What's Happening in the...

Earth and the Environmental Sciences

Spring 2013
Newsletter

This newsletter presents some of the research conducted in LEC that examines the fate of organic chemical contaminants in the environment and their impact on remote regions like the Arctic.

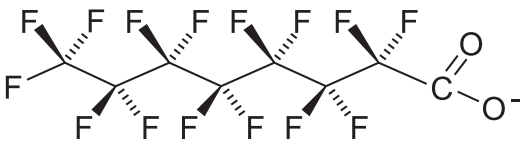
The long-range transport of chemical pollutants to remote regions

A range of organic chemicals produced by industry and the agrichemical sector, or arising as unwanted by-products, can resist degradation and persist in the environment. Many of these chemicals have physical or chemical properties which promote a global distribution, resulting in low but significant concentrations in air, water and soil in regions well-removed from their area of use. If these chemicals bioaccumulate, they can pose a threat to organisms through foodweb linkages.

Examples of chemicals that undergo long-range environmental transport include 'legacy' pollutants like DDT and polychlorinated biphenyls, as well as current-use chemicals such as brominated flame retardants and perfluoroalky substances. We analyse these chemicals in environmental samples using cutting-edge instrumental techniques such as GC-MS and LC-MS. Undergraduate students studying this topic for their dissertation project can learn these analytical techniques, providing valuable skills and experience for future careers.

Environmental scientists at Lancaster have been investigating how these chemicals accumulate in snow and ice and are then transferred to aquatic systems during periods of melt. Falling snow is extremely efficient at scavenging trace chemicals from air, resulting in marked accumulation in the snowpack. Using ultra-trace analytical techniques, including a specialised clean laboratory within LEC, we have observed chemical enrichment in both the snow and sea ice in the Arctic. We are also beginning to understand the processes by which organisms at the base of the marine foodweb are exposed to these contaminants.

Contaminant accumulation in deeper snow and ice cores also allows us to observe trends in chemical contamination over several decades. For example, snow and ice cores collected from remote regions of Tibet have allowed us to track patterns in chemical deposition from 1980 to the present day. Time trends such as these can provide insight into the effectiveness of global policies curtailing the use and release of certain chemical substances.



The images (top and middle) are from recent field campaigns in the Arctic. **Top**: Olivier Bertrand sampling sea ice in the Barents Sea of the European Arctic. **Middle**: the Canadian icebreaker 'Amundsen' with our air toxics sampler in the foreground. **Bottom**: Investigating the photodecay of organic contaminants in the analytical laboratory in LEC. Beneath this is the structure of perfluorooctanoate (PFOA); a globally distributed contaminant that arises from the fluorine industry. Unfortunately, this chemical is present in the blood of polar bears with increasing concentrations evident throughout the 2000s.

For more details about the reports above or about Earth Science and Environmental Science courses on offer at Lancaster University please contact the Earth and Environmental Science Admissions Staff,

Lancaster Environment Centre, Lancaster University, LA1 4YQ, UK.

E-mail: **lec.ug@lancaster.ac.uk** or see our website: **www.lec.lancs.ac.uk**

Lancaster Environment Centre | LANCASTER UNIVERSITY