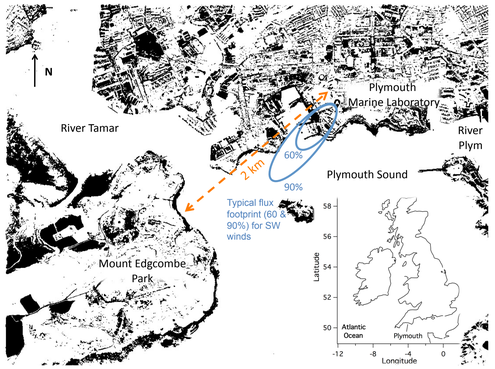
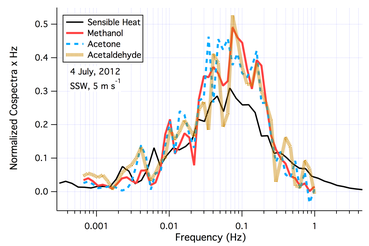
AMS 2013
Austin TX
Paper: **501**

Vertical Fluxes of Methanol, Acetaldehyde, and Acetone In a Coastal Environment (and Over the Atlantic Ocean)

Mingxi Yang (miya@pml.ac.uk)[1], Rachael Beale[1], Tim Smyth[1], Byron Blomquist[2],

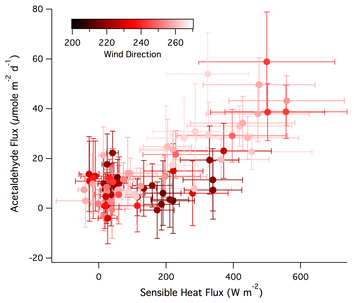
1. Plymouth Marine Laboratory, Prospect Place, Plymouth, Devon, UK. 2. University of Hawaii, Department of Oceanography, Honolulu, HI, USA





Cospectra of OVOCs and heat demonstrates expected spectral shape

Positive correlation between acetaldehyde and heat flux implies plant emission



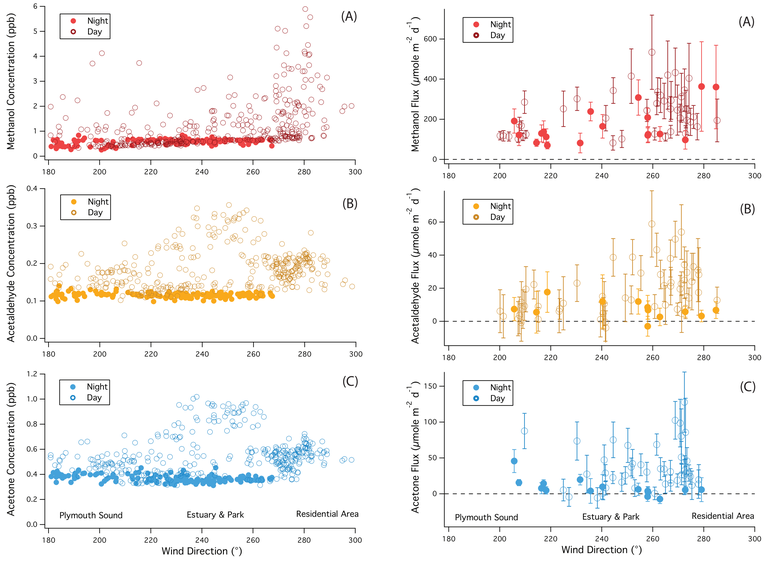
Abstract

Oxygenated Volatile Organic Compounds (OVOCs), such as methanol, acetone, and acetaldehyde, exist ubiquitously in the troposphere and are important for atmospheric chemistry and climate. They can be emitted from natural (e.g. terrestrial plants) or anthropogenic sources (e.g. industrial and combustion), photochemically produced or destroyed in air, and deposited to the surface. The role of the ocean in OVOC cycling is highly uncertain due to the lack of observations.

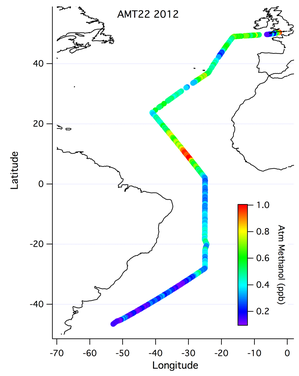
Here we present the vertical fluxes of OVOCs measured by eddy covariance in a coastal environment (left panel; submitted to ACP) and over the Atlantic Ocean (right panel; article in preparation). Quantified by a proton-reaction-transfer mass spectrometer (PTR-MS) with isotopically labeled standards at ~2 Hz, OVOC concentrations were correlated with vertical wind velocity to yield their respective net vertical transport.

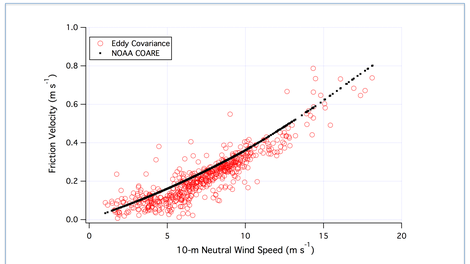
The coast near Plymouth is spatially patchy and temporally varying. Measured OVOC fluxes during March ~ July 2012 were generally positive, indicating surface emissions. In contrast, the atmosphere appears to be the source of methanol to the surface waters of the open ocean.

Concentrations and vertical fluxes of OVOCs vary with wind direction and time of day



On the Atlantic Meridional Transect cruise on RRS *James Cook* (Oct ~ Nov 2012), we measured the air-sea exchange of OVOCs. 3-D wind velocities corrected for ship's motion based on concurrent linear acceleration and angular rotation (Edson et al., JAOT, 1998) were used for eddy covariance calculations. Near-surface concentrations of OVOCs were also measured from the twice-a-day CTD casts using the same PTR-MS with a membrane-inlet (Beale et al. ACA, 2010). Here we present preliminary results for methanol.





Friction velocity (u_*) shows expected relationship with wind speed, validating the motion correction

Always from air to sea, methanol flux was elevated in continental outflow regions, and approximately agrees with gas exchange predictions