March 04 2016

Selection of 'best' bulk met values for SeaState 2015 cruise.
File: SeaState_2015_met_10min_v1.txt

Variables:
version 1, BWB, March 2016

col	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	std_hed_ref	std deviation in gyro heading, deg
8	wspd_ref	true windspeed, composite, m/s
9	wdir_ref	true wind direction, composite, m/s
10	rwspd_ref	relative wind speed, composite, m/s
11	std_rwspd_ref	std deviation rel wind speed, composite, m/s
12	rwdir_ref	relative wind dir, composite, +/- 180 deg from bow
13	std_rwdir_ref	std deviation rel wind direction, composite, deg
14	ta_ref	air temperature, C
15	rh_ref	relative humidity, %
16	qa_ref	specific humidity, g/kg
17	ts_ref	surface temperature, composite, C
18	qs_ref	surface saturation specific humidity, g/kg
19	p_mb_ref	atmospheric pressure at height zp, mb
20	rs_ref	shortwave downwelling PSP radiative flux, edited, W/m2
21	rl_ref	longwave downwelling PIR radiative flux, edited, W/m2
22	rain_ref	rain rate, mm/hr (set to zero for SeaState2015)
23	zt_ref	air temperature measurement height, m
24	zq_ref	air humidity measurement height, m
25	zp_ref	air pressure measurement height, m
26	zu_ref	wind speed measurement height, composite, m

Best Wind Speed / Direction:

A reference relative wind direction and speed is defined as the starboard mast anemometer for rwdir 0 to 180° and as port mast anemometer for rwdir 0 to -180°. All wind sensors are subject to flow distortion effects, however, so there is no perfect reference standard.

The upper PSD sonic is at the top of the bow tower & slightly off center to stbd by ~0.3 m. It should be least affected by interferences when relative wind direction shifts. The lower PSD sonic is mounted on a davit on the bow's nose, below the tower and slightly ahead of the tip of the bow. This sonic will experience significant flow distortion effects.

Raw U/V from both PSD sonics was corrected with a standard factor for flow distortion effects: U/0.95, V/1.15. These factors may not be exactly appropriate for this ship, esp for the lower sonic.

The ship scs sonic is also at the top of the tower, off center to port and ~0.5 m lower than the PSD sonic.

Mast sonics are on either side of the upper radar platform of the main mast just behind the bridge and several meters higher than the bridge roof.

All wind measurements should agree well when rwdir is near zero. This is mostly true except for the lower PSD sonic. Bias appears rapidly in the two mast sonics when wind shifts away from the bow to +/- 90°. The mast anemometers clearly show the effects of disturbance when wind blows from the opposite side of the mast and as expected return to reasonable agreement when rwdir is from the stern (+/-180°).

The ship scs sonic shows distortion effects when relative wind direction shifts to starboard. The PSD sonic mounted to the right will interfere with the ship sonic when wind is from the stbd direction. Because it is mounted lower than the PSD upper sonic it is more affected by flow distortion around the tower platform.

For rwdir +/- 120 deg, the PSD upper sonic is within 1 m/s of the reference rwspd and deviates least over this range. Suggest using PSD upper as 'best' wspd when rwdir range is within +/- 120°, the stbd mast sonic for rwdir > 120° and the port mast sonic for rwdir < -120°. Vairable zu records changes in measurement height, depending on the anemometer chosen for the 'best' value.

T / RH

Air temperature measurements from the ship and both PSD systems were within 0.2 °C.
The PSD HMT 337 temperature is used for the 'best' ta value.

Ship RH is biased high, frequently over 100%. PSD HMT 335 and HMT 337 RH largely agree in the mean but the 337 shows much greater temporal variability. The 335 RH can flatline at high RH and can take several hours to reequilibrate when RH falls. HMT337 RH is used as the 'best' RH value.

Pressure

Corrected to sea level, all pressure measurements agree to within a couple tenths of a mb. PSD pressure is used as the 'best' value. The zp variable indicates measurement height (17m).

Rain

Rain was not observed during the project and the ORG rain gauge was mostly covered with ice or frost in any case. Several instances of light snow were noted but we have no reliable measure of total precip. Rain is set to zero in the 'best' met dataset.

Solar Radiative Flux

'Best' data are from the PSD PSP sensors, hand selected for periods when the PSPs are free of frost or icing. Missing values are interpolated.

IR Radiative Flux

'Best' data are from the PSD PIR sensors, hand selected for periods when the PIRs are free of frost or icing. Missing values are interpolated.

Surface Temperature

Surface temperature is a composite of the PSD sea snake and 'best' IR radiometric skin tempertures. Both of these were first edited to remove bad values. For jd 275 we use the sea snake since we were in open water and the IR temperature seems off. For other days we use IRt when the difference from the sea snake is greater than 0.5 ℃ (the assumption is that we are in ice) and the sea snake temperature if the difference is less than 0.5 ℃. If either the sea snake or IRt is missing for a given period we use the corresponding good value.

Navigation Parameters

Ship GPS and gyro are used for 'best' lat, lon, sog, cog and heading.