Flux and meteorological data Standard Operating Procedure
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Revision history
2009-02-25, 2009-10-08
Current: 2011-09-29

I. Processing data
1. Go to processing directory:
   - L:\Applied Science\Non-CESI science projects\Mangrove CO2 fluxes\Tower\ data_2006_2008\processing\

2. Convert 1-min logger data to 30-min files for periods when data was extracted from the loggers and when the computer (and LabView) was shut off.
   - Open in Excel, remove headers, replace {NAN, inf, #NAME?} with 'NaN'. Save as a different *.dat file.
   - Process minute data using: logger1_minute_to_halfHourly_09.m and logger2_minute_to_halfHourly_09.m
   - Paste files from …\logger_1\minute_files\output to logger_1 monthly folders (same for logger_2)

3. Run fixOffset.m for any half-hourly logger_1 or logger_2 files that have become offset by 1 minute or more. For instance, Lab View generated the file 0901250831.txt. A whole set of files was offset by 1 minute. However, restarting the program on January 26, 2009 seemed to fix this issue.

4. Run fluxes_main_test3.m and sonic_wind_direction.m
   - Flux processing based on fluxes_main.m, but will only process files from startDate to endDate (one day before this day).
   - Output data to …\data_2006_2008\run_fluxes\output\flux_YYMMDD.txt
   - Before 2009-07-16, data were: [H, LE, Fco2, ustar]
   - Starting 2009-07-16, data are: [H, LE, Fco2, ustar, CO_2, H_2O, Temp, P].
   - Mean terms (CO_2, H_2O, Temp, P) set to: 13-19, 0-2600, 0-40, 99-103, respectively. See filters in H_LE_fun3.m.
   - Wind processing (file listed above) output: [u, v] average wind vectors from the sonic anemometer.
   - Wind data in …\data_2006_2008\run_fluxes\output\wind\wind_YYMMDD.txt

4. (ONLY before 2009-07-16) Run CO2_main_postWilma.m.
   - This computes mean quantities (all from the LICOR) from startDate to endDate (one day before this day).
   - Output data to …\data_2006_2008\run_fluxes\output\means_YYMMDD.txt
   - Data are: [CO_2, H_2O, Temp, P], and are needed to compute the half-hourly change in CO_2 storage effect on NEE.
   - Starting on 2009-07-16, storage (mean) values are computed using flux script (above).

4. Run log1_main_test.m (in …\data_2006_2008\processing directory)
   - Based on log1_main.m, but processes files from startDate to (endDate – 1).
   - Output data to …\data_2006_2008\processing\output\logger1_YYMMDD.txt
   - Fields are identified in log1Fun.m. Note that the fields will be identified later upon concatenation of daily data files.

5. Run log2_main_09_test.m (in …\data_2006_2008\processing directory)
   - Based on log2_main_09.m, but processes files from startDate to (endDate – 1).
   - Note that log2_main_09.m replaced log2_main.m, which had a different set of output fields.
   - Output data to …\data_2006_2008\processing\output\logger2_YYMMDD.txt
   - Fields are identified in log2Fun_09.m. Again, fields will be identified later upon concatenation of daily data files.

6. Concatenate {fluxes, logger1, logger2} using flux_concat_postWilma3.m (in …\data_2006_2008\run_fluxes). Concatenate sonic wind data using wind_concat.m.
   - Creates a big matrix with all of the data, including the date: {year, month, day, hour}
   - Outputs a user defined *.mat file to: 'data_2006_2008\processing\output\synthesis\' with fields: out, id (structure).
   - Note that the current version of this code generates data in increments of a full year. Consequently, there can be large blocks of output with NaNs. This can easily be cleaned up later.

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Comment: Develop the code to append or insert newly processed (since the last run) data. Reprocessing and concatenating all the post-Wilma data is redundant.

II. Data reconstruction and gap-filling fluxes

1. Run gap_fill_met_data2.m (in …\data_2006_2008\analysis\). This program adds fields to and fills in missing or errant data in key fields from the data matrix in step I above. Specific station data includes:
   a. SH3 – USGS, Gordon Anderson. This includes: [Date, time, cond_surf, T_surf, stage, ground_water_level]. 30-min interval.
   b. SR – NPS station. Includes: [date, time, salinity]. 60-min interval.
   c. JB – NPS station. Includes: [date, time, Tair, photo_rad, total_rad]. 30-min interval.
   d. RPL – NPS station (Royal Palm). Includes: [date, time, Tair]. 60-min interval.
2. DataForEver procedure:
   a. Choose merged datasets for a given site (e.g. JB, Joe Bay) at a half-hourly interval (see above).
   b. Replace 'null' with 'nan' in appended Excel (.txt) data. Save file with new date in file name.
   c. Change station input file names in gap_fill_met_data.m, and update name of the output file (patched_postWilma_yyyymmdd.txt). Output is: {out, id}.
3. Run fillGapsMain2.m. This gap-fills CO_2 fluxes (id.Fco2s).
   a. Output – D (data matrix), h (id structure), fNaN (filter showing where invalid and missing Fco2 values were gap-filled). So, ~fNaN give locations of the valid CO_2 fluxes.
   b. User must specify an output file such as 'results_postWilma_yyyymmdd.mat' in …\data_2006_2008\processing\output\synthesis\
4. Run flux_error_simulation_ver5.m. This code imputes wind data from sonic, performs flux filtering for fetch, and writes out a data file such as: results_post_yyyymmdd.mat with fields: {D, h, fNaN}
   a. Run code using gapBuildFun2.m then gapBuildFun2a.m. Copy and paste 'result' structure (day, night, total) into the Excel spreadsheet for calculating monthly –NEE and errors – *NEP_statistics_yyyymmdd.xlsx*

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Comment: How do we automate gap filling of meteorological data? The problem is that we need to download recent data from dataForEver and regress data from dataForEver (x-axis) versus tower data (y-axis). The period of record can vary depending on available data sets.