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Published

2014

Conference Title

SETAC Europe 24th Annual Meeting

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MO026 Oceanic transport of Perfluorinated compounds into Antarctic waters, and the influence of the Antarctic Circumpolar Current

Current S.J. Wild, Griffith University; R. Bossi, Aarhus University / Environmental Science; D. Hawker, Griffith University / School of Environment; R. Cropp, Griffith University; S.M. Bengtson Nash, Griffith University / Southern Ocean Persistent Organic Pollutants Program SOPOPP. Despite the apparent pristine conditions and remoteness of Antarctica, persistent organic pollutants have been detected in the region since the 1960s. Today a large variety of organic pollutants can be found in the Antarctic environment and its subsisting species. Unlike the more traditional persistent organic pollutants, perfluorinated compounds (PFCs) such as perfluorooctane sulfonate (PFOS) and other poly- and perfluorinated alkyl substances (PFAS) tend to have very low volatility so are less prone to long-range atmospheric transportation. These types of compounds however readily dissolve in water when in ionic form and appear to accumulate in the world's oceans. As a result of this, one of the primary transport mechanisms for PFCs is believed to be through the oceanic currents. These oceanic currents, similarly to atmospheric currents, are believed to transport these towards compounds the poles where they may accumulate. In the Southern Ocean, the Antarctic Circumpolar Current is major physical feature presenting a barrier for direct north-south transport of surface waters. It is assumed that this barrier is also currently serving to inhibit bulk transfer of hydrophilic pollutants such as PFCs from higher latitude into the water surrounding the Antarctic continent. This hypothesis was supported by recent evidence indicating that Antarctic species, that cross the polar front zone to forage have detectable PFC burdens, whilst those who are restricted to south of the Antarctic Circumpolar Current do not. The barrier however is not impervious, with continuous exchange of older upwelling water bodies and some surface water exchange occurring, presenting the possibility of long term bulk input via this pathway. In order to investigate levels of PFCs in Southern Ocean surface waters and ascertain the role of the Antarctic circumpolar current in mechanistic transfer of pollutants south of the polar front zone, water samples were collected along longitudinal sampling transects from Hobart to the Antarctic Continent in 2011 and 2012. Two litre samples were collected every half to one degree of change in latitude. The preliminary results from this investigation indicate levels of PFOS as well as other PFAS within the southern ocean are currently at levels in the parts per thousand. The trends and patterns of detection are further interpreted within this presentation.