Latitudinal gradients in Southern Hemispheric soluble iron deposition

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The deposition and dissolution of aerosols containing trace metals into the ocean may provide important micronutrients required for marine primary production in waters where they are depleted, such as the Southern Ocean. Conversely, the deposition of soluble iron can trigger toxic algal blooms in nutrient-poor tropical and subtropical waters. For example, Trichodesmium blooms require large quantities of soluble iron, of which aerosols are a source. To date most studies have assumed that mineral dust aerosols represent the primary source of soluble iron in the atmosphere. However, fire emissions and oil combustion are other potential sources. A few studies have shown that iron contained in biomass burning emissions is significantly more soluble that mineral dust, but to date no data exists for Australian fires. Latitudinal gradients of soluble iron deposition are investigated using Australian aerosols and Antarctic snow. Here, we present changes in aerosol iron fluxes and sources from biomass burning-derived aerosols in the Australian tropics to higher latitudes in Antarctica and the Southern Ocean where the aerosol loading is amongst the lowest in the world. Soluble iron fluxes at Cape Grim Baseline Air Pollution Station, Tasmania (~1 x 10^{-7} g m^{-2} y^{-1}) and in coastal (~1 x 10^{-6} g m^{-2} y^{-1}) and inland (0.2 x 10^{-6} g m^{-2} y^{-1}) Antarctic snow are orders of magnitude lower than the Australian tropics.