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A Blueprint for Advancing Hydrologic Predictability in the Nile Basin

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Hydrologic monitoring in the Nile basin is presently carried out on the basis of sparse in-situ network. Yet, hydrologic processes are known to exhibit high spatial and temporal variability. Routine hydrologic measurements at fixed locations have been valuable for observing integrated catchment responses (e.g., streamflow) or atmospheric forcing (e.g. precipitation) at a point. These measurements fail to convey much information on (1) responses of ungauged catchments, (2) space-time patterns of hydrologic fields across the basin, and (3) impact of possible future scenarios (e.g., intervention of water resource project, land use change, etc.) on the hydrologic regime. This paper presents the broad outlines of an emerging approach for improving hydrologic predictability in the Nile basin, and the specific tasks needed to realize its implementations. The new approach embraces the space-time heterogeneities of hydrologic processes, and the integrative observations-modeling uncertainty in characterizing those processes. Instead of relying solely on field measurements, it will take advantage of recent developments in satellite remote sensing technology to observe space-time patterns of hydrologic variables. It will acknowledge the various observational and modeling error sources to provide ensemble characterizations of prediction uncertainty in the delivered hydrologic products. Instead of using hydrologic models that have not been tested to work in the Nile basin, it will seek to identify optimality criteria for the use of hydrologic models driven by satellite precipitation datasets for the Nile basin. The defining feature of the new approach will be a sharp focus on the use of satellite data, establishment of a ground validation site for error characterization, and in bridging the scale incongruity between hydrologic process and meteorological forc-

ing datasets combined with the associated satellite sampling and hydrologic modeling uncertainty. This new focus will revolutionize hydrologic predictability in the Nile basin, thus improving the accuracy of quantitative forecasts that would feed directly into the making of more-efficient, more-equitable and better-informed water management and planning decisions.