

Direct/bulk fluxes from the 2011 DYNAMO Cruise – Version 2

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This document is the Readme for *Dynamo2011_flux_10_alllegs_v2.txt* and *Dynamo2011_flux_hr_alllegs_v2.txt*. This data is an update to the previous version 1 with the main following changes:

- 1) The sea-snake measurements were reduced by 0.058C based on a comparison with the OSU T-chain SBE device.
- 2) Bulk estimates of air sea fluxes were computed using the COARE bulk algorithm version 3.5 (*Edson et al., 2013: On the exchange of momentum over the open ocean, J. Phys. Oceanogr., 43, 1589-1610*).
- 3) The motion correction scheme was modified. In a nutshell, the tilt correction is now carried out after the correction for the platform velocity but before removing the ship's mean velocity. See Landwehr et al. 2015 for more details (*Landwehr, S., N. O'Sullivan, and B. Ward, 2015: Direct flux measurements from mobile platforms at sea: Motion and airflow distortion corrections revisited. J. Atmos. Oceanic Technol., 32, 1163–1178*).
- 4) A correction to account for biases in gas concentration measurements has been applied on the covariance and ID latent heat fluxes. See Fratini et al. 2014 for more details (*Fratini, G., D. K. McDermitt, and D. Papale, 2014: Eddy-covariance flux errors due to biases in gas concentration measurements: origins, quantification and correction, Biogeosciences, 11, 1037–1051*).
- 5) Extra variables were added at the end of the file so that the column assignment is now as follows:

```
jdy=x(:,1);%day-of-year at beginning of time average
ushp=x(:,2)%doppler log, SCS (m/s) →not available, replaced by SOG
U=x(:,3);%true wind PSD sonic relative to water (m/s)
dir=x(:,4);%true wind direction from relative to water, PSD sonic (deg)
urel=x(:,5);%relative wind speed, PSD (m/s)
reldir=x(:,6);%relative wind dir (from),clockwise rel ship's bow, PSD sonic
(deg)
head=x(:,7);%ship heading, deg clockwise rel north, PSD GPS
tsnk=x(:,8);%sea snake temperature, PSD (C)
ta=x(:,9);%air temperature, PSD (C)%
qse=x(:,10);%sea surface specific humidity from snake (g/kg)
qa=x(:,11);%air specific humidity, PSD (g/kg)
hsc=x(:,12);%sensible heat flux, covariance, PSD sonic anemometer(W/m^2)
hsib=x(:,13);%sensible heat flux, ID, PSD sonic anemometer(W/m^2)
hsb=x(:,14);%bulk sensible heat flux, (W/m^2)
hlc=x(:,15);%latent heat flux, covariance, (W/m^2)
hlib=x(:,16);%latent heat flux, ID, (W/m^2)
hlib=x(:,17);%bulk latent heat flux, W/m^2 (includes Webb et al. correction)
taucx=x(:,18);%covariance streamwise stress, PSD sonic anemometer (N/m^2)
taucy=x(:,19);%covariance cross-stream stress, PSD sonic anemometer (N/m^2)
tauib=x(:,20);%ID streamwise stress, PSD sonic anemometer (N/m^2)
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taub=x(:,21);%bulk wind stress along mean wind, (N/m^2)
rs=x(:,22);%downward solar flux, PSD units (W/m^2)
rl=x(:,23);%downward IR flux, PSD units (W/m^2)
org=x(:,24);%rainrate, PSD STI optical rain gauge (mm/hr)
J=x(:,25);%ship plume contamination index
tiltx=x(:,26);%flow tilt at PSD sonic anemometer
Jm=x(:,27);%ship maneuver index
ct=x(:,28);%ct^2 (K^2/m^.667)
cq=x(:,29);%cq^2 ((g/kg)^2/m^.667)
cu=x(:,30);%cu^2 ((m/s)^2/m^.667)
cw=x(:,31);%cw^2 ((m/s)^2/m^.667)
hrain=x(:,32);%rain heat flux, Gosnell et al 1995, JGR, 18437-18442 (W/m^2)
hlwebb=x(:,33);%correction to measured latent heat flux, Webb et al.
lat=x(:,34);%latitude, deg (PSD pcode)
lon=x(:,35);%longitude, deg (PSD pcode)
zu_psd=x(:,36);%height of mean wind sensor, 17.75 m
zt_psd=x(:,37);%height of mean air temperature sensor, 15.6 m
zq_psd=x(:,38);%height of mean air humidity sensor, 15.6 m
%***** ships imet and scs data
sog=x(:,39);%speed over ground, SCS gps, (m/s)
U_scs=x(:,40); %true wind speed relative to earth (m/s) - 19.6m
dir_scs=x(:,41);%true wind direction from relative to earth, clockwise rel
north (deg)
cog=x(:,42);%course over ground, SCS gps, (m/s)
tsg=x(:,43);%tsg water temperature (C)
ta_im=x(:,44);%imet air temperature (C)
qs_tsg=x(:,45);%imet bulk water specific humidity (g/kg)
qa_im=x(:,46);%imet air specific humidity, (g/kg)
rs_im=x(:,47);%imet solar flux, (W/m^2)
rl_im=x(:,48);%imet IR flux (W/m^2)
wco2_lic=x(:,49);%LICOR 7500 CO2 flux, (micatm m/s) - not calculated in
version 2
q_lic=x(:,50);%Specific humidity from LICOR (g/kg)
sgq_lic=x(:,51);%Standard deviation of specific humidity from LICOR (g/kg)
co2_lic=x(:,52); %CO2 concentration from Licor (umol/mol)
sgC_lic=x(:,53);%Standard deviation of CO2 concentration from LICOR
(microatm)
press=x(:,54); %Best available atmospheric pressure (mb)
Uearth=x(:,55); %True wind speed (m/s) relative to earth
direarth=x(:,56); % True wind direction (deg) from relative to earth
rlcler=x(:,57); % Longwave downwelling clear sky model (W/m2)
Rscl=x(:,58); % Shortwave solar radiance clear sky model (W/m2)
U10N=x(:,59); % 10m neutral windspeed, COARE 3.5
T10N=x(:,60); % 10m neutral temperature, COARE 3.5
Q10N=x(:,61); % 10m neutral specific humidity, COARE 3.5
RHrf=x(:,61); % relative humidity at reference height
rh=x(:,63); % psd RH (%)
rh_im=x(:,64); % ship RH (%)
press=x(:,65); % psd pressure (mbar)
P_im=x(:,66); % ship pressure (mbar)
rnl=x(:,67); % net longwave heat flux (w/m2)
hnet=x(:,68); % net heat flux, bulk, W/m2
hnet_c=x(:,69); % net heat flux, turb, W/m2

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Below are some comparison plots of the flux differences between the version 1 and 2 of the dataset, for stress, sensible and latent heat fluxes respectively.



