**Statistical and dynamical climate predictions to guide water resources in Ethiopia**

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**Abstract**

Climate predictions with lead times of one season or more often provide prospects for exploiting climate-related risks and opportunities. This motivates the evaluation of precipitation prediction techniques from statistical and dynamical models, and their combination, to potentially augment prediction skill over the Blue Nile basin in Ethiopia. This work considers to what degree greater skill or reliability in a particular prediction technique translates through hydropower management models given their nonlinear response. The statistical and both CFSv1 and CFSv2 models are evaluated independently and through multi-model combinations. Stochastic precipitation series from the period 1982-2000 are generated to compare prediction techniques.

For the June-September rainy season, the CFSv2 model produces a substantially lower mean bias in precipitation than the CFSv1 model, however considering correlations with observations, root mean squared errors, and rank probability skill scores, the results are mixed, with neither model proving superior. Multi-model approaches do slightly better. For the linked climate forecast – hydropower system, utilizing CFSv2 proves markedly superior compared to CFSv1 across a range of metrics. This includes an expected increase in annual benefits of approximately $15 million dollars on average (preliminary results.) The CFSv2-based system is also on par with the statistical-based system. Marginal improvements from including multi-model climate prediction techniques are on the order of $2 million dollars annually, compared with the CFSv2 or statistical techniques. Ideally these results will provide decision-makers with sufficient incentive to integrate improved prediction techniques into sectoral management models, and further justifies expanding efforts into climate forecast improvement.

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