also captures the direction of rainfall but struggles to get the correct magnitude. This is an area that still require research and model development.

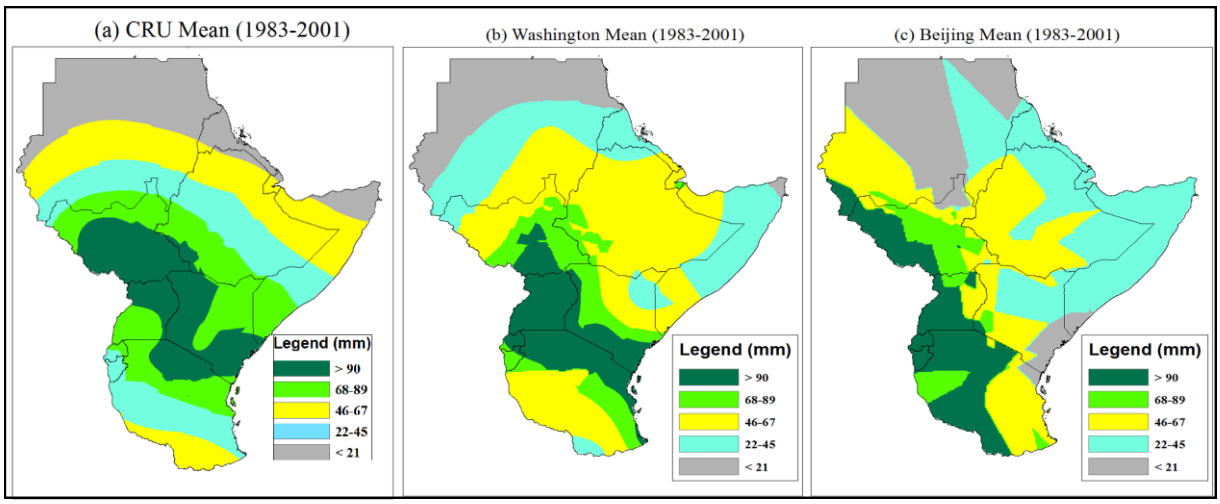


Figure 1: Spatial distribution of seasonal mean of observed rainfall, Washington and Beijing models output for 1983-2001.

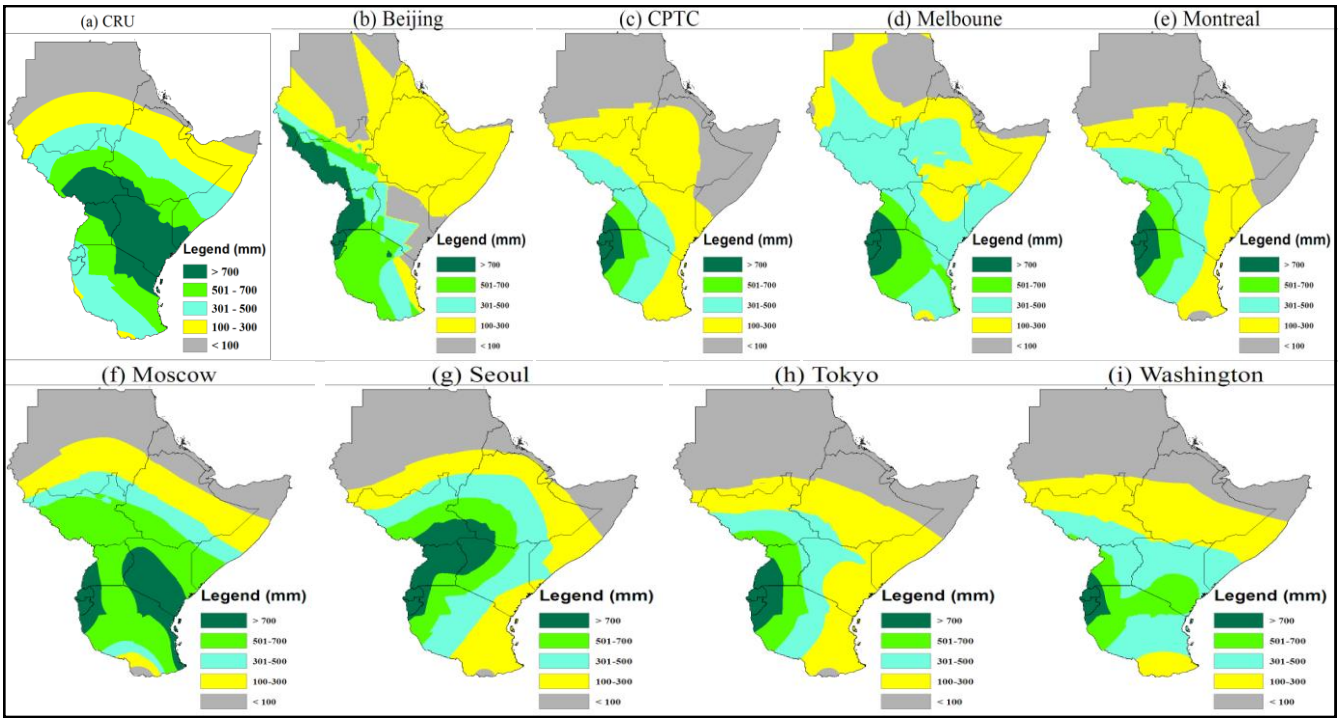


Figure 2: Spatial distribution of model output for 1997

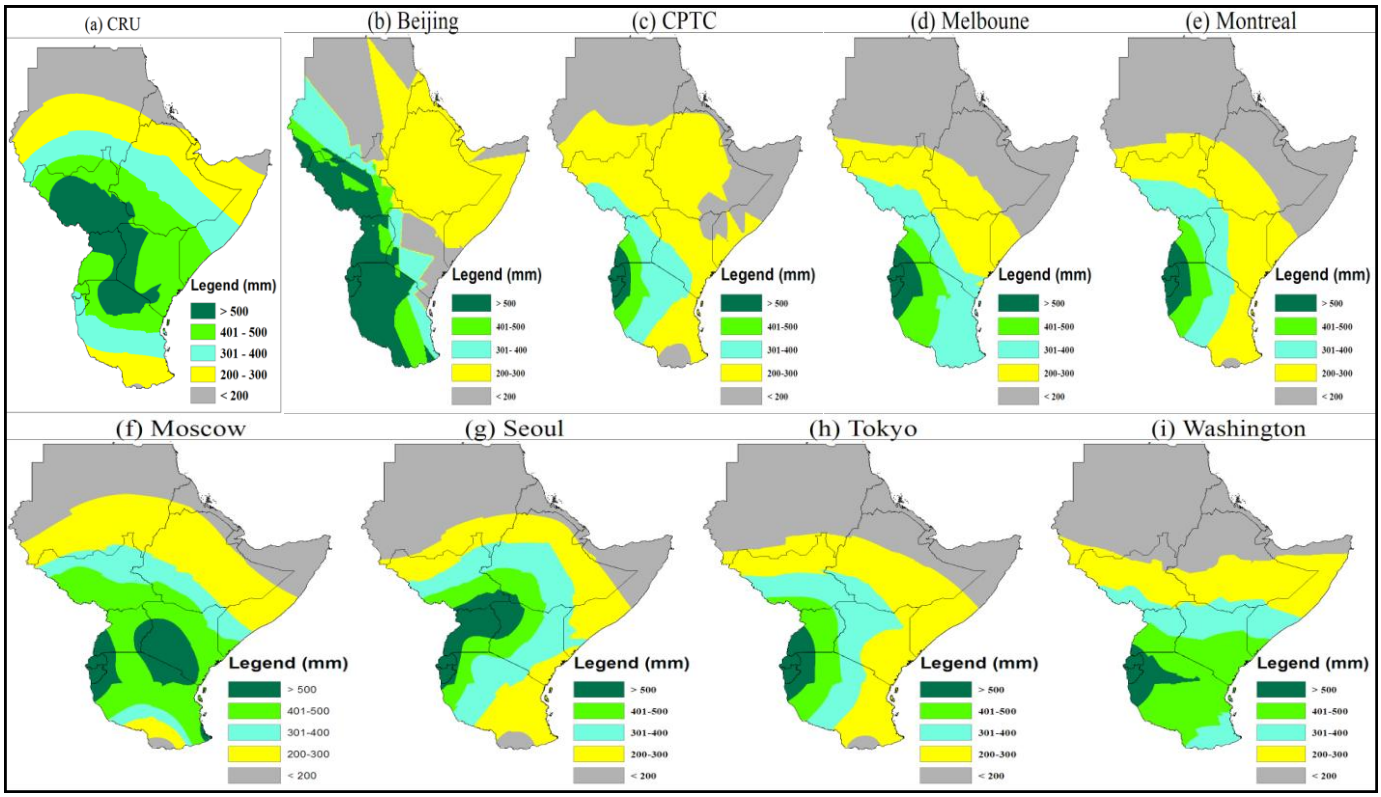
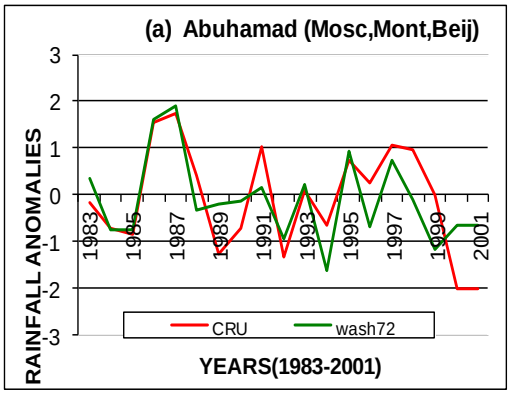


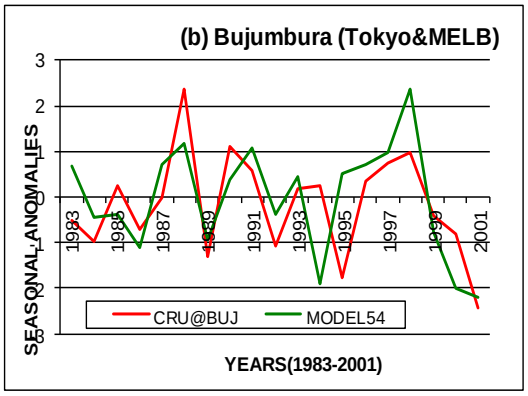
Figure 3 : Spatial distribution of rainfall for 2000

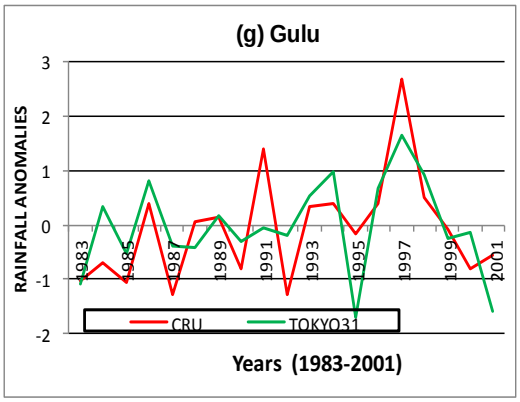
CRU	Beijing	CPTEC	Melbourne	Montreal	Moscow	Seoul	Tokyo	Washington
Abuhamad	-0.38	0.07	-0.38	-0.39	-0.09	0.16	-0.23	-0.05
Asmara	-0.35	-0.35	0.43	0.21	0.43	-0.09	0.29	0.03
Bujumbura	0	-0.15	-0.39	0.17	0	-0.03	-0.20	0.35
Combolcha	0	0.11	-0.37	0.12	0.12	-0.17	0.29	0.37
Dagoreti	0.05	0.43	0.10	-0.18	-0.14	-0.14	0.44	0.66
Djibouti	0.15	-0.26	0.35	0.58	0.50	0.37	0.38	0.64
Entebbe	0.04	-0.14	0.18	0.19	0	0.23	0.21	0.75
Gulu	0.35	-0.20	-0.18	0.07	-0.02	0.08	0.49	0.43
Juba	0.12	-0.23	0.12	-0.18	-0.14	0.13	0.33	0.51
Kabale	0.38	0.21	-0.56	0.36	-0.45	-0.01	0.18	0.27
Kericho	0.13	0.11	-0.04	0.08	-0.61	0.06	0.39	0.22
Khatoum	0.07	-0.16	-0.06	-0.08	-0.11	0.02	0.28	0.55
Lamu	0.12	-0.22	0.15	-0.16	-0.15	0.14	0.34	0.53
Lodwar	0.12	-0.22	0.15	-0.16	-0.15	0.14	0.34	0.53
Makindu	0.05	-0.57	0.01	-0.22	0.03	0.08	0.16	0.48
Mtwara	-0.06	-0.43	-0.19	0.70	0.09	0.06	0.76	0.66
Mwanza	0.03	-0.23	-0.11	-0.28	-0.01	0.19	0.32	0.37

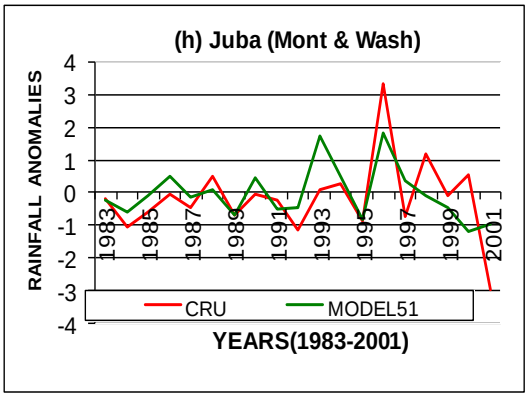
Table 1: Correlation Coefficients between Model output and Observed Rainfall Anomalies at various Stations in the GHA.

Narok	0.49	-0.17	0.03	-0.23	0.03	0.11	0.40	0.43
Wajir	0.07	-0.16	-0.23	-0.06	-0.43	0.07	0.08	-0.08
Wau	-0.10	0.20	0.35	0.13	-0.21	0.07	0.26	0.36









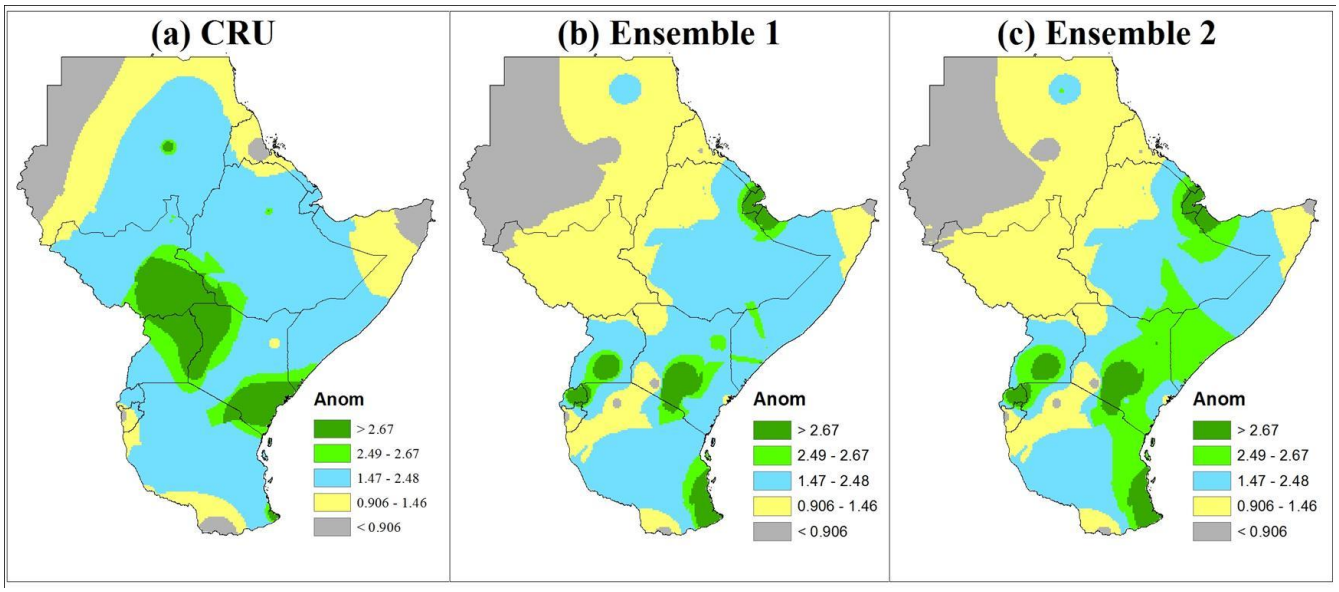


Figure 4: Spatial distribution of (a) CRU (b) ENSE 1, (c) ENSE 2 models output for 1997.

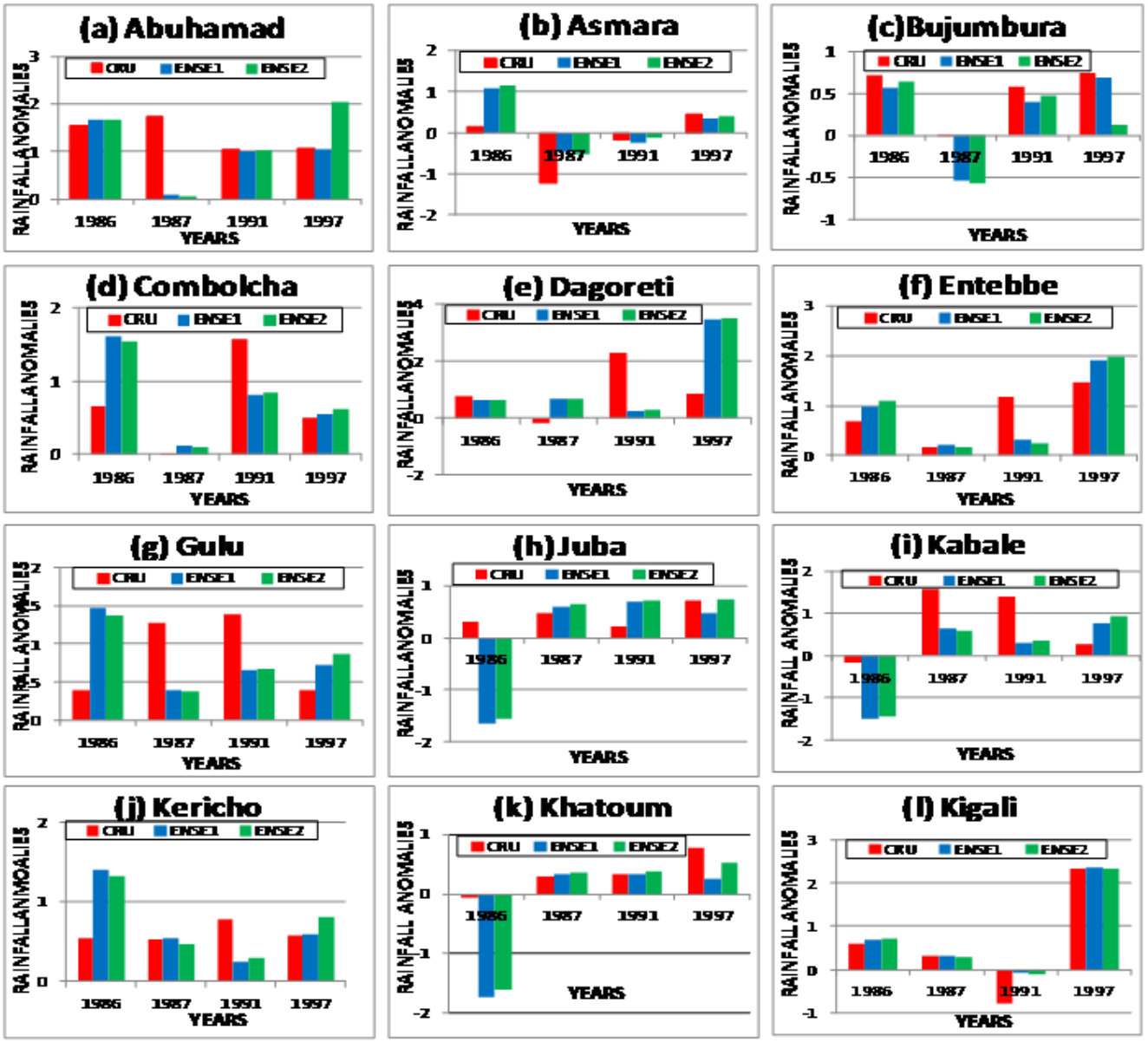


Figure 5: Ensemble model output and observed rainfall for enhanced rainfall records

Table 2: Correlations for Ensemble model

Stations	ENSE 1	ENSE 2
Abuhamad	0.21	0.23
Asmara	0.56	0.26
Bujumbura	0.59	0.64
Combolcha	0.29	0.43
Dagoretti	0.63	0.65
Djibouti	-0.35	0.55
Entebbe	0.61	0.66
Gulu	0.76	0.78
Juba	0.68	0.73
Kabale	-0.35	-0.37
Kericho	0.62	0.62
Khartoum	-0.70	0.75
Kigali	0.64	0.64
Kisumu	0.71	0.76
Lamu	0.71	0.76
Lodwar	0.71	0.76
Makindu	0.69	0.73
Mtwara	0.71	0.70
Mwanza	0.29	-0.54
Narok	0.55	0.61
Wajir	-0.39	-0.59
Wau	0.32	0.30