Estimation of Variability in Water Resources in the Major River Basins of the World Using Satellite Data

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The increasing trend of floods and droughts over the past decade has made the study of hydrologic processes and water availability vital to our understanding of these extreme events. These events have resulted in a loss of thousands of lives as well as billions of dollars of property damage. Many of these extreme events occur in developing countries where in-situ observing networks are sparse, making forecasting and estimation of impacts near impossible. Data from NASA Earth Observing Satellites are used to measure changes in eleven river basins globally. This study assesses how the water cycle variables such as precipitation, soil moisture, runoff, evapotranspiration and vegetation have changed over the past 15 years in these river basins that are located in different climate and ecosystems. Monthly trends using GRACE Water Equivalent Thickness Anomaly, TRMM and GPM Precipitation, MODIS NDVI and ET, and GLDAS Runoff and Root Zone Soil moisture are analyzed over each major basin, and at sub-basin level using the 2007 Koppen Climate Classification. Using a global variable anomaly index, water basins across the globe can be compared, and extreme events can be identified. This information provides a basis to determine the spatial variation of expected water availability, and to predict changes in water cycle variables using time lag relationships.

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