**Particle backscattering coefficient and its relation to biogeochemical properties in the Southern Atlantic and Southeastern Pacific**

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Marine particle backscattering coefficient (*b*bp) data collected in the Southern Atlantic
and Southeastern Pacific during the February-March 2015 R/V Melville MV1102 cruise were
analyzed in relation to biogeochemical properties. Measurements were made at 59 locations during fixed stations, where vertical profiles were acquired, and en route (flow-through system). The *b*bp(555) varied from 0.0011-0.0043 m-1. Fractionation experiments revealed a lower contribution of submicron particles (<0.7 µm) to *b*bp (33±8%), however with a strong linear relationship with the chlorophyll-*a* concentration (Chl*a*) (*r*2, 0.81) and the concentration of heterotrophic bacteria (*r*2, 0.43). The magnitude and spectral slope of the *b*bp of the submicron fraction also had a strong relation with the slope of the particle size distribution (PSD) from 0.5-3 µm (*r*2, 0.90 and 0.80), indicating a tight covariation between the tiny submicron particles with the pico-sized PSD (which also covaried with Chl*a* (*r*s,-0.59)). The *b*bp of the larger fraction had a dispersive power law relationship with Chl*a* (*r*2, 0.13), but a stronger linear relation with particulate organic carbon (*r*2, 0.55) and particulate inorganic carbon (PIC) (*r*2, 0.84). The higher contribution of larger particles to *b*bp was associated with the greater proportion of detritus (*r*s, 0.44), higher concentration of micro diatoms and presence of coccoliths. Suspended minerals deposited from Aeolian dust also likely contribute to the higher *b*bp in the study region. Such sources strongly affect *b*bp, but cause dispersion in the *b*bp vs. Chl*a* relationship, whereas the smaller fraction (i.e., submicron detritus and subpico cells) is more tied to the trophic level.

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