

Preface

5th International CO₂ Conference, Cairns, Australia, 8–12 September 1997

The focus of atmospheric CO₂ research through most of the 1980s and early 1990s was the search for “the missing sink”. By the time of the 4th CO₂ International Conference in Carqueiranne, France, 1993, it was the feeling of many researchers that the missing sink had to be in the terrestrial biosphere, and that it was only a matter of time before unambiguous verification. However, the guest editors of the Carqueiranne *Tellus* issue sounded a word of warning: “Nature revealed a new puzzle in the form of unusually slow growth rates of atmospheric CO₂ since 1991, whose explanation will be a challenge for the 5th International CO₂ Conference”.

This Cairns *Tellus* issue documents a response to that challenge, but not with a clear and unambiguous answer to the slowing of CO₂ growth rates from 1991 through 1995. We offer two perspectives on this, distilled from the Cairns presentations. The first is that there is increased awareness of large inter-annual variability in the global carbon budget, and of the potential for “natural” climate variability to impose significant global CO₂ variability on ENSO to multi-decadal time-scales and longer. The other perspective is that an enormous amount of new information on regional carbon fluxes has been accumulating since Carqueiranne, particularly from areas in which fluxes were previously largely unconstrained (e.g., the southern oceans, tropical to boreal forests, tundra, etc.). Pending full assessment and integration of these new constraints into global inverse models, some caution on making inferences on the global budget has prevailed.

Meanwhile, for the CO₂ community that will meet for the 6th International Conference in Japan, 2001, a new challenge has emerged. With the signing of the Kyoto Protocol in October

1997, national governments all around the world formally recognised that changing atmospheric composition is a problem requiring international attention. A political imperative now impinges on our research. Several crucial questions must be answered by 2001: “Can we quantify regional and national fluxes of CO₂ arising from ecosystem source and sink processes?”; “Can we assign these fluxes to specific mechanisms, e.g., intentional forest regrowth, so as to provide useful information within the proposed framework of the Kyoto agreement?”; “Can a trustworthy and credible procedure for the quantification of fluxes be developed that will comply with the political/economic imperatives of greenhouse reduction agreements?”. Answering these questions on a rapid timetable will require unprecedented effort and collaboration amongst atmospheric, ecosystem and land management and oceanic scientists, and close collaborations with our colleagues in the political and economic arenas.

In this issue, we add a significant innovation. We anticipated that, in Cairns, as in previous CO₂ Conferences in this series, many of the most significant and provocative exchanges would not be captured in the formal, traditional research submissions. In order to capture some of the excitement of the meeting, the Guest Editors invited the Keynote speakers to prepare short “*Keynote Perspectives*” aimed at providing their view on the critical science, and reflective of their talks and ensuring discussions. Guidelines were broad — “based on your talk, provide a perspective on progress in the 4 years since 1993, and offer opinions on the research directions over the next 4 years”. Normal reviewing criteria were relaxed for these Keynote Perspectives, subject to editorial discretion. 13 keynote speakers were identified by

the Conference Scientific Steering Committee on the basis of the excellence of their recent research – of these, 9 responded with Keynote Perspectives, and 3 have submitted full papers. As it turned out, the Keynote submissions varied widely in length and style. However, taken overall, they provide an excellent definition of the state of the science in 1997. All Keynote submissions are identified.

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Guest Editors