Parameters in file SeaState\_2015\_met\_sfc\_flx\_V0\_10min

There is both a matlab version and a NetCDF version of this file. They contain the same variables.

June 16, 2016 OP

File name shows that values are 10-minute averages (or interpolations for wave parameters) for Days 274 (Oct 1) through 310 (Nov 6) 2015 along track of R/V Sikuliaq.

**column varName description**

1 jd\_ref decimal day-of-year at start of averaging interval

2 lat\_ref latitude

3 lon\_ref longitude, +/- 180 deg

4 sog\_ref gps speed over ground, m/s

5 std\_sog\_ref std deviation in sog, m/s

6 cog\_ref gps course over ground, deg

7 hed\_ref gps heading, deg

8 std\_hed\_ref std deviation in gyro heading, deg

9 wspd\_ref true windspeed, composite, m/s

10 wdir\_ref true wind direction, composite, m/s

11 rwspd\_ref relative wind speed, composite, m/s

12 std\_rwspd\_ref std deviation rel wind speed, composite, m/s

13 rwdir\_ref relative wind dir, composite, +/- 180 deg from bow

14 std\_rwdir\_ref std deviation rel wind direction, composite, deg

15 ta\_ref air temperature, C

16 rh\_ref relative humidity, %

17 qa\_ref specific humidity, g/kg

18 ts\_skn\_ref composite skin temperature from ship-based IR sources, deg C

19 ts\_snk\_ref sea-snake temperature when deployed (either at 10 cm depth or
 on top of ice/snow), deg C

20 to\_frz\_ref freezing point of sea water from salinity from ship intake (6.5
 m depth), deg C

21 sal\_ref salinity at ship intake (6.5 m depth), PSU

22 qs\_ref surface saturation specific humidity, g/kg

23 p\_mb\_ref atmospheric pressure at height zp, mb

24 slp\_ref sea-level pressure by height-correcting p\_mb\_ref, mb

25 swd\_med\_ref downwelling SW radiation, manually edited, W/m2

26 swd\_bst\_ref downwelling SW radiation, linear interpolation across gaps,
 W/m2

27 lwd\_med\_ref downwelling LW radiation, manually edited, W/m2

28 lwd\_bst\_ref downwelling LW radiation, gaps estimated by linear
 interpolation between good data points, W/m2

29 mlh\_ref atmospheric mixed-layer height estimated from soundings at times
 of soundings, m

30 cld\_bas\_ref median cloud base from ceilometer during 10-min period, m

31 pcp\_ref precipitation rate (set to 0.1 mm/h when logs indicated precip;
 otherwise 0)—i.e., only coarse indicator if precipitating or not

32 zt\_ref air temperature measurement height, m

33 zq\_ref air humidity measurement height, m

34 zp\_ref air pressure measurement height, m

35 zu\_ref wind speed measurement height, composite

36 hs\_blkr bulk sensible heat flux (W/m2) calculated using COARE or SHEBA
 flux schemes depending on ice concentration (50% threshold). Neither
 scheme was developed for mixed waves and ice. Parameters 32-35 used for
 instrument heights.

37 hl\_blkr bulk latent heat flux (W/m2), as for sensible heat flux

38 ust\_blkr bulk friction velocity (m/s), as for sensible heat flux

39 swu upwelling shortwave radiation estimated from best downwelling SW
 radiation and estimated surface albedo; W/m2

40 lwu upwelling longwave radiation estimated from composite skin
 temperature, estimated surface emissivity, and Stefan-Boltzmann relation;
 W/m2

41 alb\_ref surface albedo estimated from the observed surface conditions(ice
 conc, snow depth, skin temperature, water freezing point) and subjective
 estimates of alb=0.08 (open water), 0.35 (thin ice), 0.65(thicker ice),
 0.85 (snow covered ice)

42 emiss\_ref surface emissivity estimated from surface type/conditions:
 emiss=0.99 (open water), 0.985 (ice covered water)

43 fatm net atmospheric energy flux at the surface(=swd\_bst\_ref-swu+
 lwd\_bst\_ref-lwu-hs\_blk\_ref-hl\_blk\_ref); W/m2

44 ice\_concvo\_ref total ice concentration from visual observations,0-10

45 ice\_typ1vo\_ref primary ice type from visual observations

 10-frazil;11-shuga;12-grease;13-slush;20-nilas;30-pancakes;40-young grey
 ice 10-15cm; 50-young grey ice 15-30 cm; 60-first year < 70 cm; 70-first
 year 70-120 cm; 80-first year>120 cm; 75-second year; 85-multiyear;
 90-brash; 95-fast ice

46 ice\_z\_ref ice thickness estimates from visual observations, cm

47 snow\_z\_ref snow depth estimates from visual observations, cm

Notes:

1. The bulk turbulent fluxes are very preliminary and are based on roughness lengths and conditions for either over near 100% multi-year ice cover or open water conditions using parameterized Charnock relationships, depending on the estimated ice cover (50% threshold). There is no application of the roughness lengths to be determined from the covariance turbulent flux measurements from the cruise, nor do these bulk fluxes use the measured wave heights. Hopefully, these will all be applied by the end of the project.
2. The parameters described as “composite” (e.g., wspd\_ref, ts\_skn\_ref) utilize data from different sensors on the ship depending on the ship-relative wind direction or riming conditions to try to minimize the effects of the ship or riming on these parameters. The selection of instrument used for each hour has been carefully done by comparing time series, ship-relative wind directions, temperature/humidity conditions, and manual notes by onboard scientists.
3. The downwelling radiation was significantly contaminated by riming. The obviously contaminated values have been manually removed. The “best” estimates of these parameters include linear interpolation across the missing data points. Negative values of SWd are set to 0 W/m2. Other techniques for filling in these gaps are also possible but are not included in this file; they may be utilized in future versions.
4. The upwelling radiation terms are obtained from surface albedo values estimated from measured surface conditions (ice concentration; snow depth; surface skin temperature) providing SWu, or the surface skin temperature and estimated surface emissivity (emiss\_ref) providing LWu using the Stefan-Boltzmann relation. These estimated upwelling radiation terms are combined with the downwelling radiation terms and the bulk turbulent fluxes to obtain the complete surface energy budget fatm. The values for SWu, LWu, alb\_ref, emiss\_ref, and fatm are based on the above technique applied using values for albedo and emissivity felt appropriate by O. Persson and indicated in description for variables 41 and 42. Other choices or techniques are possible and may give slightly different results.
5. The variables obtained from visual observations (variables 44, 45, 46, & 47) are obtained from the spreadsheet summarizing the manual observations obtained from the bridge throughout the cruise (SKQ201512S\_Clean\_Summary)
6. The atmospheric mixed-layer depth (variable 29) is estimated from each balloon sounding and is only documented for the 10-minute period closest to the sounding time
7. The cloud base (variable 30) is obtained from the ceilometer 15-s backscatter profiles, and the cloud base value reported is the median value during the 10-min time period