

**【Grant-in-Aid for Scientific Research(S)】**  
**Science and Engineering (Engineering II)**



**Title of Project : Leadership for Sustainability Assessment of World Water Resources using an Integrated Water Cycle and Resource Model**

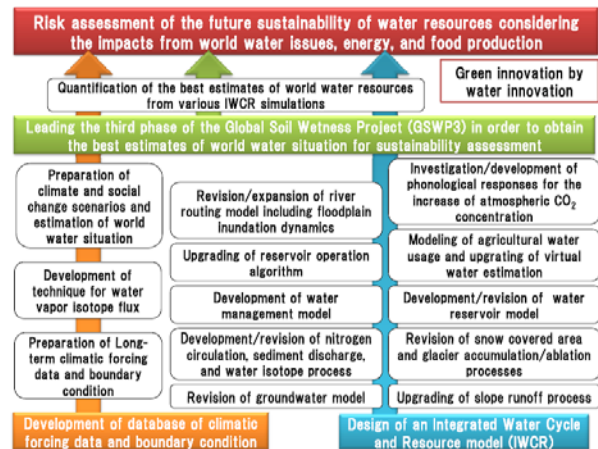
Taikan Oki  
(The University of Tokyo, Institute of Industrial Science,  
Professor)

Research Area : Engineering

Keyword : Hydrology, global water cycle, climate change, human activities

**【Purpose and Background of the Research】**

An Integrated Water Cycle and Resource model (IWCR) is developed based on earth system science and coupled with human activities, crop growth, and environmental flow considerations derived from detailed process-level studies. Development of IWCR and its application to global water researches have been pioneered by our group and are currently utilized in various efforts throughout the world. In this project, we will revise IWCR for more precise and appropriate estimation of global hydrological cycles and organize the third phase of the Global Soil Wetness Project (GSWP3) to test and demonstrate improved real-world representation of the world water situation and world water resources.



**【Research Methods】**

The core of IWCR consists of a physically-based global water cycle model and an anthropogenic water intervention model. Both of them will be revised to simulate the real-world more precisely and realistically. Additional modules representing the phenological responses for the increase of atmospheric CO<sub>2</sub> concentration, the sediment discharge, and the water isotope processes, will be developed and coupled with the two main models. Long-term climatic forcing data, surface parameters, and climate and social change scenarios will be prepared based on the best available earth observational dataset. Furthermore, we will lead GSWP3, which seeks

to provide best estimates of world water resources from an ensemble of IWCR simulations to be conducted under the GSWP3. Using these estimates, we will assess the future sustainability of water resources considering the impacts from drought and flood, water pollution, hydropower, and food production.

**【Expected Research Achievements and Scientific Significance】**

The best estimates of world water resources quantified under the framework of GSWP3 using various IWCR simulations will contribute to decision making and/or policy developments that seek to reduce the impacts of emerging global water issues. IWCR can also be expected to be a useful impact assessment tool for global water footprint, which has been discussed by International Organization for Standardization. Current understanding of global water cycle is inadequate for many applications. This project, with international leadership from the Japanese community, will serve as a significant step toward illuminating the issues, and providing a best science platform for discussing long-range variations of the global water cycles quantitatively.

**【Publications Relevant to the Project】**

- Oki, T. and S. Kanae, 2006: Global Hydrological Cycles and World Water Resources, *Science*, Vol.313(5790), pp1068-1072.  
Hanasaki, N., T. Inuzuka, S. Kanae, T. Oki, 2010: An estimation of global virtual water flow and sources of water withdrawal for major crops and livestock products using a global hydrological model, *Journal of Hydrology*, 384, pp232-244.

**【Term of Project】** FY2011-2015

**【Budget Allocation】** 134,300 Thousand Yen

**【Homepage Address and Other Contact Information】**

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