

## Comparing carbon isotopic signatures between meteorites and terrestrial mantle samples: Need for reassessment of carbon composition of Earth's mantle

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Carbon isotopic composition of Earth's mantle is supposed to be -5‰ based on mean values obtained from bulk measurements of oceanic basalts, carbonatites, diamonds and other terrestrial samples [1]. This value is the most significant assumption made in order to understand how carbon is cycled between the surface and interior of the Earth. But there are specific localities that exhibit different mean values, bimodality and outliers [2].

However, the value of -5‰ may not be representative of the entire mantle. Carbon compositions in the terrestrial mantle samples show considerable variations like E-chondrites, the fundamental building blocks of Earth [3]. The carbon composition of Earth does not coincide with the Martian mantle value of -20 ‰ although both the planets should have started with similar initial compositions [4]. Carbon can form various stable compounds in the mantle governed by different oxygen fugacity, and fractionation in isotopic composition is likely to occur under high pressure-temperature conditions [5]. It becomes important to reassess the mantle compositions of Earth, particularly since Si-rich carbide-bearing diamonds from great mantle depths (> 1100 km) is now available [6]. Following preliminary combustion investigations for carbon and nitrogen, measurements of carbon isotopic compositions of these Jagersfontein diamonds and inclusions at high resolution by NanoSIMS are underway.

[1] Deines (2002) *Earth Sci. Rev.* **58**, 247-258. [2] Cartigny (2005) *Elements* **1**, 79-84. [3] Javoy *et al.* (2010) *EPSL* **293**, 259-268. [4] Grady *et al.* (2004) *Int. J. Of Astrobiology* **3(2)**, 117-124. [5] Mikhail *et al.* (2010) *AGU Fall Meeting abstract* No: U21A-0001 . [6] Jones *et al.* (2008) *9<sup>th</sup> Int. Kimberlite Conference* Extended Abstract No: 9IKC-00360.

## Measurements of ocean derived aerosol off the coast of California

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The oceans are a major source of aerosol number and mass to the atmosphere. Over the remote oceans, coarse-mode sea-salt particles dominate aerosol light scattering. Recent measurements suggest that direct emissions of ocean-derived particles also control the aerosol number concentration and thus the aerosol cloud condensation nuclei concentration. Measurements of atmospheric aerosols over the ocean include particles directly emitted from the ocean and particles produced by gas phase reactions in the atmosphere, making it difficult to distinguish between the two sources. Here we report recent measurements of particles directly emitted from the ocean using a newly developed *in situ* particle generator/sampler (SeaSweep). Bubbles were generated 1 m below the ocean surface alongside the research vessel *Atlantis* off the coast of California and swept into a hood/vacuum hose to feed a suite of instruments on board the ship measuring aerosol physical, chemical, optical, and cloud nucleating properties.

The number size distribution of the directly emitted (nascent) particles had a dominant mode at 55-60nm (dry diameter) and a secondary mode at 200-300nm. The aerosol was not volatile at 230°C. This temperature rules out ammonium sulfate and nitrate as significant components of the nascent aerosol but does not distinguish between particulate organic matter and sea salt. The organic component of the nascent aerosol volatilized at a temperature between 230 and 600°C. The nascent aerosol was not enriched in Ca, K, or Mg above that found in surface seawater. The submicrometer organic aerosol was primarily composed of carbohydrates based on FTIR analysis. The nascent organic aerosol concentration did not increase in regions of higher surface seawater chlorophyll.