기조강연

Prof. Taikan Oki
University of Tokyo
President of Japan Society of Hydrology
and Water Resources (JSHWR)

Keynote Lecture Title: Transformation for Sustainable Water Resources Management

Prof. Taikan Oki is a Special Advisor to the President, and a Professor at Graduate School of Engineering, The University of Tokyo. His previous academic positions include Associate Professor with the Institute of Industrial Science, The University of Tokyo and Associate Professor with the Research Institute for Humanity and Nature. He was also affiliated as the Senior Vice-Rector, United Nations University, Japan, and an Assistant Secretary-General, United Nations for 2016-2021. His areas of expertise are global hydrology and the sustainability of world water resources including the virtual water trade and water footprint. He was one of the coordinating lead authors for the chapter "Freshwater Resources" of the IPCC WGII AR5. He got many awards such as the Biwako Prize for Ecology in 2011, and the Japan Academy Medal in 2008. He is the first Japanese AGU Fellow in its Hydrology Section (2014). He became a full member of the Club of Rome and the Science Council of Japan since October 2020. 2021 International Hydrology Prize (Dooge medal) winner, 2023 John Dalton Meal (EGU) winner. President of the Japan Society for Hydrology and Water Resources (2022-24).

Biosketch of AGU-KWRA Keynote lecture

Prof. Venkataraman Lakshmi
John L Newcomb Professor of Engineering
President-Elect Hydrology Section, American Geophysical Union
Department of Civil and Environmental Engineering
University of Virginia Charlottesville VA 22904

Keynote Lecture Title: Title: A Study of Hydrological Extremes from Space

Dr. Lakshmi graduated from University of Roorkee in 1987 with a Bachelor degree in Civil Engineering and a Doctorate in Civil and Environmental Engineering in 1996 from Princeton. He worked at NASA Goddard Space Flight Center 1996-1999 as a research scientist in the Laboratory for the Atmospheres.

His areas of research interest are catchment hydrology, satellite data validation and assimilation, field experiments, land-atmosphere interactions, satellite data downscaling, vadose zone and water resources.

He is currently the John L Newcomb Professor of Engineering in the Department of Civil and Environmental Engineering at the University of Virginia. He has served as Cox Visiting Professor at Stanford University 2006-2007 and 2015-2016 and Program Director for Hydrologic Sciences at the National Science Foundation (2017-2018).

Dr. Lakshmi is a fellow of the American Society of Civil Engineers (ASCE), Geological Society of America (GSA), American Society of Agronomy (ASA) and he has over 190 peer-reviewed articles and around 600 presentations and thesis supervisor for 25 graduate students. He is currently serving as editor for Vadose Zone Journal and the founding editor-in-chief of Remote Sensing in Earth System Science (Springer Journals). He has served on the National Academies Panel for the Decadal Survey of Earth Observations from Space (NASA) and as chair of the planning committee for Groundwater Recharge and Flow: Approaches and Challenges for Monitoring and Modeling Using Remotely Sensed Data (NGA).

He is currently serving as a member of the Water Science and Technology Board, National Academy of Sciences and Vice-Chair of the Earth Science Advisory Committee for NASA. He is the President-Elect of the Hydrology Section of the American Geophysical Union.

Land surface hydrology has evolved over the last 80 years, the first hydrological modeling was done using simple empirical formulae and the first hydrological formulation called the “bucket model” was introduced into General Circulation Models in the mid 1960s. Hydrological observations has also evolved over the past century. For centuries, humankind observed rainfall using raingauges, streamflow using stream gages and this formed the underpinnings of the observational system. However, raingauges gave way to radars that have been observing precipitation over large areas and this has supported a variety of weather, agriculture, and aviation applications. The origins of land surface earth observations using sensors on satellites can be traced to the Landsat series that have been operational since the 1970s. The Advanced Very High Resolution Radiometer (AVHRR) began observing land surface vegetation and temperature in the early 1980s and have continued since. NASA launched the Moderate Resolution Spectroradiometer (MODIS) in the year 2000 that has provided more spectral and spatial resolution than the Landsat and is currently being used. The latest system is Visible Infrared Imaging Radiometer Suite (VIIRS) that has similar functionality to the MODIS with even better spatial resolution. MODIS and VIIRS also generate evapotranspiration using the sensor observations and models. In the case of precipitation, the first satellite sensors were on the Tropical Rainfall Measurement Mission (TRMM) launched in 1997, a joint venture between NASA and JAXA. This was followed by the Global Precipitation Measurement Mission (GPM) which is also a joint mission between many countries. In the area of soil moisture, the Advanced Microwave Scanning Radiometer (AMSR) launched in 2003, provided observations although the sensor was not optimized for soil moisture retrieval. This was followed by Soil Moisture and Ocean Salinity (SMOS) launched 2009 and Soil Moisture Active Passive (SMAP) launched in 2015 that have sensors that are optimal to observe the top 5cm soil moisture. In the case of groundwater, Gravity Recovery and Climate Experiment (GRACE) for unconfined aquifers and Interferometric Synthetic Aperture Radar (InSAR) for confined aquifers carry out observations necessary to characterize the changes in groundwater.

The importance of remote sensing is underscored by the fact that large portions of the terrestrial surface do not have observations of precipitation or streamflow and as a result, hydrological studies are not possible. The lack of hydrological studies is a severe detriment to water resources planning. This is specifically the case when nations deal with transboundary aquifers and equitable sharing of water is priority. The case of groundwater is even more complicated as observing wells to check the water levels in an aquifer are very few and do not even exist in developing countries. Further complications are introduced when countries do not share hydrological data such as streamflow of rivers that flow between countries. Satellite remote sensing provides an easy mechanism for collaboration between countries in the absence of in-situ observations.

There are several examples of the use of satellite observations for estimation of hydrological extremes, viz., floods and droughts for global river basins. As the spatial resolution of the soil moisture products from satellite sensors are very low, we have developed an algorithm that downscales soil moisture from SMAP and SMOS and performs validation at a global scale. The integration of satellite remote sensing with hydrological modeling is possible by use of satellite data products such as precipitation for input to hydrological models and soil moisture for assimilation.

My vision for hydrology is to promote unselfish cooperation between people from all parts of the world and all disciplines. Open science makes it possible for equal access and will move the needle of progress forward by leaps and bounds. Scientific discovery will no longer be limited by whom you know, but only by the current state-of-knowledge. This rapidly growing paradigm in many parts of the scientific community will help transmit the state-of-the-art observations and data sets, modeling and visualization tools to students and practicing professionals globally. Sharing best practices in data and models will help us solve the water resources challenges of today and the future. I strongly support new and existing initiatives in diversity, inclusivity, equity, and access. Everyone should have an equal hand in the advancement of our discipline.

Satellite remote sensing in hydrology provides such a mechanism. As satellite data sets are global – they do not have national boundaries, we can use this in the spirit of collaboration for data sharing and for water resources management. Such proactive collaboration will help to ward off conflicts between nations arising from water issues.

원태상 기념강연

김 영 오
서울대학교 건설환경공학부 교수

Title: 불확실한 수문학의 세계, 우리는 늘 도전자(In Uncertain World of Hydrology, We are Always Challengers)

본 강연은 Ensemble Streamflow Prediction과 Climate Change Adaptation 분야에서 30 여년 연구한 100여편의 논문 성과를 Uncertainty Quantification & Reduction과 Decision Making Under Uncertainty를 중심으로 요약하며 진행된다.

강연자의 석사학위 논문은 ARMA 시계열 모형을 Tansfer Noise Model로 발전시켜 Lake Erie 수위예측에 적용하였으며, 박사학위 논문은 Stochastic Dynamic Programing에 Bayesian 확률이론을 접목하여 Seattle에 전력을 공급하는 Skagit Hydropower System을 대상으로 예측 정확도의 가치를 평가하였다. 한국 수문학자로는 최초로 NASA Global Hydrology & Climate Center에서 박사후연구원으로 근무하면서 일찍이 기후변화 영향평가를 연구하였고, 그 경험이 1999년 서울대학교를 부임한 후에도 이어져 2009년 국토해양부 프로젝트 '기후변화에의한 수문전망 분석과 평가 연구단' 의 단장을 3년간 역임하였다. 또한 국내에서는 가장 먼저 Ensemble 개념의 도입을 제안하여, 현재 운영되고 있는 홍수통제소 및 한국수자원공사 국가가뭄정보분석의 확률예보 시스템의 토대가 되었다.

이러한 업적이 인정되어 2012년 서울대학교 신양공학학술상, 2017년과 2018년에 각각 대한토목학회와 한국수자원학회 학술상, 2018년 세계 물의날 국무총리 표창, 2021년 한국과학기술총연합회 과학기술우수논문상 등을 수상하였다.

■ 학력

1989 서울대학교 토목공학과 (공학사)
1991 U. of Cincinnati, Civil & Env. Eng. (공학석사)
1996 U. of Washington, Civil & Env. Eng. (공학박사)

■ 경력

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