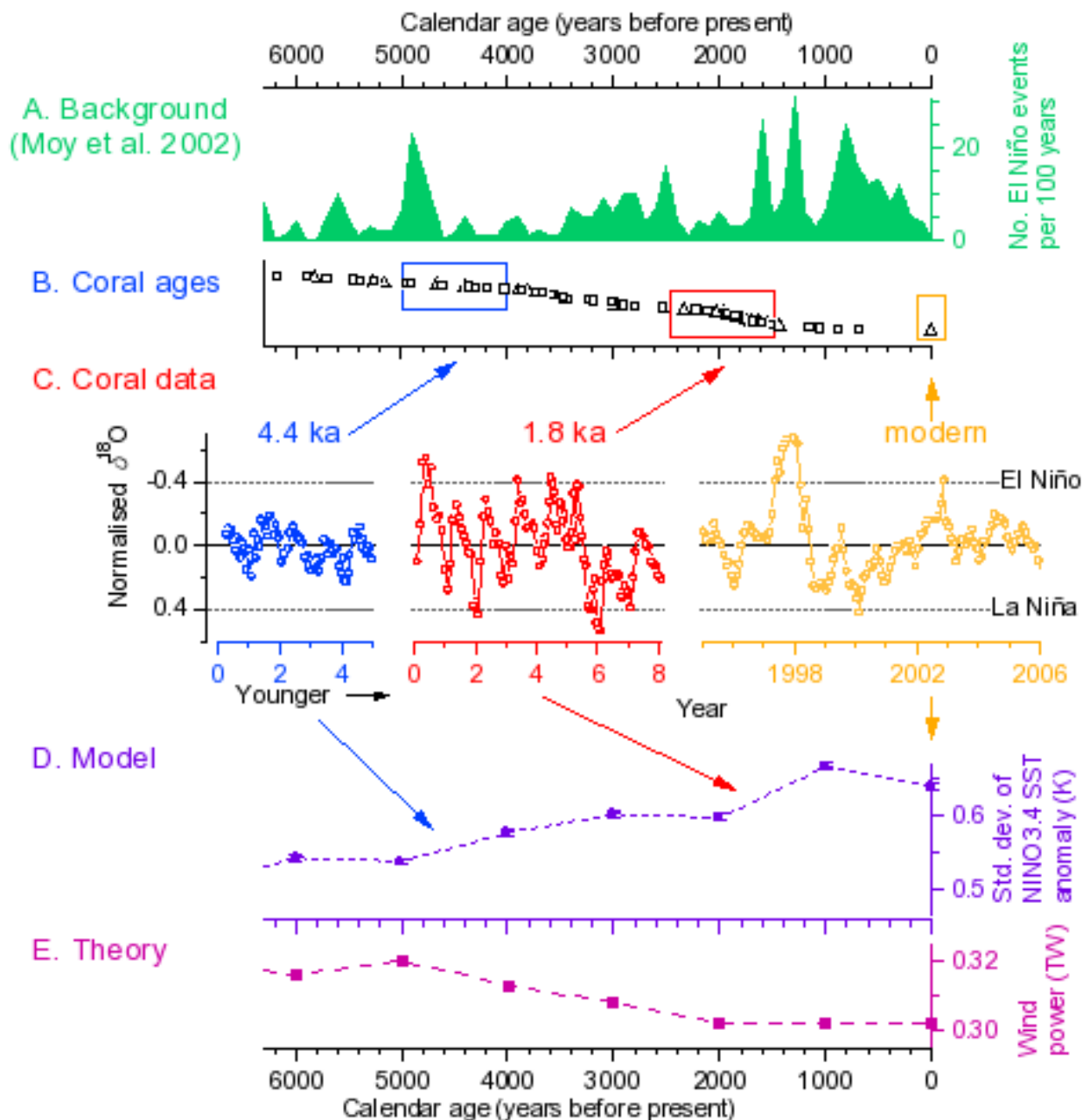


Data-model integration: Challenges and opportunities

Steven J. Phipps

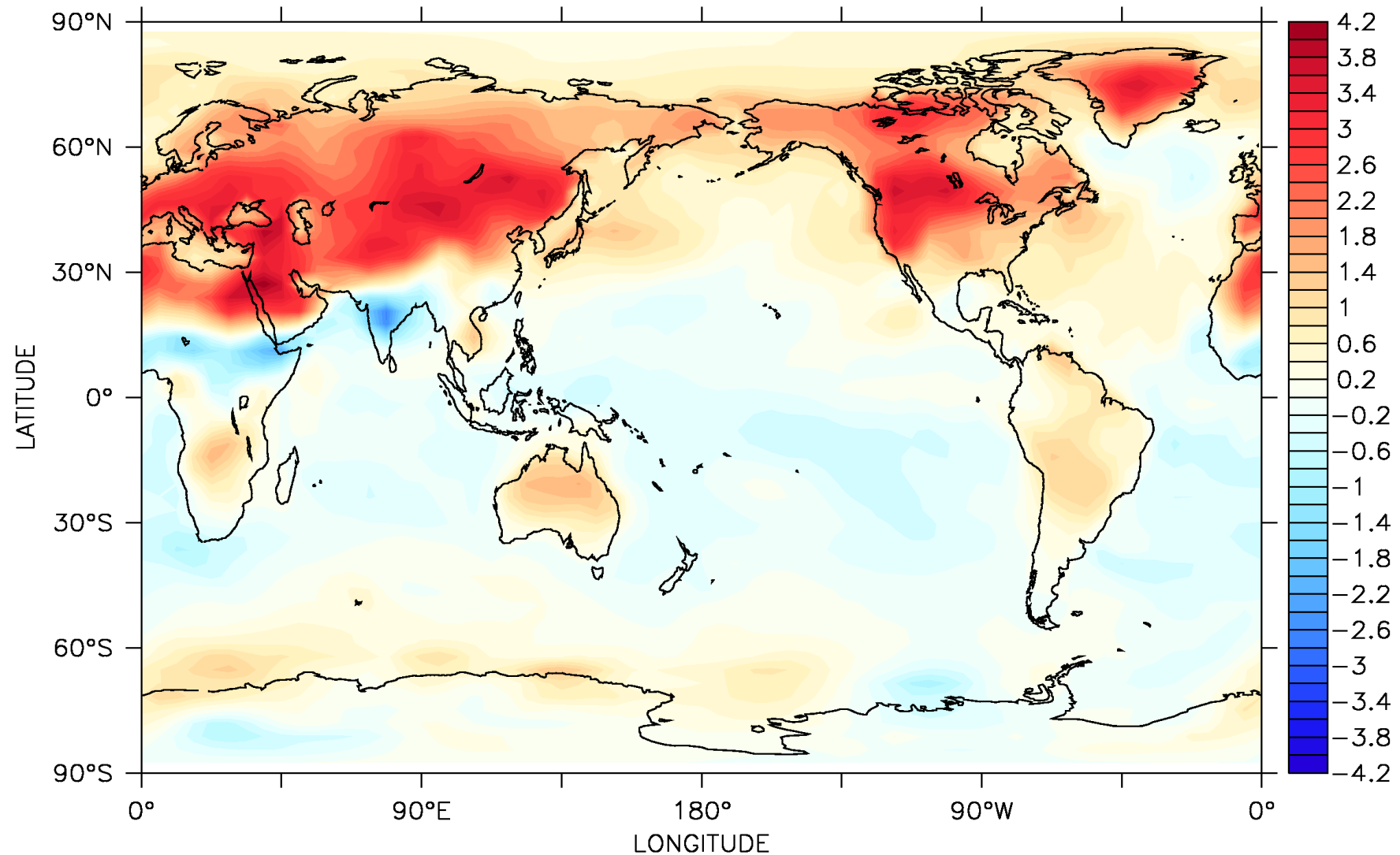
Climate Change Research Centre
University of New South Wales
Sydney, Australia

Data-model integration: a win-win situation



- Data-model integration is a two-way process
- The data constrains the model simulations
- The models provide the dynamical interpretation of the data
- Everyone wins!

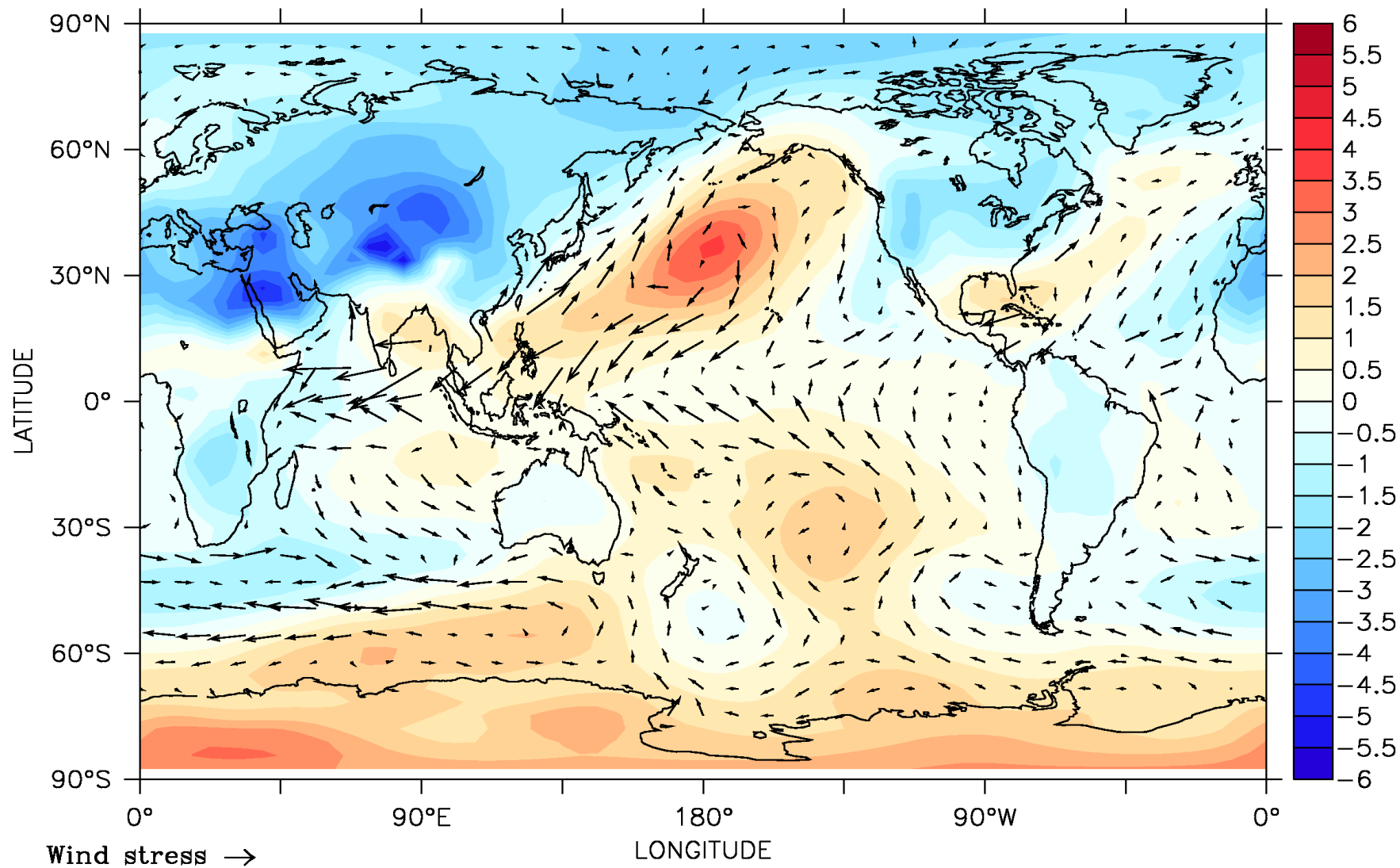
Example: NH summers were warmer at 8 ka ...



June–July–August surface air temperature anomaly (°C)

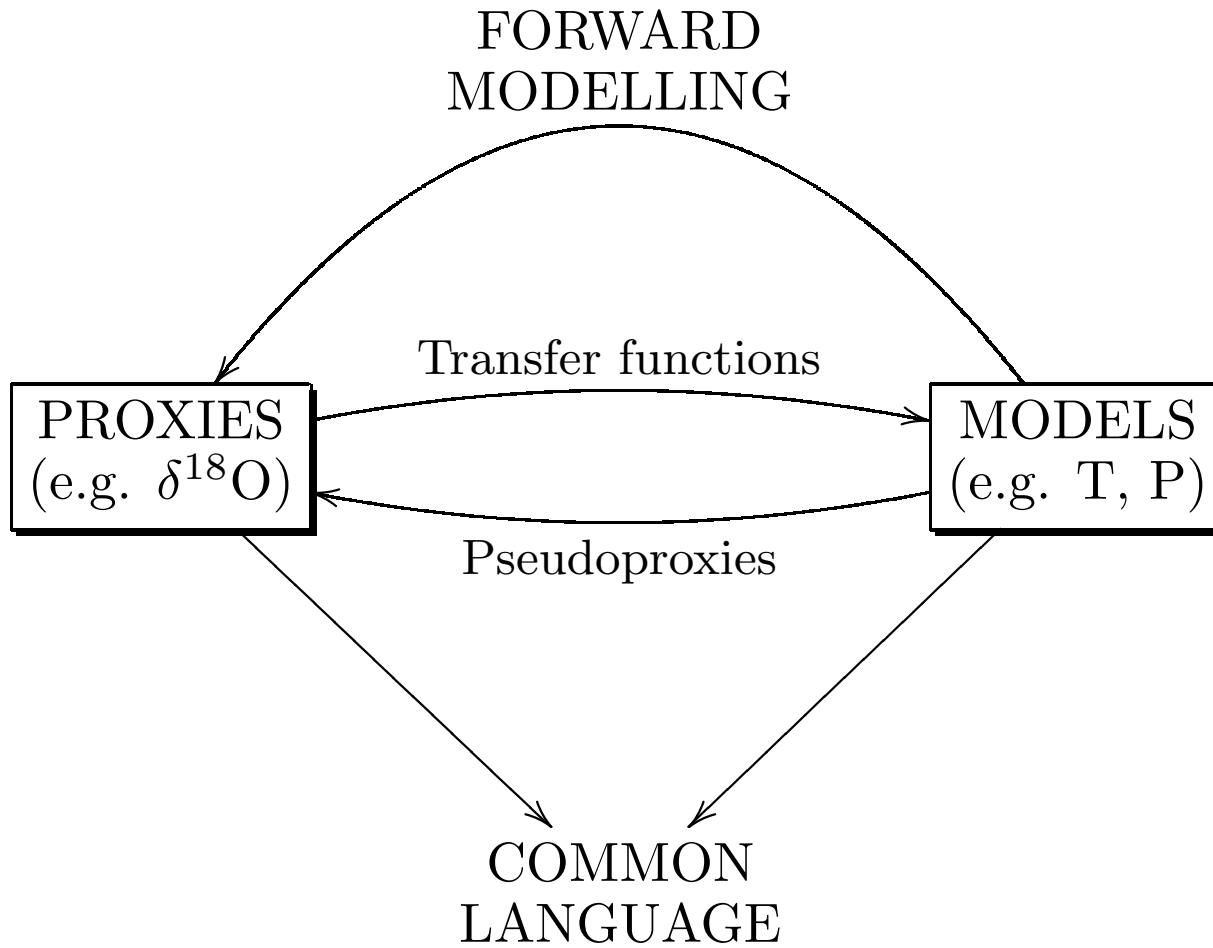
Phipps and Brown (2010), *IOP Conf. Series: Earth and Env. Sci.*

... which enhanced the trade winds in the Pacific



June-July-August mean sea level pressure anomaly (hPa)

Data-model integration: differing approaches



Opportunities

- Understand the drivers of Southern Hemisphere climate variability and change, including abrupt climate changes
- Understand the characteristics of natural climate variability on centennial and millennial timescales
- Understand the links between the Australasian climate and the global climate system
- Understand the modes of natural climate variability and their influence on the Australasian climate
- Characterise the response of the climate system to external forcings: sensitivity, feedbacks, signal-to-noise ratios...
- Detection and attribution of anthropogenic influences
- Better representation of physical processes within the models
- Enhanced ability to predict and adapt to future climate change

Challenges and gaps in capability

- Dynamics:
 - Understand the dynamics of the Australasian climate
 - Construct a common language for data-model integration?
- Data:
 - Understand relationships between proxies and climate regimes
 - Construct syntheses of Australasian climate
 - Reconstruct values of key climatic indices (ENSO, SAM...)
 - Boundary conditions for models (ice sheets, sea level, vegetation, GHGs, solar, volcanic...)
- Modelling:
 - Comprehensive earth system models: dynamic ice sheets, dynamic vegetation, biogeochemical cycles...
 - Forward modelling of biophysical processes
 - Modellers