

The BYU QuikSCAT/SeaWinds Ultra High Resolution Wind and Wind/Rain Product

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1 BYU Ultra High Resolution Wind/Rain Product User Notes

1.1 Data Format:

Table 1 shows the header of the BYU L2H product HDF file.

Table 2 summarizes the SDS contents of the file. The individual SDS elements are described below.

The various data sets contain:

1. **ascnode**: indicates whether the data is from an ascending or descending pass
2. **swath_indicies**: vector of along-track and cross-track starting and ending indicies on ultra high resolution grid. The data is stored as follows [along-track_start, along-track_end, cross-track_start, cross-track_end].
3. **latitude**: latitude index of each wvc
4. **longitude**: longitude index of each wvc
5. **land_mask**: flags land or water for each wvc
6. **wind_speed**: wind-only wind speed ambiguities (m/s), in corresponding MLE value order
7. **wind_dir**: wind-only wind direction ambiguities (deg), in corresponding MLE value order
8. **num_ambigs**: number of wind-only ambiguities at each wvc (max=4)
9. **max_likelihood_est**: MLE value from wind retrieval (units arbitrary)
10. **wvc_selection**: index (1..4) of selected wind-only ambiguity (type of ambiguity selection is in the ambig_select field in the header)
11. **wvc_selection2**: alternate ambiguity selection (type of ambiguity selection is in the ambig_select2 field in the header)
12. **wind_speed_ncep**: ncep wind speeds (m/s) interpolated to 2.5km
13. **wind_dir_ncep**: ncep wind directions (deg) interpolated to 2.5km
14. **wind_speed_L2B**: L2B wind speeds (m/s) interpolated to 2.5km

Table 1: Header Structure for BYU L2H Product. Sample values shown.

Element Name	Definition	Max Array Size
LongName	QuikSCAT 2.5km Ocean Wind Vectors and Rain Rate	[1]
ShortName	QSCATL2H	[1]
producer_institution	Brigham Young University (BYU), Microwave Earth Remote Sensing (MERS) Laboratory	[1]
InstrumentShortName	SeaWinds	[1]
PlatformLongName	NASA Quick Scatterometer	[1]
PlatformShortName	QuikSCAT	[1]
data_format_type	NCSA HDF	[1]
L2Hfilename	QS_S2H03221.20001592043	[1]
avewrfilename	QS_S2A03221.20001592043.avewr	[1]
L2Bfilename	QS_S2B03221.20001592046	[1]
Investigator	David G. Long, long@ee.byu.edu (801) 422-4383	[1]
WindModel	QS_MODL0003	[1]
RainModel	BYU V6 Quadratic	[1]
RainThresholds	BYU_rainflag_thresholds_V0.txt	[1]
build_id	1.000/2004-01-01	[1]
ambig_select	Median Filtered Closest to L2B	[1]
ambig_select1	Maximum Aposteriori Probability	[1]
rain_file	indicates whether file contains simultaneous wind/rain info	[1]
map_file	indicates whether file contains MAP estimation info	[1]

Table 2: Possible HDF SDS arrays within the BYU L2H Product. ⁽¹⁾ Simultaneous wind/rain data not always included. ⁽²⁾ MAP wind estimation data for hurricanes not always included.

Dataset/Name	Rank	Dimensions (Maximum)			Scale	Offset	Type
ascnode	1	1	0	0	0.056	0.0	int*2
swath_indicies	1	4	0	0	1.000	0.0	int*2
latitude	2	760	16240	0	0.001	0.0	int*2
longitude	2	760	16240	0	0.001	0.0	int*2
land_mask	2	760	16240	0	1.000	0.0	byte8
rain_flag	2	760	16240	0	1.000	0.0	int*2
wind_speed	3	760	16240	4	0.0050	0.0	int*2
wind_dir	3	760	16240	4	0.0056	0.0	uint2
max_likelihood_est	3	760	16240	4	0.0001	0.0	int*2
num_ambigs	2	760	16240	0	1.000	0.0	byte8
wvc_selection	2	760	16240	0	1.000	0.0	byte8
wvc_selection2	2	760	16240	0	1.000	0.0	byte8
wind_speed_L2B	3	760	16240	0	0.010	0.0	int*2
wind_dir_L2B	3	760	16240	0	0.010	0.0	uint2
wind_speed_ncep	3	760	16240	0	0.010	0.0	int*2
wind_dir_ncep	3	760	16240	0	0.010	0.0	uint2
⁽¹⁾ wind_speed_swr	3	760	16240	4	0.0050	0.0	int*2
⁽¹⁾ wind_dir_swr	3	760	16240	4	0.0056	0.0	uint2
⁽¹⁾ rain_rate_integrated	3	760	16240	4	0.010	0.0	int*2
⁽¹⁾ rain_rate_surface	3	760	16240	4	0.010	0.0	int*2
⁽¹⁾ max_likelihood_est_swr	3	760	16240	4	0.0001	0.0	int*2
⁽¹⁾ num_ambigs_swr	2	760	16240	0	1.000	0.0	byte8
⁽¹⁾ wvc_selection_swr	2	760	16240	0	1.000	0.0	byte8
⁽¹⁾ percent_rain	3	760	16240	4	0.010	0.0	int*2
⁽¹⁾ regime	3	760	16240	4	1.000	0.0	byte8
⁽¹⁾ wvc_selection_opt	2	760	16240	0	1.000	0.0	byte8
⁽¹⁾ set_selection_opt	2	760	16240	0	1.000	0.0	byte8
⁽¹⁾ wvc_quality_flag	2	760	16240	0	1.000	0.0	int*2
⁽¹⁾ rain_confidence_flag	2	760	16240	0	1.000	0.0	byte8
⁽²⁾ hurricane_model_params	1	5	0	0	1.000	0.0	int*2
⁽²⁾ wvc_selection_map	2	760	16240	0	1.000	0.0	byte8
⁽²⁾ map_model_speed	3	760	16240	0	0.0050	0.0	int*2
⁽²⁾ map_model_dir	3	760	16240	0	0.0056	0.0	uint2
⁽²⁾ wind_speed_map	3	760	16240	4	0.0050	0.0	int*2
⁽²⁾ wind_dir_map	3	760	16240	4	0.0056	0.0	uint2
⁽²⁾ max_aposteriori_prob_est	3	760	16240	4	0.0001	0.0	int*2
⁽²⁾ num_ambigs_map	2	760	16240	0	1.000	0.0	byte8

15. **wind_dir_L2B**: L2B wind directions (deg) interpolated to 2.5km
16. **wind_speed_swr**: simultaneous wind/rain wind speed ambiguities (m/s), in MLE value order
17. **wind_dir_swr**: simultaneous wind/rain wind direction ambiguities (deg), in MLE value order
18. **rain_rate_integrated**: rain rate ambiguities (km mm/hr), in MLE value order
19. **rain_rate_surface**: rain rate ambiguities (mm/hr), in MLE value order
20. **max_likelihoood_est_swr**: MLE value from wind or wind/rain retrieval (units arbitrary)
21. **num_ambigs_swr**: number of ambiguities at each wvc (max=4)
22. **wvc_selection_swr**: index (1..4) of selected simultaneous wind/rain ambiguity based on median-filter-based ambiguity removal
23. **percent_rain**: inferred wvc rain fraction (percent) for each ambiguity
24. **regime**: estimated wind/rain retrieval regime
 - 0 - Estimated rain does not significantly affect wind (rain estimate poor)
 - 1 - Estimated rain and wind backscatter are of same order (both rain and wind estimate OK)
 - 2 - Estimated rain dominates wind (wind estimate quality poor)
25. **wvc_selection_opt**: ambiguity selection index (1..4) from combined simultaneous wind/rain and wind-only retrieval. Index is for simultaneous wind/rain ambiguities (**wind_speed**) where **set_selection_opt**=0 or from wind-only ambiguities (**wind_speed1**) where **set_selection_opt**=1
26. **set_selection_opt**: flag to indicate which retrieval method is used for each wvc. Used with **wvc_selection_opt**.
 - 0 - index value **wvc_selection_opt** for simultaneous wind/rain retrieval,
 - 1 - index value **wvc_selection_opt** for wind-only retrieval
27. **wvc_quality_flag**: copy of L2B **wvc_quality_flag** on 2.5km grid
28. **rain_confidence_flag**: rain estimate quality confidence flag
 - 0 - Low confidence in estimated rain
 - 1 - High confidence in estimated rain
29. **hurricane_model_params**: hurricane model parameters for MAP estimation [**along-track_eye_index**, **cross-track_eye_index**, **max_speed_scale**, **mean_flow_u**, **mean_flow_v**]. **Along-track_eye_index** and **cross-track_eye_index** are the eye center indices starting from **along-track_start** and **cross-track_start**.
30. **wvc_selection_map**: index (1..4) of selected point-wise MLE ambiguity based on MAP ambiguity selection
31. **map_model_speed**: hurricane model fit speed field that provides the means of the prior distributions for MAP ambiguity selection or MAP estimation
32. **map_model_dir**: hurricane model fit direction field that provides the means of the prior distributions for MAP ambiguity selection or MAP estimation

- 33. **wind_speed_map**: field-wise MAP estimation wind speed ambiguities (m/s), in corresponding MAP value order
- 34. **wind_dir_map**: field-wise MAP estimation wind direction ambiguities (deg), in corresponding MAP value order
- 35. **max_aposteriori_prob_est**: MAP value from MAP wind retrieval (units arbitrary)
- 36. **num_ambigs_map**: number of MAP ambiguities at each wvc (max=4)

1.2 Usage Guidance:

Wind direction convention

The oceanographic, or flow vector, convention for wind direction is adopted for SeaWinds on QuikSCAT. Under this convention, a wind direction of 0 implies a flow toward the north.

Reference Height for Surface Winds

The adopted reference height for all wind vectors is 10 meters.