Proceedings of 8 ICSHMO, Foz do Iguaçu, Brazil, April 24-28, 2006, INPE, p. 1597-1600.

JOHN KIDSON'S CONTRIBUTION TO SOUTHERN HEMISPHERE METEOROLOGY

James A Renwick *
NIWA, Wellington, New Zealand

1. INTRODUCTION

John Kidson retired recently, after nearly four decades of active research in climate dynamics and meteorology. His early research career included three years at MIT, studying tropical meteorology and the mechanism of the Equatorial stratospheric QBO. Upon his return to New Zealand, he studied many aspects of New Zealand and Southern Hemisphere weather and climate, making key contributions on zonal flow vacillation and the "High Latitude Mode" (now known as the Southern Annular Mode), and was one of the first proponents of the use of EOF analysis in the atmospheric sciences. This talk will review John's many contributions to Southern Hemisphere atmospheric sciences, his long-term interest in extratropical circulation variability and its connection to variations in tropical climate, and the wide variety of other fundamental and applied research he undertook.

2. BIOGRAPHICAL SKETCH

John Kidson began his career in the Meteorological Service of New Zealand in 1963, after completing a Masters degree (with honours) in Physics at Canterbury University in Christchurch. The Met. Service clearly had high expectations of John from the start, giving him a wide range of challenging tasks to deal with after his initial atmospheric physics and forecaster training. His early work comprised field work on air quality and boundary layer meteorology (including construction of equipment), editing the Proceedings of the 1963 International Symposium on Tropical Meteorology (held in Rotorua, N.Z.), and assisting with development of NWP research.

John entered the graduate program at MIT in 1965 and completed his ScD in 1968, working with Reginald Newell. His thesis topic was "The General Circulation of the Tropics", motivated in part by the effort to understand the mechanism of the Equatorial stratospheric QBO. His thesis work generated a number of important papers, and formed part of a two-volume monograph, *The General Circulation of the Tropical Atmosphere and Interactions with Extratropical Latitudes,* published by MIT Press in 1972 and 1974.

* *Corresponding author address*: James A. Renwick, NIWA, P.O Box 14901, Wellington, NEW ZEALAND; e-mail: j.renwick@niwa.co.nz

After his return to New Zealand, John worked in research at the Met. Service through the 1970s and 1980s, transferring to the National Institute of Water and Atmospheric Research (NIWA) when it was formed in the early 1990s. John continued research work in NIWA through to his retirement (for health reasons) in 2002. He spent a year back at MIT in the mid-1970s, and a year at NCAR in the 1980s, and throughout his career John played a role on the international stage, through IAMAP, IUGG, WMO, IGBP, AMS, as well as working with the Royal Society of New Zealand for a number of years.

While his research interests have always been focused on large-scale climate dynamics and predictability, John maintained a keen interest in computing and the technological side of the atmospheric sciences. He was one of the main facilitators behind the Met. Service acquiring its first computer for operational work in 1978. He oversaw, and in many cases was personally responsible for, implementation of operational NWP, satellite data processing, message handling, and forecast graphics, acting for a few years virtually as a one-man IT division. For much of his professional career, John managed and led research groups both in the Met. Service and in NIWA, and was active in mentoring a number of younger scientists.

3. TROPICS AND EXTRA-TROPICS

A key focus of John Kidson's research, since his early days at MIT, has been the large-scale circulation of the tropical atmosphere, and linkages between the tropical and extra-tropical circulation. In this regard, some of the innovations of John's research are:

- One of the first comprehensive descriptions of the general circulation of the Tropics, from radiosonde data, including evidence of significant cross-equatorial momentum transports, and evidence of biennial modulation of the Hadley circulation, related to the QBO;
- significant contributions to understanding that Sahel rainfall variations are related to atmospheric circulation patterns, rather than to anthropogenic causes such as overgrazing and resultant local changes in albedo;

- contributions to understanding of tropical atmospheric circulation changes associated with the El Niño-Southern Oscillation (ENSO) phenomenon, and related influences upon rainfall and temperature;
- identification of the High Latitude Mode (HLM, now more commonly known as the Southern Annular Mode, SAM) as the leading pattern of Southern Hemisphere circulation variability on monthly and longer time scales, and diagnosis of its nature as being generated by internal dynamics.

Associated with his research on large-scale dynamics, John served as President of the IAMAP International Commission on Climate for four years, after having been Secretary for about six years. John was also a member of the Royal Society of New Zealand National Committee on Geodesy and Geophysics (1979-1985, chair 1982-1985) and Principal Delegate for New Zealand to the XVIII Assembly of IUGG in 1983. John served on the AMS Committee on Meteorology of the Southern Hemisphere (1985-1988) and the Royal Society of New Zealand Climate Change Committee (1988-2001) and IGPB Committee (1989-97).

4. DATA ANALYSIS AND COMPUTING

John's research work has always been marked by a facility with large data sets, and an ability to summarise and quickly draw out key physical features from complex data. To these ends, John has often been at the forefront in the use of multivariate statistical techniques for atmospheric data analysis. Influenced in part by his time at MIT in the 1960s, John was an early proponent of EOF analysis for climate research, as demonstrated by his 1975 publication using EOFs to investigate monthly mean circulation variability. While a ubiquitous approach in recent years, it was little-used in the early 1970s.

From the mid 1980s, John employed cluster analysis to good effect, initially to identify transitions in the phase space of seasonal mean circulation variability in the Southern Hemisphere extratropics. Later, he used a clustering approach to objectively define a synoptic-climatological classification scheme for "map typing" New Zealand weather patterns. Variations in the occurrence of the resultant synoptic types have been used to explore relationships between circulation variability and a number of climate-sensitive parameters, from fish stocks to forest fire danger.

Taking a break from research in the late 1970s, John was a primer mover in the acquisition of the Met. Service's first in-house computer system for operational forecasting, a PDP 11/70. His natural aptitude for programming was then put to great use, as John was responsible for coding and implementing the Met. Service's first regional NWP model, and for developing visualisation software. A significant related effort was in the area of message processing for operational NWP, where John designed structures for storage and retrieval of meteorological data and wrote key operational software. John played a significant role in developing and implementing software for processing and display of satellite remote sensing products, including work on estimation of vegetation index and sea surface temperature.

John resumed his research efforts in the mid-1980s, but retained a close interest in computing infrastructure, guiding the purchase of a number of operational systems, culminating with his role in NIWA's acquisition of a Cray T3E-1200 in 1999. With the advent of the World-Wide Web, John developed an ability with HTML and Java, and set up web portals for real-time access to SST and other satellite-based products.

John's expertise in the field of computer-based meteorological data processing received wide recognition. In the 1980s, he was involved in preparing specifications for, and development of, the World Meteorological Organization's (WMO) Global Data Processing System (GDPS) of the WMO World Weather Watch. John was elected Vice-Chairman of the Working Group on the GDPS in 1984.

5. PERSONAL ATTRIBUTES

John has always had an agreeable and friendly nature, though his sharp mind and ability to quickly see to the heart of matters could give a somewhat sterner first impression to some (the present author included). His dry wit and sense of fun was often put to good use. At Met. Service and at NIWA, John contributed over the years to a number of satirical "Christmas Carols" lampooning bureaucracies large and small and making gentle fun of the working environment. These endeavours also capitalised on one of John's other strengths, his beautiful singing voice, often used to deliver said carols at staff Christmas parties. Many are the New Zealand delegations at international conferences saved by John's performances when called upon to sing during the conference dinner, or on a bus excursion to some significant local site. A feature of work in John's research group at Met. Service was the annual Christmas parties at John and his wife Marie's home, where much music-making and singing always ensued!

6. SUMMARY

John Kidson's career in meteorology and climate research has been long, illustrious, and

productive. He has made major contributions to the development of meteorology and atmospheric sciences in New Zealand, both in terms of forecast operations and research. He has also contributed greatly to the international community, through important research results and his role in a number of international scientific bodies, panels, and commissions.

7. ACKNOWLEDGEMENTS

The author owes many thanks to a number of John Kidson's colleagues, for their information and reminiscences, particularly John Hickman, Kevin Trenberth, Mike Wallace, Neil Gordon, and Don Thompson.

8. SELECTED BIBLIOGRAPHY (CHRONOLOGICAL)

Kidson, J.W., 1968: *The General Circulation of the Tropics*. Doctoral Thesis, Dept. of Meteorology, Massachusetts Institute of Technology, September 1968, 205pp.

Kidson, J.W., D.G. Vincent, and R.E. Newell, 1969: Observational studies of the general circulation of the tropics: Long term mean values. *Quart. J. Roy. Meteor. Soc.*, **95**, 258-287.

Kidson, J.W., and R.E. Newell, 1969: Exchange of atmospheric angular momentum between the hemispheres. *Nature*, **221**, 352-353.

Newell, R.E., J.W. Kidson, and D.G. Vincent, 1969: Annual and biennial modulations in the tropical Hadley-cell circulation. *Nature*, **222**, 76-78.

Newell, R.E., J.W. Kidson, D.G. Vincent, and G.J. Boer, 1972: *The General Circulation of the Tropical Atmosphere and Interactions with Extratropical Latitudes.* Vol. 1. Cambridge Ma.: MIT Press. 258pp.

Newell, R.E., J.W. Kidson, D.G. Vincent, and G.J. Boer, 1974: *The General Circulation of the Tropical Atmosphere and Interactions with Extratropical Latitudes.* Vol. 2. Cambridge Ma.: MIT Press. 371pp.

Kidson, J.W., 1975: Eigenvector analysis of monthly mean surface data. *Mon. Wea. Rev.*, **103**, 177-186.

Kidson, J.W., 1977: African rainfall and its relation to the upper air circulation. *Quart. J. Roy. Meteor. Soc.*, **103**, 441-456.

Newell, R.E. and J.W. Kidson, 1984: African mean wind changes between Sahelian wet and dry periods. *J. Climatol.*, **4**, 27-33.

Kidson, J.W., 1985: Tropical eigenvector analysis and the southern oscillation. *Mon. Wea. Rev.*, **103**, 187-196.

Taylor, B. F., P. W. Dini, and J. W. Kidson, 1985: Determination of seasonal and interannual variation in New Zealand pasture growth from NOAA-7 data. *Remote Sensing of Environment*, **18,** 177-192.

Taylor, B. F. and J. W. Kidson, 1985: Sea surface temperatures from satellites. New Zealand Meteorological Service Information Publication **9**, 4 pp.

Kidson, J.W., 1986: Index cycles in the southern hemisphere during the Global Weather Experiment. *Mon. Wea. Rev.*, **114**, 1654-1663.

Kidson, J.W., and N.D. Gordon, 1986: Interannual variations in New Zealand temperature and precipitation patterns. *N.Z. J. Geol. and Geophys.*, **29**, 363-375.

Kidson, J.W. 1988: Indices of the Southern Hemisphere zonal wind. *J. Climate*, **1**, 183-194.

Kidson, J.W. 1988: Interannual variations in the Southern Hemisphere circulation. *J. Climate*, **1**, 1177-1198.

Kidson, J.W. 1991: Intra-seasonal variations in the Southern Hemisphere Circulation. *J. Climate*, **4**, 939-953.

van Loon, H., Kidson, J.W. and Mullan, A.B. 1993. Decadal variation of the annual cycle in the Australian data set. *J. Climate*, ***6,*** 1227-1231.

Madden, R.A., and Kidson, J.W., 1997: The potential for long range predictability of temperature over New Zealand. *Int. J. Climatol.,* **17**, 483-495.

Sinclair, M.R., J.A. Renwick, and J.W. Kidson, 1997: Low-frequency variability of Southern Hemisphere sea level pressure and weather system activity*. Mon. Wea. Rev.,* **125**, 2531-2543.

Kidson, J.W., 1999: Principal modes of Southern Hemisphere low-frequency variability obtained from NCEP-NCAR reanalyses. *J. Climate*, **12,** 2808–2830.

Kidson, J. W. and I. G. Watterson, 1999: The structure and predictability of the "high-latitude mode" in the CSIRO9 general circulation model. *J. Atmos. Sci.*, **56,** 3859-3873.

Madden, R. A., D. J. Shea, R. W. Katz, and J. W. Kidson, 1999: The potential long-range

predictability of precipitation over New Zealand. *Int. J. Climatol.*, **19,** 405-421.

Kidson, J.W., 2000: An analysis of New Zealand synoptic types and their use in defining weather regimes. *Int. J. Climatol.*, **20,** 299-316.

Kidson, J.W., and J.A. Renwick, 2002: The Southern Hemisphere evolution of ENSO during 1981-1999. *J. Climate*, **15,** 847-863.