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Integrated Flood Forecast and Virtual Dam Operation System for Water Resources and Flood Risk Management

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While availability of hydrological- and hydrometeorological data shows growing tendency and advanced modeling techniques are emerging, such newly available data and advanced models may not always be applied in the field of decision-making.
In this study we present an integrated system of ensemble streamflow forecast (ESP) and virtual dam simulator, which is designed to support river and dam manager's decision making. The system consists of three main functions: real time hydrological model, ESP model, and dam simulator model. In the real time model, the system simulates current condition of river basins, such as soil moisture and river discharges, using LSM coupled distributed hydrological model. The ESP model takes initial condition from the real time model's output and generates ESP, based on numerical weather prediction. The dam simulator model provides virtual dam operation and users can experience impact of dam control on remaining reservoir volume and downstream flood under the anticipated flood forecast. Thus the river and dam managers shall be able to evaluate benefit of priori dam release and flood risk reduction at the same time, on real time basis. Furthermore the system has been developed under the concept of data and models integration, and it is coupled with Data Integration and Analysis System (DIAS) - a Japanese national project for integrating and analyzing massive amount of observational and model data. Therefore it has advantage in direct use of miscellaneous data from point/radar-derived observation, numerical weather prediction output, to satellite imagery stored in data archive. Output of the system is accessible over the web interface, making information available with relative ease, e.g. from ordinary PC to mobile devices.
We have been applying the system to the Upper Tone region, located northwest from Tokyo metropolitan area, and we show application example of the system in recent flood events caused by typhoons.