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Please contact me if you would like to use these data or if you have any questions. No further version of this dataset is expected.

Reference:
Yang, M., B. W. Blomquist, and P. D. Nightingale (2014), Air-sea exchange of methanol and acetone during HiWinGS: Estimation of air phase, water phase gas transfer velocities, J. Geophys. Res. Oceans, 119, doi:10.1002/2014JC010227.

Three hourly averaged tab-delimited text files are attached. Missing data are indicated by NaN.

HiWinGS Physical Fluxes hourly Yang 19 Jan 2015.txt

This file contains mostly hourly integrated eddy covariance (EC) measurements of physical fluxes from the PML sonic anemometer on the foremast of the ship (~20 m above mean sea level). The timestamp "time_hourly" indicates the middle of the flux averaging intervals. In the motion correction of the sonic winds, u, v, w is linearly decorrelated with the ship velocity as well as acceleration in the respective axis (i.e. u is decorrelated with uplat and acc1). The friction velocities computed with and without the decorrelation step are virtually the same. I have computed the friction velocities 1) from the integral of the u'w' component only, and 2) from both u'w' and v'w' components.

In the computation of sensible heat flux, the sonic temperature (similar to virtual temperature, Ts) is first linearly decorrelated with the vertical ship displacement to remove the influence of ship's heave across the temperature gradient in air. Virtual heat flux is computed as the integral of the w'Ts' cospectrum from 0.002 Hz to 5 Hz. Neglecting the low frequency (i.e. <0.002 Hz, or 8 minutes) contribution reduces the scatter in flux presumably related to nonstationarity. Sensible heat flux is finally derived by subtracting the latent heat contribution from the covariance virtual heat flux. The latent heat contribution is taken from the bulk COARE model: 0.51*(tair + 273.15)*usr*(qsr/1000). Here tair is the air temperature (deg C), usr is the friction velocity (m/s), and qsr the scaling parameter for moisture (g/kg).

To minimize the effect of air flow distortion by the ship's superstructure, all covariance fluxes are limited to relative wind direction within 60 degrees from the bow. Additional filters for ship's maneuvers are described in Yang et al. JGR 2014.

Variable descriptions below:

time_hourly (month/day/year HH:MM:SS in UTC; middle of hourly interval)
time_start_hourly (month/day/year HH:MM:SS in UTC; start of hourly interval)
U10N_UH (10-m neutral wind speed from U. Hawaii's sonic on the met mast, adjusted to U10n using COARE model v. 3.5, from L. Bariteau "best met data set", m/s)
Ustar (EC friction velocity, u'w' component only, m/s)
Ustar_UV (EC friction velocity, u'w' and v'w' components, m/s)
Cd10n (EC 10-m neutral drag coefficient = (Ustar/U10N)^2)
Cd10n_UV (EC 10-m neutral drag coefficient = (Ustar_UV/U10N)^2)
hsb (EC sensible heat flux, W/m2)
deltaT (sea surface temperature minus potential temperature in air at 10 m, from L. Bariteau "best met data set", deg. C)
k_heat (EC transfer velocity of sensible heat at 10 m, computed as hsb/deltaT, adjusted to neutral atmosphere following similarity theory, cm/hr)
Ch10n (EC 10-m neutral sensible heat transfer coefficient = k_heat/U10N)

HiWinGS Methanol Acetone hourly Yang 19 Jan 2015.txt

This file contains the methanol and acetone data. See Yang et al. JGR 2014 for detailed descriptions for data processing and filtering. As with physical fluxes, only measurements within 60 degree of the bow are shown here. Methanol and acetone fluxes were consistently negative, implying air-to-sea deposition (some occasional positive fluxes were due to noise the measurement). Methanol and acetone transfer velocities are computed as flux/(Cw/H – Ca), where Cw is the seawater concentration, H is the Ostwald solubility, and Ca is the atmospheric concentration (converted from atmospheric mixing ratio). To reduce noise, methanol and acetone transfer velocities are only computed for times when the atmospheric mixing ratios of these compounds were greater than 0.2 ppb. No Schmidt number normalization is applied to the methanol and acetone transfer velocities, since both compounds are primarily airside controlled. The airside Schmidt number for methanol and acetone is 1.09 and 1.55, respectively. Both are essentially temperature independent.

Variable descriptions below:

time_hourly (month/day/year HH:MM:SS in UTC; middle of hourly interval)
time_start_hourly (month/day/year HH:MM:SS in UTC; start of hourly interval)
MeOH_flux (EC methanol flux, μmole/m2/day)
Acetone_flux (EC acetone flux, μmole/m2/day)
MeOH_ppb (atmospheric methanol mixing ratio, ppb)
Acetone_ppb (atmospheric acetone mixing ratio, ppb)
Ostwald_MeOH (Ostwald water:air solubility of methanol, dimensionless)
Ostwald_Acetone (Ostwald water:air solubility of acetone, dimensionless)
Scw_Acetone (seawater Schmidt number of acetone)

Scw_MeOH (seawater Schmidt number of methanol)
KMeOH_neutral (total methanol transfer velocity in airside units, adjusted to neutral atmosphere following similarity theory, cm/hr)
KAcetone_neutral (total acetone transfer velocity in airside units, adjusted to neutral atmosphere following similarity theory, cm/hr)
MeOH_nM (~2 m seawater methanol concentration, nanomolar)
Acetone_nM (~2 m seawater acetone concentration, nanomolar)

HiWinGS ECMWF waves hourly Yang 19 Jan 2015.txt

ECMWF (European Centre for Medium-Range Weather Forecast) reanalysis wave data for the HiWinGS cruise, courtesy of K. Christensen and B. Ward. Model data are every six hours. I have linearly interpolated them to the hourly timestamp "time_hourly".

Variable descriptions below:

time_hourly (month/day/year HH:MM:SS in UTC; middle of hourly interval)
time_start_hourly (month/day/year HH:MM:SS in UTC; start of hourly interval)
mdts (mean direction total swell, deg)
mdww (mean direction wind waves, deg)
shts (significant height total swell, m)
shww (significant height wind waves, m)
mpts (mean period total swell, s)
mpww (mean period wind waves, s)
msqs (mean square slope)
cdww (coefficient of drag with waves)
wind (10 metre wind speed, m/s)
dwi (10 metre wind direction, deg)