Session: C3 Poster: W254A

Water-Food-Climate: How can Africa adapt to climate risk?

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Our global water resources include energy, agricultural and environmental systems, which are linked together as well as to climate via the water cycle. As such, watersheds and river basins are directly impacted by local and regional climate variations and change, and in turn, these managed systems provide direct inputs to the global economy that serve and promote public health, agricultural and energy production, ecosystem surfaces and infrastructure. With the prospect of potential climate change and associated shifts in hydrologic variation and extremes (i.e. non-stationarity in the hydro-climate system), the MIT Integrated Global Systems Model (IGSM) framework has enhanced its capabilities to model impacts (or effects) on the managed water-resource systems including how we may be able to adapt to these impacts. A key component of this enhancement is the linkage with the Water Resources System (WRS) into the IGSM framework. WRS is a model of the global water resources management system, agricultural (rain-fed and irrigated crops and livestock) and aquatic environmental systems at a large river basin scale. In particular, the incorporation of the river routing and reservoir modeling will provide the capability within the IGSM framework to explore allocation of water among irrigation, hydropower, urban/industrial, and in-stream uses and investigate how society might adapt water resources due to shifts in hydro-climate variations and extremes. These results can also be incorporated into economic models allowing us to consider the implications of climate for growth and development prospects. In this study, we consider how changes in the regional hydro-climate over southern Africa impact agriculture and water-management systems, and whether adaptive strategies can cope with the more severe climate-related threats to growth and development. All this is cast under a probabilistic description of regional climate change that is constructed under the IGSM framework.