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Abstract Hydrologic uncertainty and economic uncertainty both affect market-oriented hydropower operation. For medium-term cascade hydropower operation, the uncertainties of daily reservoir inflow and market clearing power price can pose risks to operation, especially when power stations participate in multiple power markets. It is difficult to obtain the fluctuation range of uncertain variables for different expected power sale profits, and to plan the operation range of cascade hydropower stations. For a cascade hydropower system dispatching power to two markets, this work developed a risk assessment method for medium-term optimal cascade hydropower operation based on information gap decision-making theory (IGDT). We established a bilevel stochastic IGDT model for the main hydrologic and economic uncertainties in hydropower market participation. The lower-level model solves the minimum robustness profit or maximum opportunity profit from power sale, and the upper-level model solves the maximum robustness fluctuation range or minimum opportunity fluctuation range of the uncertain variables for different expected profits. Then we converted the bilevel model to two equivalent single-level models, and provided solutions. The proposed method does not require the probability distribution of uncertain variables, which is often unavailable; moreover, it reduces computational complexity while ensuring accuracy of results. The proposed method can provide decision makers with reasonable power dispatch options. This work used a cascade hydropower system in Southwest China as a case study. The proposed method provided acceptable fluctuation range of uncertain reservoir inflow and power price under different expected profits, and provided the operation range to guarantee the expected profit. Decision makers with different risk preferences can evaluate various strategies to optimize medium-term cascade hydropower operation to ensure the expected profit.