

**Developing an Integrated Water Cycle Model for
Sustainability Assessment of World Water Resources**

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【Outline of survey】

In this project developing an Integrated Water Cycle Model (IWCM), we further discuss and assess sustainability of the world water resources along with the sustainability of food production in order to contribute for international policy making and evaluate the possible measures mitigating the world water issues that are anticipated to be realized in coming decades. Core of IWCM consists with two pre-developed models of natural global hydrological cycle and anthropogenic water use, and these components will be revised in more precise, realistic, and generalized manners. Additional modules representing nitrogen cycle, water quality, hydropower dam operation, and deep ground water resources, will be developed and coupled with the two main models.

A 100-year IWCM simulation will be implemented for the 20th century. Daily output will be analyzed for water and energy budgets, detailed water cycle, and water use. These estimates will be validated by various observational data that will be also collected by the project. We further investigate on primal feedback processes of water cycle to the earth system, and quantify global impacts of artificial reservoirs, population and/or economic growth, and land use change. Furthermore, future projection of water resources will be illustrated by taking considerations of the climate change.

【Expected results】

IWCM will be designed to provide the boundary condition of climate model simulations, and it is anticipated to contribute for the 5th report of IPCC, which is expected to be prepared in 2012. Such climate change simulations, that incorporate reasonably interactive impacts of anthropogenic activities and natural water cycles, will overcome the current (AR4) shortages, and thus will lead the community. IWCM is also expected to be a useful decision making tool for international measures and/or policies trying to mitigate the emerging world water problems.

Current global water cycle, as a starting point, still has a number of unrevealed issues. This project with an international leadership from the Japanese community will give a significant step illuminating the issues, and it will help to discuss long-range variations of the global water cycles quantitatively and precisely.

【References by the principal investigator】

- T. Oki and S. Kanae, Global Hydrological Cycles and World Water Resources, *Science*, **313**, 1068-1072. DOI: 10.1126/science.1128845, 2006.
- N. Hanasaki, S. Kanae, T. Oki, A reservoir operation scheme for global river routing models, *Journal of Hydrology*, **327**, 22-41, 2006.

【Term of project】 FY2007—2011

【Budget allocation】 18,000,000 yen

(2007 direct cost)

【Homepage address】

<http://hydro.iis.u-tokyo.ac.jp/>