ARC Network for Earth System Science
Call for proposals: [researcher exchange support program/workshops]

Principal Investigator:

Dr Neil J. Holbrook
Senior Lecturer

Contact Details:
Department of Physical Geography
Division of Environmental and Life Sciences
Macquarie University
Sydney NSW 2109.
Australia.

E-mail: neil.holbrook@mq.edu.au
Phone: +61 (0)2 9850-8429
Fax: +61 (0)2 9850-8420

Other Investigators:

Dr Scott B. Power
Principal Research Scientist
Bureau of Meteorology Research Centre
GPO Box 1289
Melbourne VIC 3001.

Shayne McGregor
Masters (honours) Candidate
Department of Physical Geography
Division of Environmental and Life Sciences
Macquarie University
Sydney NSW 2109.

Project Title:

The predictability of interdecadal timescale ENSO-like variability

Proposed Nodes:

Atmospheric Node and Oceanic Node

Project Description:

El Niño-Southern Oscillation (ENSO) is the strongest signal of interannual variability in the Earth’s climate system and it affects climate over many parts of the world (e.g., Ropelewski and Halpert 1987) including Australia (e.g., Power et al. 1999). El Niño (La Niña) events tend to increase the risk of dry (wet) conditions in many parts of Australia, and the economic costs of Australian droughts often associated with ENSO are believed to run into hundreds of millions of dollars (e.g., White 2000). Managerial
strategies based on accurate forecasting of ENSO events could significantly reduce this cost, with greater savings expected for more skilful forecasts (Adams et al. 1995).

Important progress has been made in the understanding and short term forecasting of ENSO in the past several decades (Wang et al. 2003). However, the intensity and frequency of ENSO appears to vary on decadal and longer time scales (e.g., Trenberth and Hurrell 1994; Power et al. 1999). Many different hypotheses have been proposed to explain this apparent ENSO decadal variability (see Latif (1998), Miller and Schneider (2000) and Power and Colman (2006) for recent reviews), but the majority of these hypotheses can be categorised into two main themes. These are: (i) that low-frequency midlatitude ocean exchanges with the tropical Pacific generate equatorial Pacific sea surface temperature variability on interdecadal time scales, thus modulating the background state in which ENSO operates (e.g., Gu and Philander 1997; Capotondi and Alexander 2001; Wang et al. 2003; McGregor et al. 2004; Schneider 2004; Tourre et al. 2005), and (ii) that interdecadal SST variations in the tropical Pacific are a consequence of high frequency atmosphere-ocean dynamics in the equatorial region (e.g., Frankignoul et al. 1997; Newman et al. 2003; Timmermann et al. 2003; Power and Colman 2006; Power et al. 2006).

McGregor et al. (2006a,b) recently investigated the ocean dynamic importance of each of these themes with a series of reduced-gravity ocean shallow-water model experiments. Results of their experimentation suggests that the decadal variability of ENSO is made up of two main components, (i) an equatorially forced component which has relatively short lead times for predictability, and (ii) an off-equatorially forced component which may provide predictable lead times of up to five years.

If successful, this funding will facilitate several very valuable and necessary blocks of face-to-face contact between the project investigators. This time will be devoted to developing a robust scientific method to further extend the studies of McGregor et al. (2006a, b) with the aim of identifying the extent to which the decadal variations of ENSO are predictable. Initially this will be carried out through theoretical discussions together with numerical simulations using the coupled model of McGregor et al. (2006b). In the long term, we aim to utilise the Australian Climate Ocean Model (AusCOM) in a series of forced experiments and the Australian Community Climate Earth-System Simulator (ACCESS) in a series of coupled experiments to further test our findings in the more state-of-the-art model domain. Our face-to-face block discussions are essential in order to properly tease out the issues that aim to enhance model climate predictability.

**Summary of support request:**

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<th>Scott B. Power</th>
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Shayne McGregor

Return airfare (Syd-Melb) $350
Airport transfers $150
Per Diem (10 days @ $160/day) $1600

Total cost: $4900

How will this project enhance the network and support the ESS community?

If successful, (i) the coupled ocean-atmosphere nature of the project focus (ENSO and decadal scale climate variability) crosses between the ESS network nodes of the ocean and atmosphere; (ii) this project will enable Neil Holbrook, Macquarie University, to spend necessary block time working directly with Scott Power, BMRC, both at BMRC headquarters in Melbourne and at Macquarie University, Sydney; and (iii) this project will facilitate and enhance student research training and will provide Shayne McGregor, Macquarie University, access to more complex models (i.e., AusCOM and ACCESS), while engaging Scott Power, from an important non-university group, to interact and co-supervise Shayne’s research.

References:


