Flux system on the WFBAY, result file output format README

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GreatLakes_flux10min_year-month_v3_decorr.txt - 10-minute met/flux results
43 columns formatted as follows:
% 1: fractional (decimal) day of year
% 2: air temperature, LUFFT sensor, deg C
% 3: relative humidity, LUFFT sensor, %
% 4: atmospheric pressure, LUFFT sensor, mbar
% 5: water temperature, Seabird, degC
% 6: solar downwelling radiative flux, LUFFT sensor, W/m2
% 7: IR downwelling radiative flux, W/m2 - not measured, actually a clear sky model +10W added to it.
% 8: air temperature, IRGASON sensor, deg C
% 9: relative humidity, IRGASON sensor, %
% 10: atmospheric pressure, IRGASON sensor, mbar
% 11: air specific humidity from IRGASON, g/kg
% 12: air specific humidity from LUFFT, g/kg
% 13: surface saturation specific humidity, g/kg
% 14: air density, LUFFT sensor, kg/m3
% 15: true wind speed, IRGASON sensor, m/s
% 16: true wind direction, IRGASON sensor, deg
% 17: relative wind speed, IRGASON sensor, m/s
% 18: relative wind direction, IRGASON sensor, deg from bow
% 19: relative wind speed, LUFFT sensor, m/s
% 20: relative wind direction, LUFFT sensor, deg from bow
% 21: height above the reference ellipsoid (WGS84 coordinate system), m
% 22: latitude
% 23: longitude
% 24: Course-Over-Ground, estimated from IMU GPS, deg
% 25: Speed-Over-Ground, estimated from IMU GPS, m/s
% 26: mean airflow tilt angle, IRGASON, deg
% 27: heading, IMU sensor, deg
% 28: ship plume contamination index (1=bad, 0=good)
% 29: maneuver index (<3 is good)
% 30: latent heat 'Webb correction' flux
% 31: streamwise wind stress, covariance, IRGASON, N/m2
% 32: wind stress, COARE 3.6 bulk model, N/m2
% 33: sensible heat flux, covariance, IRGASON, W/m2
% 34: sensible heat flux, COARE 3.6 bulk model, W/m2
% 35: latent heat flux, covariance, IRGASON, W/m2
% 36: latent heat flux, COARE 3.6 bulk model, W/m2
% 37: Evaporation, covariance, mm/hour
% 38: Evaporation, COARE 3.6 bulk model, mm/hour

% 39: IRGASON H2O Strength
% 40: IRGASON CO2 Strength
% 41: CO2 concentration, IRGASON, umol/mol
% 42: CO2 flux, IRGASON, micatm m/s
% 43: std dev of CO2 concentration, IRGASON, umol/mol

Notes:

• Two quality criteria are provided in the data set:

* A maneuver index (jmanuv) less than 3 implies no significant maneuver during the average. This is an index based on the standard deviations of the heading, the ship speed and the ship motion in the y-direction.

* A ship plume contamination index (jplume) equal 0 implies no ship or other contamination. This index is based on wind, temperature and humidity variances from the IRGASON, as well as H20 strength more than 80% and a mean tilt flow between 0 and 10degrees.

Combining those 2 quality criteria to the relative wind direction should remove most of the outliers from the data set. Other outliers should be assessed. For instance: jj=find((rwdir_son<90 & rwdir_son>-90) & jmanuv<3 & jplume==0);

• Because the IRGASON detects water vapor mass concentration (ρv in kg/m3), the water vapor -velocity correlation must be corrected as per Webb et al (Hlatent = Le <w' ρv'> + hl_webb). The values given for covariance heat fluxes in the file are Le<w' ρv'>. Values for hl_webb are included in column 30. This should be applied to the covariance values. It is already included in the bulk values given here.

• The CO2 fluxes have not been corrected any possible effects (humidity or temperature Webb effect for instance).

• Sensible heat flux was computed from vertical velocity -sonic temperature covariance. The humidity contribution to sonic temperature was removed using the bulk latent heat flux.

• Assuming a draft of ~8m, the IRGASON&LUFFT sensor height were estimated to be around 23.5m, the IMU at 14.6m, the Seabird temperature sensor at ~-7m below water line.