



## Measurements of Greenhouse Gases and Ozone in the Southern Pacific Ocean

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Climate change is one of the most pressing global environmental issues of our time. It is driven by atmospheric change, and in particular by the large growth in greenhouse gases. There have been a great number of measurement campaigns focused on the Northern Hemisphere, however the data coverage in the Southern Hemisphere and the Australasian region is sparse.

During three ship cruises in the Southern Pacific, in situ measurements of the key greenhouse gases  $\text{CH}_4$ ,  $\text{CO}_2$ ,  $\text{N}_2\text{O}$ ,  $\text{O}_3$  as well as  $\text{CO}$  and  $\delta^{13}\text{C}(\text{CO}_2)$  were performed in the marine boundary layer aboard the Australian research vessel "Southern Surveyor" by a continuous FTIR analyser and an ozone monitor. During the first transect from Hobart ( $42.5^\circ \text{S}$ ,  $147.2^\circ \text{E}$ ) to Brisbane ( $27.3^\circ \text{S}$ ,  $153.1^\circ \text{E}$ ) in April 2012 air influenced by terrestrial sources from Australia, such as pollution plumes originating from biomass burning or large metropolitan areas, were sampled. Southern Hemisphere marine air over the Pacific Ocean was characterised during the second and third transects from Brisbane to Fiji ( $17.6^\circ \text{S}$ ,  $177.5^\circ \text{E}$ ) and Fiji to Hobart in May and June 2012.

The observations of  $\text{CH}_4$ ,  $\text{CO}_2$ ,  $\text{CO}$  and  $\text{O}_3$  are presented across the latitudinal and longitudinal transects. Seasonal variability as well as air mass history influence the trace gas distributions. Backward trajectory analyses were performed to identify the origin of the air masses and to determine correlations between the different trace gases. For offshore air a distinct correlation between  $\text{O}_3$  and  $\text{CH}_4$  was found. Close to land enhanced concentrations with different compositions were observed, reflecting the complex source attributions from the Australian continent. To test our understanding of the greenhouse gas emissions, transport, and chemical processing from this region the measurements are compared to results from the global chemical transport model GEOS-Chem.