Department of Civil and Earth Resources Engineering

Hydrology and Water Resources Research

Professor	Assistant Professor	Assistant Professor
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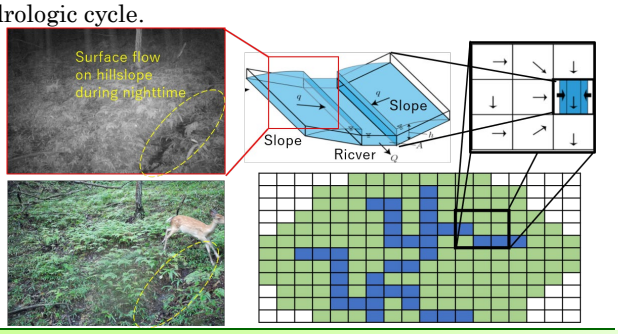
Towards a better relationship between human society and water resources

We study physical mechanisms of the hydrologic cycle with energy and material transport. The research topics include analysis and numerical modeling of hydrological processes such as surface-subsurface flow, atmosphere-land surface interaction with human activities. Based on the understanding of the physical process in hydrology, we develop fundamental technologies for river planning, water resources management, real-time hydrologic forecasting and water-related disaster mitigation.

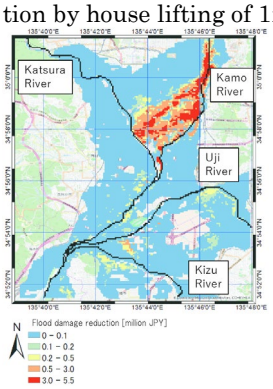
Analysis and numerical modeling of hydrologic processes

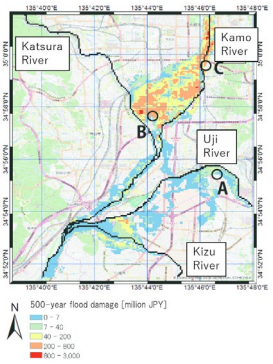
Understanding the hydrologic cycle is the basis for river planning and mitigation measures against water-related disasters. We analyze hydrologic phenomena in various aspects and improve our understanding of the hydrologic cycle.



Flood risk assessment for local-scale integrated flood risk management

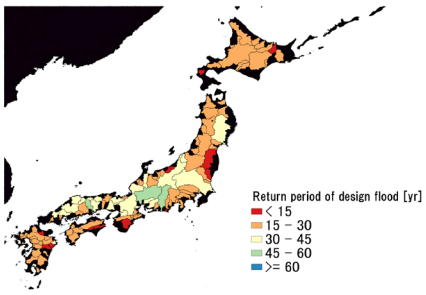
We develop a framework of local flood risk assessment with probabilistic modelling of various types of extreme rainfall, a large number of flood-inundation simulations and flood damage estimation. In the Kyoto Basin, we evaluate on-site flood risk (e.g. 500-year flood damage in the left bottom panel), based on which integrated flood risk management including urban planning is analyzed (e.g. the right bottom panel shows annual flood damage reduction by house lifting of 1m.





Climate change impacts on floods and water resources

Climate change will give us a serious impact on our life. We develop a method to make climate change impact assessments on catchment-scale floods and water resources with global climate model outputs. In particular, we construct a nation-scale catchment hydrological model over 109 class-A river basins and analyze the future change of river discharges. The right panel shows the projected return periods of the design flood in 4K warmer climate conditions.



Land surface modeling for water resources assessment

We develop a sophisticated land surface model (LSM) which can consider human activities to predict future change in water resources. We conduct model intercomparison to improve our understanding in modeling hydrological process and enhance the model's prediction. The bottom figures present intercomparison results showing the difference in estimated runoff (left) and streamflow (right) between our model and the LSM developed by Meteorological Institute in a catchment in Thailand.