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From Hazard Anticipation & Mitigation to Increasing Food Security: Utilizing Ensemble Forecasts in the Developing World

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"…one can prepare, one can strive, one can make a choice, but ultimately life is an elaborate game of providence and probability…."
(Daniel Silva, 2021)

During the last three decades, there have extraordinary advances in the field of weather prediction. At the forefront of these advances been the creation of ensemble systems using global models with models of ever increasing resolution. ECMWF has been at the forefront of this revolution within which Tim Palmer has played an inspiring role.

Our early work developed probabilistic forecasts of floods of the transboundary rivers of the Ganges and Brahmaputra on the 1-14 day time scales based on ECMWF predictions. These proved to be useful and the system continues to be generated operationally through RIMES (Regional Integrated Multi-Hazard Early Warning System for Africa and Asia) for flood forecasts in Bangladesh. We adapted the system to produce forecasts for the Indus Valley region and for heat wave forecasting in Gujarat, India. The utility of these hazard forecasts have allowed anticipatory actions to be taken which have minimized property, crop loss and fatalities. We provide several examples where probabilistic forecasts have been used successfully in South Asia to mitigate the impact of weather hazards.

More recently, we have shifted our efforts to the agricultural sector of the developing world noting that over 80% of agricultural land across the globe is "rain-fed"(no irrigation) and are regions of food and income insecurity. We are of the belief carefully crafted probabilistic forecasts conveyed to the farmer will allow an optimization of agricultural activities and, hopefully a minimization of food insecurity. In collaboration with PxD (Precision Agriculture for Development: a no-profit organization to support people living in extreme poverty by providing customized digital information and services that increase productivity, profitability, and environmental sustainability) we currently have two regions in our "forecast for farmers"project: The Punjab of Pakistan and Karnataka, India to whom we provide probabilistic 1-14 day forecasts and intraseasonal and seasonal outlooks. PxD acts as the interpretive interface working directly with farming communities and groups.

However, many regions of the world are not reaping the potential benefits from advanced weather forecasting systems, sometimes impeded by social, technological and political reasons, but mainly revolve around the issue of communication. We propose a broader strategy for communication of probabilistic forecasts to user communities across the globe that is simple, rapid and economical in essence the same mode of communication we have developed for the Punjab-Karnatika "forecast for farmers"project in conjunction with PxD. There is a broader aim of this new paradigm whereby aid, relief and lending agencies can concentrate less on recovery following a hazardous event but more on prevention minimization of impacts through capacity building, optimizing agricultural practices, supporting hazard anticipation and mitigation planning. Central to this ambition is the generation of probabilistic forecasts and their communication. We argue that probabilistic forecasts and their thoughtful communication translates into increasing resilience in the face of weather hazards and improving food security in a changing climate.

Presenter: WEBSTER, Peter (School of Earth and Atmospheric Sciences Georgia Institute of Technology)