Session: B3 Oral presentation

Wind effects on past and future regional sea-level trends in the southern Indo-Pacific

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Global sea-level rise due to the thermal expansion of the warming oceans and freshwater input from melting glaciers and ice-sheets is threatening to inundate low-lying islands and coast-lines worldwide. At present global mean sea level rises at 3.1 ± 0.7 mm/yr (Bindoff and et al. 2007) with an accelerating tendency (Church and White 2006; Rahmstorf 2007). However, the magnitude of recent decadal sea-level trends varies greatly spatially attaining values of up to 10 mm/yr in some areas of the western tropical Pacific. Identifying the causes of recent regional sea-level trends and understanding the patterns of future projected sea-level change is of crucial importance. Using a wind-forced simplified dynamical ocean model, we show that the regional features of recent decadal and multidecadal sea-level trends in the tropical Indo-Pacific can be attributed to changes in the prevailing wind-regimes. Furthermore it is demonstrated that within an ensemble of ten state-of-the art coupled general circulation models, forced by increasing atmospheric CO2 concentrations over the next century, wind-induced redistributions of upper-ocean water play a key role in establishing the spatial characteristics of projected regional sea-level rise. Wind-related changes in near surface mass and heat convergence near the Solomon Islands, Tuvalu, Kiribati, the Cook Islands and French Polynesia oppose, but can not cancel the regional signal of global mean sea-level rise.