OKI Taikan Lab.

[Global Hydrological Cycle: Monitoring and Prediction]

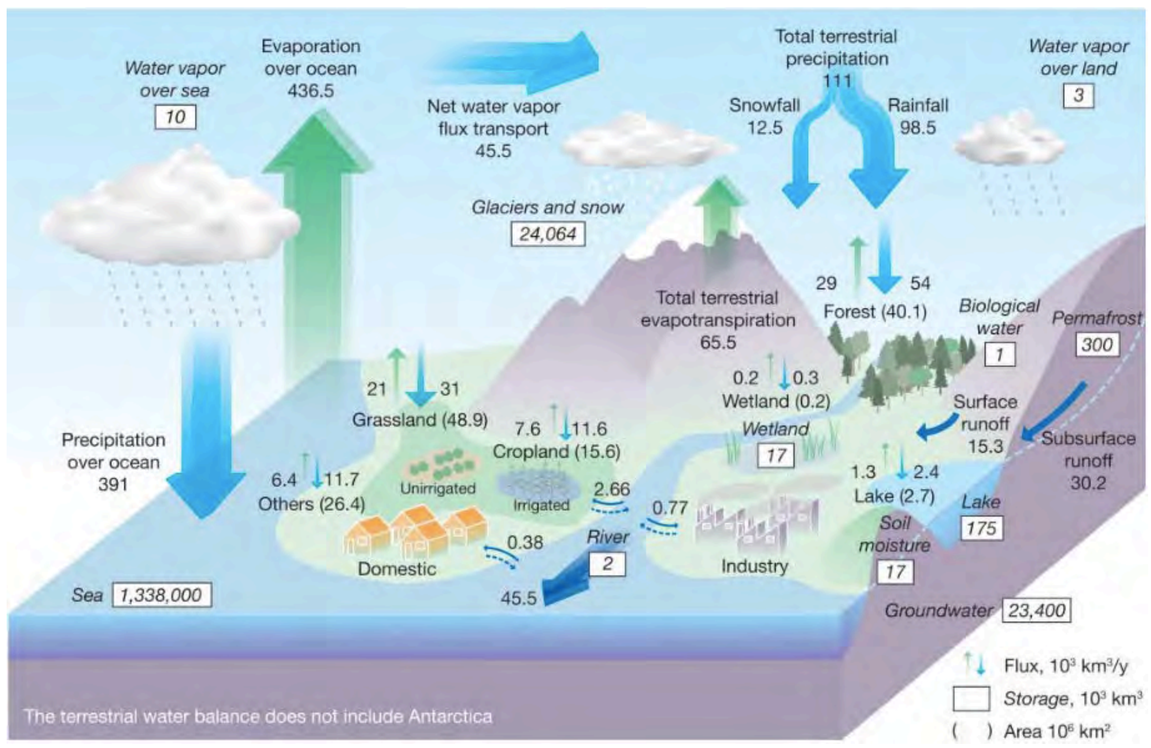
Department of Human and Social System

Global Hydrological System

Department of Civil Engineering http://hydro.iis.u-tokyo.ac.jp/indexJ.html

Estimating Global Hydrological Cycles

Water scarcity occurs around the world because of the temporal variation and spatial heterogeneity of water availability, rather than by the absolute shortage of water resources. The global simulation model predicting the fluctuation of hydrological cycles is useful to provide scientific basis to tackle with water issues, and also contribute to predict how climate change influences the water risks such as floods and droughts. Utilizing big data, such as high resolution boundary conditions from satellite data, we're challenging to develop quasi-real-time simulation system, and also to estimate the hydrological variations on millennium scale.



Water Circulation on the earth[Oki and Kanae (2006)]

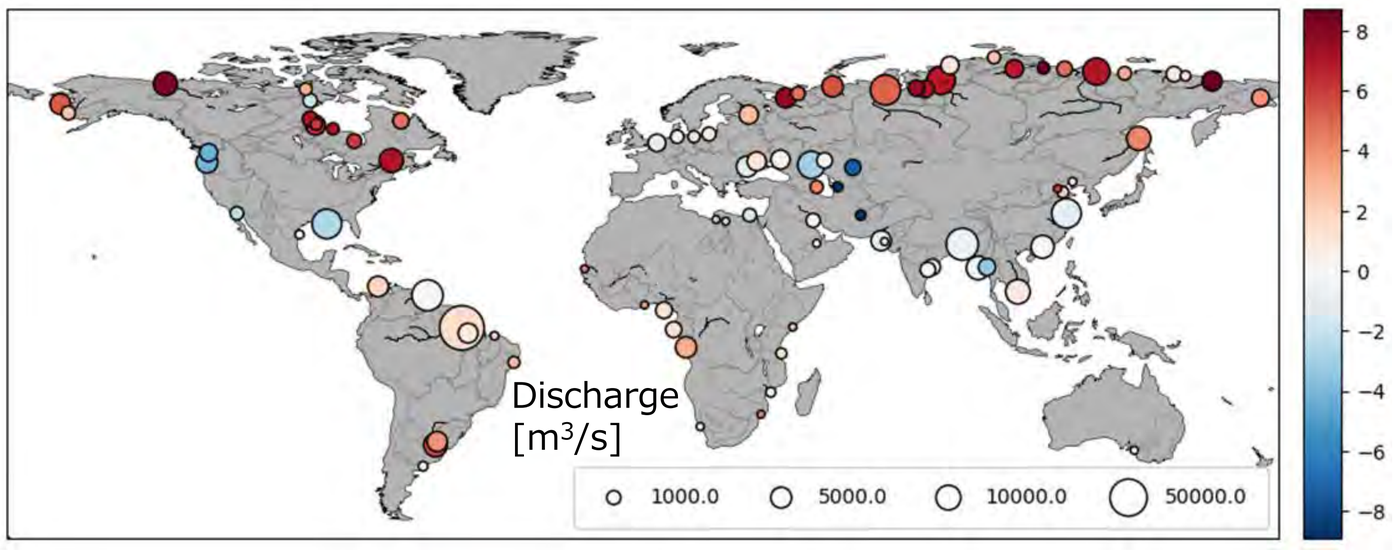
Future Terrestrial Model：from "Natural" nature to "Real" nature

In order to provide more *realistic* information for decision-makers, we include anthropogenic interventions on hydrological cycle, such as reservoir operation and water withdrawals ("real" system), in our terrestrial model, when we improve the biogeophysical processes ("natural" system) of the model. Further, we dedicate ourselves to develop better boundary conditions crucial for terrestrial models, such as topography, water surface, and glacier areas, by reducing errors in high resolution global dataset estimated based on earth observation from space. The datasets are shared and widely used.

The Hot Topic：Development of a Global River Temperature Model

We have developed a global-scale model to simultaneously solve hydrodynamics and energy budget for river water temperature that have often been approximated by air temperature. While it is known that floodplain inundation affects the seasonal variability of discharge, it is found that it accelerates the solar absorption to warm water temperature.

It has estimated the fluxes of mass and energy from land to ocean on a global scale, and the effect is significant on Arctic and inland oceans. This model can be the basis of a water quality model, and it enables to estimate the impacts of anthropogenic drainage on the ecosystem and the changes in cooling efficiency at power plants and factories in inland areas.



In river basins flowing from the south to the north, energy is transported from the warmer upstream area to higher latitudes, and the river water temperature is generally warmer than the sea [°C].