Impacts of spreading hypoxia on coastal biota of the subarctic Pacific

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Throughout the subarctic Pacific, oxygen levels have persistently declined over at least the past 50 years, a result of the freshening and possibly warming of the ocean's surface layer. Short time-series measurements or repeat surveys can mislead us in assessments of oxygen losses due to decadal oscillations that are obvious in some data sets. Therefore, our trend analyses rely on measurements made over periods of 25 to 55 years. At Ocean Station P over the past half century, a >20% oxygen decline in interior ocean waters has resulted in a shoaling of the hypoxic boundary (60 μM) of ~100 m. Such trends are not observed at the HOT site in subtropical waters of the N Pacific. Along the coast of North America from California to Alaska, spreading hypoxia along sloping oxygen isopleths (deeper towards Alaska) cause forced migrations into shallower waters and/or northward. The groundfish community along the outer British Columbia coast has been moving into shallower habitat at a rate of 2 to 3 m per year over the past decade. If oxygen continues to be lost at rates observed in the past few decades, expanding hypoxia and developing anoxia have the potential to force extinctions or northward migrations at a rate of >500 km per decade along the continental slope. This displacement of communities is much greater than the 50 km per decade predicted globally in warming oceans.

The palaeoclimatic significance of coherrent carbon and oxygen isotopic signals in a number of New Zealand stalagmites

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Coherrent oxygen and carbon isotopic profiles spanning the last 75kA from stalagmites from both the North and South Islands of New Zealand show abrupt changes coincident with all of the North Atlantic Heinrich Events (excepting H0). We believe that the Heinrich Events were associated with or effected global climatic shifts that were expressed in the south west Pacific by southerly displacement of the Intertropical Convergence Zone. The coherrence of synchronous shifts in oxygen and carbon isotopic composition in stalagmites from a wide geographical area can be explained by observations we have made of the impact of prolonged rainfall on the composition of karst waters. Thus the changes observed in the stalagmites also indicate that while the climate of New Zealand was as cold in marine oxygen isotope stage 4 as in stage 2, it was much wetter. This provides an explanation for the significantly greater areal extent of South Island glaciations during MOIS4 than at any time subsequently