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Skill and reliability of experimental GEFS ensemble forecast guidance designed to inform decision-making in reservoir management in California

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Many reservoirs operated by the U.S. Army Corps of Engineers (Corps) in California provide flood control as well as water supply, recreation and stream flow regulation. Operations for flood control follow seasonally specified elevations for an upper volume of reservoir storage with unused storage capacity designated for flood risk management and thus not available for water supply storage. In the flood control operation of these reservoirs, runoff is captured during rain events and then released soon after at rates that do not result in downstream flooding (typically over a 5 to 8 day period), resulting in evacuated storage space to capture runoff from the next potential storm. As part of the Forecast-Informed Reservoir Operations (FIRO) partnership to more effectively balance flood and drought risks, we developed an experimental California medium-range precipitation forecast system based on NCEP GEFS reforecasts and Climatology-Calibrated Precipitation Analysis (CCPA). We have applied this experimental forecast system to predict the probability of day 5-10 precipitation accumulations at each CCPA grid point within California to exceed certain pre-specified thresholds. Discussions with flood and water supply managers indicate that forecast guidance for the very low risk of extreme precipitation for watersheds above reservoirs can be valuable for decision making. In this study, we assess the skill and reliability of this experimental forecast system to predict low probabilities of precipitation extreme events for select watersheds during recent winter precipitation seasons. Our analysis indicate there may be sufficient reliability in forecasts guidance for low probabilities of heavy precipitation events to inform decision making in reservoir management in select California river basins to manage flood risk while increasing water supply for consumptive use and ecosystem services.