Model Comparison of Subantarctic Mode and Antarctic Intermediate Water in the South Pacific between the Last Glacial Maximum and abrupt climate events

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Subantarctic Mode Water (SAMW) and Antarctic Intermediate Water (AAIW) are large-volume intermediate water masses that transport climatically important properties such as, heat, freshwater, and CO_2 equatorward into the Southern Hemisphere subtropical gyres. Presently, some of the freshest and coldest SAMW and AAIW are formed in the southeast Pacific. This study sets out to investigate changes in the properties, formation, and circulation of SAMW and AAIW between the Last Glacial Maximum (LGM) and abrupt climate events (such as, Heinrich 1 and the Younger Dryas) in the South Pacific compared to present day. The NCAR-CCSM3 LGM simulation of 21, 000 years ago, and the North Atlantic freshwater hosing experiment, the addition of 0.1 Sv of freshwater over 500 years, are used. The LGM is characterized by a global cooling of surface and oceanic temperatures. The freshwater hosing experiments show a cooling in the Northern Hemisphere and a warming in the Southern Hemisphere. In particular, SAMW and AAIW are 1-2°C warmer in the southeast Pacific during the freshwater hosing experiment when compared to the LGM. However, there are no significant changes in salinity within SAMW and AAIW between these periods. Similar to the present ocean, during the LGM, SAMW and AAIW form in deep mixed layers in the southeast Pacific, equatorward of the subantarctic and polar fronts, respectively. During the freshwater hosing experiment, there is no significant change in the depth or location of these deep mixed layers when compared to the LGM. Identifying changes in SAMW and AAIW during extreme climate events can provide insight for understanding the role these water masses will have in future climate change.

Black Carbon in Phoenix-area soils: Distribution and relationship with land use across a desert city

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Black carbon (BC) is the partially combusted residue of fossil fuel and biomass burning. Operationally, this class includes everything from charcoal to fully graphitc soot. BC is ubiquitous in the environment, but remains a poorly quantified pool in global and regional carbon budgets [1, 2]. Furthermore, there is no information on BC in urban settings despite the fact that urban soils receive BC inputs from both fossil fuel and biomass derived sources (i. e., cars and forest fires). We present data on BC content and isotopic composition in soils from the city of Phoenix in the desert Southwestern US..

Soil samples were collected during 2000 and 2005 as part of the Central Arizona Phoenix Long-Term Ecosystem Reserch (CAP LTER) program's semi-decadal soil survey in the greater Phoenix metropolitan area. Phoenix is one of the fastest growing metropolitan areas in the United States. Soil cores were collected, and composite samples from 0-10cm and 20-30cm depth were homogenized and stored dry. Sample sites are each categorized according to land-use/land-cover and have ancillary data on basic soil properties and geochemistry. Black carbon was isolated from the bulk soil by chemo-thermal oxidation (CTO375; [3]) followed by EA-IRMS analysis for carbon content and ^{13}C stable isotope composition. This technique isolates soot, a nanoparticulate combustion product.

Urban soils in Phoenix have between 0.03 and 0.8 wt% BC; this represents as much as 45% of the bulk soil organic carbon. BC is distributed unevenly throuought the city, with higher amounts of BC in soils with urban land-use classifications and lower BC content in soils with open (desert) classification. Because BC has both natural and anthropogenic sources it's distribution and composition in the growing urban region is quite variable; however, BC content in the soils from the urban core appear to be related to proximity with major roadways. BC is also elevated in residential areas that were previously under agriculture. This suggests that the presence of BC in urban soils may be related to other growth and development indicies (population, distribution of wealth, etc.).

[1] Masiello (2004) *Mar. Chem.* **92**, 201-213. [2] Czimczik & Masiello (2007) *Glob. Biogeochem. Cycl.* **21**, GB3005. [3] Gustafsson *et al.* (2001) *Glob. Biogeochem. Cycl.* **15**, 881-890.