Colorado State University

HYDROLOGY DAYS AWARD

WILFRIED H. BRUTSAERT

William L. Lewis Professor of Engineering
Cornell University

In recognition of outstanding contributions to hydrologic science in the areas of boundary layer theory, modeling of evapotranspiration, vadose zone and hillslope hydrology, and stream-aquifer dynamics

HYDROLOGY DAYS 2008

RECOGNITION AND AWARDS

- Phi Kappa Phi; John W. Gilmore Award (Univ. California), 1962
- Freeman Fellowship (American Society of Civil Engineers), 1975
- Fulbright-Hays Award, 1976
- Fellow, American Geophysical Union, 1982
- Hydrology Award, American Geophysical Union, 1988
- President-Elect, Hydrology Section, American Geophysical Union, 1990-1992, President, 1992-1994
- Robert E. Horton Memorial Lecturer, American Meteorological Society, 1993
- Fellow, American Meteorological Society, 1992
- Ray K. Linsley Award, American Institute of Hydrology, 1993
- Member, U.S. National Academy of Engineering, 1994
- Honorary Doctorate (Doctor Honoris Causa), University of Ghent, 1995
- Distinguished Engineering Alumnus Award, University of California, Davis, 1995
- Walter B. Langbein Lecturer, American Geophysical Union, 1997
- Council Member, American Meteorological Society, 1996 – 1998
- Robert E. Horton Medal, American Geophysical Union, 1999
- International Award, Japan Society of Hydrology & Water Resources, 2002
- Jule G. Charney Award, American Meteorological Society, 2003
- JSPS Award for Eminent Scientist, Japan Society for the Promotion of Science, 2005

AUTHORSHIP

- Author and co-author of more than 200 publications, of which 155 were refereed papers and 86 in AGU journals. These have led to some 3,100 citations.
- Author of Evaporation into the Atmosphere: Theory, History and Applications, Springer, New York, 299 pp., 1982. (Russian translation Ispareniye v Atmosferu, Gidrometeoizdat, Leningrad, USSR, 1985).
- Author of Hydrology: An Introduction, Cambridge University Press, 605 pp, 2005. Second printing 2006. (Japanese translation completed and in press; currently being translated into Chinese)

EDITORIAL WORK

- Associate Editor, Hydrological Research Letters (Japan Soc. Hydrol. & Water Resour.) 2007-
- Deputy Editor, Water Resources Research, (AGU), 2001-2004.
- Associate Editor (member of Editorial Board) of the Journal "Boundary-Layer Meteorology" (‘86-‘99)
- Editor (w/ G.H. Jirka), Conf. Proceed. “Gas Transfer at Water Surfaces” Springer, NY, 639 pp., 1984.
- Associate Editor of the journal "Water Resources Research" (AGU) (1978-1982).
- Advisory Editor (Overseas for Hydrologic papers) of the Journal "Agronomie", (France) (1981-1991).
- Associate Editor of the journal Geophysical Research Letters (AGU) (1978-1980).
- Associate Editor (for hydrology) of the "IUGG Quadrennial Report – 1974-1978" (AGU) (1979).

SOCIETY MEMBERSHIP

- American Geophysical Union
- National Academy of Engineering
- American Meteorological Society
- American Society of Civil Engineers
- American Institute of Hydrology
- Sigma Xi.

THE ESTIMATION OF GROUNDWATER STORAGE CHANGES AT CLIMATIC TIME SCALES FROM LOW STREAMFLOW OBSERVATIONS

HYDROLOGY DAYS AWARD LECTURE

COLORADO STATE UNIVERSITY

MARCH 27, 2008

WILFRIED H. BRUTSAERT

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School of Civil & Environmental Engineering
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THE ESTIMATION OF GROUNDWATER STORAGE CHANGES AT CLIMATIC TIME SCALES FROM LOW STREAMFLOW OBSERVATIONS

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Abstract. During periods of no precipitation or artificial inputs, the water flow observed in a river can be assumed to result primarily from drainage of groundwater from the upstream riparian aquifers in the catchment. Groundwater storage in a basin goes through various high and low phases during any given year depending on the antecedent precipitation inputs over the region; hence, an objective way to track the long term evolution of this storage over many years is to monitor its lowest level each year, that is, when it reaches "rock bottom", or the non-depleted reserve, which is available for the next year. Because the groundwater drainage into the river system is directly related to the water stored in the upstream aquifers, observations of the trends of the annual lowest flows can serve to deduce quantitative estimates of the basin-scale groundwater storage trends over the period of the streamflow record. The proposed method was implemented and validated with streamflow and groundwater level observations in two basins in Illinois, and then applied with streamflow data in a large basin in Mongolia, where it could be compared with other measures of a changing hydrologic cycle.

EDUCATION
- Ph.D. University of California, Davis, 1962 (Engineering with minors in Math and Physics)
- M.S. University of California, Davis, 1960 (Irrigation)
- B.Eng. University of Ghent, Belgium, 1958 (Water & Soil Engineering)

SHORT-TERM APPOINTMENTS AND SABBATICALS
- Hydraulic Engineer, Tippetts-Abett-McCarthy-Stratton, New York, NY 9/1965-7/1966
- Visiting Scientist, Geophysical Institute, Tohoku University, Sendai, Japan, 9/1969-6/1970
- Visiting Professor, Engineering, University of Tokyo, Japan, 6-8/1973
- Visiting Scientist, Isotope Department, Weizmann Institute of Science Rehovot, Israel, 6-7/1975.
- Visiting Professor, Department of Hydraulics and Catchment Hydrology, Agricultural University, Wageningen, Netherlands, 9/1976-7/1977.
- Visiting Professor, Laboratory of Hydrology and Glaciology, Federal Institute of Technology, ETH, Zurich, Switzerland, 6-8/1978.
- Visiting Scholar, Department of Civil Engineering, Tohoku University, Sendai, Japan, 9/1983-7/1984.
- Visiting Professor, Laboratory of Hydrology, University of Ghent, Belgium, 8/1990-8/1991
- Visiting Scholar, University of Tsukuba, Life & Environmental Science, 6-8/1994, 6-9/2005, 4-8/2006, 6-12/2007
- Visiting Scholar, University of Tokyo, Institute of Industrial Science, 9/1998-2/1999
- Visiting Professor, Gifu Univ., River Basin Res. Center, Japan, 3-8/1999
- Guest Professor, Nagoya University, Hydrospheric Atmospheric Res. Center, 10/2005-3/2006.

COMMITTEE MEMBERSHIP AND OTHER COMMUNITY SERVICE (PAST 20 YEARS)
- Peer Committee (to select new members), Section 12 for Special Fields and Interdisciplinary Engineering, National Academy of Engineering, 2000-2002.
- Hydrology Award Committee, American Geophysical Union, 2000-2004 (Chair 2002-2004).
- Bowie Medal Committee, American Geophysical Union, 2000-2004 (Chair 2002-2004).
- Earth System Science and Applications Advisory Committee (ESSAAC), NASA, 2001-2002.
- Langbein Committee, Hydrology Section, AGU,1998- 2000 (Chair, 1999-2000)
- Council Member, American Meteorological Society, 1996 - 1998.
- Committee on Fellows, Hydrology Section, American Geophysical Union, 1995-1998.
- Committee on GEWEX, (Global Energy &Water Budget Expt), National Research Council, 1997-98.
- Oversight Panel, The GCIP Core Panel, NOAA (GEWEX) US Dept of Commerce 1997-99.
- Committee on Geophysical Research Letters - Direction and Review, AGU (1995 - 1996).
- Chair, Horton Medal Committee, American Geophysical Union (1994-1996).
- Chair, Nominating Committee, Hydrology Section, American Geophysical Union (1994-1995).
- Committee on Remote Sensing, Hydrology Section, American Geophysical Union, (1994-1996).
- President, Hydrology Section, American Geophysical Union (and Chair, Executive Committee of the Section and Council Member of the AGU) (July '92 - June '94). (President-Elect, 7/'90-6/'92).
- Advisory Panel for the Hydrologic Processes Research Program, NASA (1993-1995).
- Advisory Board for "Global Environmental Change" research program, U.Tsukuba/Ministry of Education, Japan, (1993-1995).
- Committee on Water Resources Research, National Research Council (WSTB), (1991-1997).
- Committee "Water Resources Research", Direction and Review, AGU (1991-1992).
- Committee on Hydrology, American Meteorological Society (1990-1994).
- Scientific Committee for HAPEX-Sahel (WMO/World Climate Program) (1990-1992).
- Panel on Policy Implications of Greenhouse Warming (Effects), (NRC-CoSEPP) (1989-1990).
- Executive Committee, Hydrology Section, American Geophysical Union (1988-present).
- Chair, Committee on Large-Scale Experimentation in Hydrology, Hydrology Section, AGU ('85-'90)
- Committee on Opportunities in the Hydrologic Sciences, NRC (WSTB), (1987-1990).
- Planning Group "Panel to Assess the Status and Needs of Hydrologic Science", NRC (1987).
- U.S. Delegation for U.S.-Japan Hydrology Workshop, Honolulu, HI, January 5-9, 1987.
- Chair, Hydrology Working Group for the National STORM-Program (NOAA), (1985-1990).
- Scientific Steering Group on Land Surface Processes and Climate, WMO, Switzerland (1984-1989).
- Scientific Working Group for FIFE (First ISLSCP Field Expt.- NASA) (1985-1986).