

A record of carbonyl sulfide from Antarctic ice over the last 1000 years

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Carbonyl sulfide (COS) is a trace gas, present in the troposphere, and also in the stratosphere, where it contributes to the stratospheric sulfate aerosol layer. It has both natural and anthropogenic sources. Natural processes include uptake by plants, while oceans, wetlands, volcanism and biomass burning all contribute to natural COS emissions.

We have measured COS in Antarctic ice cores from Dronning Maud Land, drilled in 1998, the DE08 core drilled at Law Dome in 1987, and the DSS0506 core drilled in 2006. Ice samples with COS gas ages between about 1050 AD and the early 20th century have been examined. A large volume ice crusher at the CSIRO Marine and Atmospheric Research laboratory was used to extract air from bubbles occluded in the ice cores. These air samples were analysed for CO₂, CH₄, CO and ¹³CO₂ at CSIRO, and then for COS and several halocarbons at the University of East Anglia on a high sensitivity gas chromatograph/tri-sector mass spectrometer system.

Initial results indicate that good sample integrity can be achieved. Measurements from the DML samples indicate low and uniform abundances across the last few hundred years, and at concentrations significantly below those in the modern-day atmosphere. Measurements in more recent ice from DE08 show the start of increasing concentrations in the early 1900s, confirming earlier evidence that the global atmospheric abundance of COS has increased as a result of industrial activity during the 20th century.

Enhanced subsidence and sediment dynamics in Galveston Bay- Implications for geochemical processes and fate and transport of contaminants

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Galveston Bay is the second largest estuary in the Gulf of Mexico. The bay's watershed and shoreline contains one of the largest concentrations of petroleum and chemical industries in the world, with the greatest concentration within the lower 15 km of the San Jacinto River/Houston Ship Channel (SJR/HSC) [1]. Extensive groundwater withdrawal to support these industries and an expanding population has resulted elevated subsidence, with the highest subsidence in lower SJR/HSC, of over 3 m (3 cm yr⁻¹) and has decreased seaward throughout the bay to 0.6 cm yr⁻¹ near Galveston Island [2]. Mercury (Hg) contamination is well documented throughout the bay sediments [1, 3]. Sediment vibra-cores were collected throughout the bay systems. ²¹⁰Pb and ¹³⁷Cs geochronologies from these cores were used to determine sedimentation rates and correlated to Hg profiles to estimate input histories. The results shows sedimentation rates of 4 cm yr⁻¹ in areas with subsidence of comparable rates, indicating that sedimentation kept pace with subsidence. Moreover, Hg core profiles correlated with radioisotope geochronologies and show significant input of Hg beginning around 1940, with a peak around 1971, and a dramatic drop off in concentration afterwards, demonstrating it to be a valuable geochronology tool. In addition, Hg concentrations were found to be dramatically higher proximal to the SJR/HSC and progressively decreasing seaward and to distal parts of the bay.

[1] Santschi *et al* (2001) *Mar Env Res* **52**, 51-97. [2] Coplin & Galloway (1999) *U.S Geo Sur Cir* **1182**, 35-48. [3] Morse *et al* (1993) *Mar Env Res* **36**, 1-37.