Variability and Predictability of African Easterly Waves

Intellectual Merit
While much is known about the mean structures of African easterly waves (AEWs), almost nothing is known about the variability of AEW structures and their predictability. Recent work has highlighted the fact that there exists significant intraseasonal variability in AEW-activity in the tropical African region but we know little about how this variability is manifested in terms of AEW characteristics (such as intensity, phase speed, scale, rainfall etc). This proposal is motivated by the need to improve our knowledge and understanding of the nature and variability of African easterly wave characteristics and the processes that determine the predictability of African easterly waves at daily-to-intraseasonal timescales. The proposed work will explore the extent to which the variability and predictability of AEWs is determined by variations in the regional environment, coupling with convection and associated latent heat release and variability in precursors. The work is planned around two complimentary themes: (i) Variability of AEWs and (ii) Predictability of AEWs. The variability-work will combine statistical analysis of observations and NWP analyses supported by idealized modeling and a case-study approach to determine the extent to which AEW characteristics vary at daily-to-intraseasonal timescales and why. The predictability work will be explored using forecast sensitivity analyses and will interact strongly with and benefit from the variability work. Moreover, AEWs provide an opportunity to understand atmospheric predictability for a class of phenomenon where dry and moist dynamics are of equal importance, unlike midlatitude systems that are primarily associated with dry dynamics.

Broader Impacts
The research proposed will make strong contributions to improving our knowledge and understanding of the interactions between weather and regional climate in the West African region. Increased knowledge and understanding of the variability and predictability of AEWs is important for weather forecasters concerned with the West African region as well as those interested in the potential for tropical cyclogenesis downstream. The knowledge gained in this project will be used to update the diagnostics on our webpages used for routine monitoring of AEWs and AEW-activity that are used by such forecasters. In particular we will endeavor to include more information about intraseasonal variations of AEWs and associated rainfall. Since AEWs are responsible for a significant amount of rainfall during the boreal summer, this work is also applicable to a range of applications important for society including
hydrology (and flood prediction), agriculture (and crop prediction) and health (including malaria risk assessments). While such applications of our work will not be dealt with in this project, efforts will be made to communicate our results to the relevant communities. One way to do this will be through communication with scientists working in these areas within the African Monsoon Multidisciplinary Analysis (AMMA) project in which Thorncroft has a leadership role.