WIS “Oneline” data file format

http://wis.usace.army.mil

The WIS oneline files are space-delimited columnar ASCII files which include one row per observation and 33 columns of data. The data for each WIS station are organized in separate yearly files with no header information so they can be easily concatenated together. Wave estimates and parameters have been generated based on the total energy, wind-sea (0) portion of the energy still under the influence of the wind (active growing), and swell (1) portion of the energy that is traveling faster than the local winds. The total wave height can be obtained from the wind-sea and swell components only by adding the energies (squaring each height, and taking the square root).

$$\mathrm{HMO} = \sqrt{\mathrm{HMO0}^2 + \mathrm{HMO1}^2}$$

A flag of -999 indicates missing, or undefined information for that time. The table below provides a variable name and description for each column.

Column	Variable	Description
1	DATE	Year, month, day, hour, minute, second (YYYYMMDDHHMMSS) UTC
2	STATION	Station ID (Basin, Level, Individual Station Number SEE BELOW)
3	LAT	Latitude in decimal degrees
4	LON	Longitude in decimal degrees (East: POSTIVE ; West: NEGATIVE)
5	WNDSPD	Equivalent Neutral Stable Marine Exposure 10-m Wind Speed (m/s)
6	WNDDIR	Wind Direction (degrees clockwise from True north)
7	USTAR	Frictional Velocity (m/s)
8	CD	Non-dimensional Drag Coefficient * 1000
9	WAVSTRS	Wave Stress ratio of stress associated with waves to total stress
10	HMO	Total: Significant Wave Height (m)
11	TPD	Total: Peak spectral wave period discrete spectral band (s)
12	TP	Total: Parabolic fit of the spectral wave period (s)
13	TM	Total: Mean wave period (s); Integral of $1.0/f^{-1}E(f,\theta)$
14	TM1	Total: First moment wave period (s); [Integral of $f \cdot E(f,\theta)$ then inverted for period]
15	TM2	Total: Second Moment Wave Period (s); [Integral of $f^2 \cdot E(f,\theta)$ then inverted for period
16	WAVD	Total: Vector Mean Wave Direction (degrees clockwise from True north)
17	SPRD	Total: Directional Spread at the Mean Wave direction (deg)
18	HMO0	Wind-Sea: Significant Wave Height (m)
19	TPD0	Wind-Sea: Peak Spectral Wave Period Discrete Spectral Band (s)
20	TP0	Wind-Sea: Parabolic fit of the spectral wave period (s)
21	TM0	Wind-Sea: Mean Wave Period (s); Integral of $1.0/f^{-1}E(f,\theta)$
22	TM10	Wind-Sea: First Moment Wave Period (s); [Integral of $f \cdot E(f,\theta)$ then inverted for period]
23	TM20	Wind-Sea: Second Moment Wave Period (s); [Integral of $f^2 \cdot E(f,\theta)$ then inverted for period
24	WAVD0	Wind-Sea: Vector Mean Wave Direction (degrees clockwise from True north)

Column	Variable	Description
25	SPRD0	Wind-Sea: Directional Spread at the Mean Wave direction (deg)
26	HMO1	Swell: Significant Wave Height (m)
27	TPD1	Swell: Peak Spectral Wave Period Discrete Spectral Band (s)
28	TP1	Swell: Parabolic fit of the spectral wave period (s)
29	TM1	Swell: Mean Wave Period (s); Integral of $1.0/f^{-1}E(f,\theta)$
30	TM11	Swell: First Moment Wave Period (s); [Integral of $f \cdot E(f,\theta)$ then inverted for period]
31	TM21	Swell: Second Moment Wave Period (s); [Integral of $f^2 \cdot E(f,\theta)$ then inverted for period
32	WAVD1	Swell: Vector Mean Wave Direction (degrees clockwise from True north)
33	SPRD1	Swell Portion: Directional Spread at the Mean Wave direction (deg)

Comma Separated Column Heading List:

The variables listed in the table above are provided in the comma separated line below. This can be useful to add to the top of a WIS data file as a header line or to define variable names in a spreadsheet application.

DATE,STATION,LAT,LON,WNDSPE,WNDDIR,USTAR,CD,WAVSTRS,HMO,TP,TPD,TM,TM1,TM2, WAVD,SPRD,HMO0,TP0,TPD0,TM0,TM10,TM20,WAVD0,SPRD0,HMO1,TP1,TPD1,TM1,TM11, TM21,WAVD1,SPRD1

WIS Station Name Convention

The WIS Station system consists of a 5 numerical number. The first number indicates the Basin run. The Atlantic stations are 60000 series, the Gulf of Mexico are the 70000 series, the Pacific 80000 series, and the Great Lakes the 90000 series. The second number indicates the Level of the WIS Hindcast. Most of the large-scale domains (Atlantic, Pacific) contain 3 distinct grids, where the resolution increases toward the coastline. A “1” indicates the Basin Level, a “2” is the Regional Level, a “3” is the Coastal level. The Great Lakes use this second digit to indicate individual lakes because only one grid is used. Lake Superior is defined by a “5”, Lake Michigan a “4”, Lake Huron “3”, Lake Erie “2” and Lake Ontario “1”.

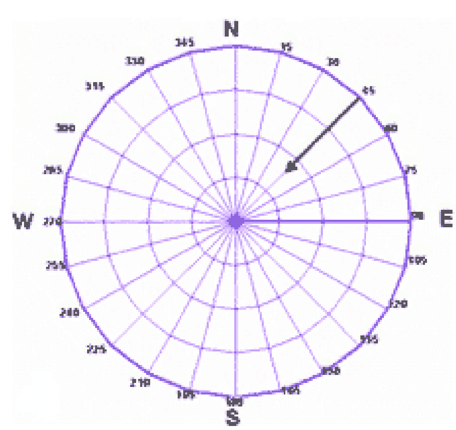
Note the WIS website is filled with the highest resolution model run information. The remaining 3 digits define the individual station number. Note that each of the station numbers will start at 0001 for every unique level. Examples are provided below:

63002 Atlantic Ocean, (6), Coastal (3), Station 002
81101 Pacific Ocean (8), Basin (1), Station 101
94460 Great Lakes (9), Lake Michigan (4), Station 460

WIS Direction Convention

WIS wind and wave directions use meteorological convention. A direction of 0° corresponds to a wind that is blowing from True North or a wave arriving from True North. Similarly, a direction of 90° corresponds to a wind or wave from due East.

The arrow in the figure represents a wind or wave vector with a 45° direction which is from the Northeast.



WIS Wave Parameter Equation Forms:

- USTAR: The frictional velocity is defined as USTAR = WNDSPD · (CD)$^{1/2}$ or:

$$u_* = U_{10} * \sqrt{C_D}$$

- CD: the roughness of the air/sea boundary. It is related to the roughness length based on a logarithmic profile or

$$C_D = \kappa \big/ \ln^2 (z / z_0)$$

Where κ is the von Karman constant, z is an elevation and z_0 is the roughness length.

- HMO (0, 1): Defined as four times the square root of the total energy of the 2-dimensional wave spectra plus the residual energy defined in the parametric region of the spectrum.

$$H_{mo} = 4* \sqrt{\iint E(f,\theta) df\, d\theta}$$

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- TPD (0, 1): Peak Spectral Wave Period: The inverse of the frequency band where the maximum energy resides.

- TP (0, 1): Parabolic fit based on the energy level at the discrete frequency and the two bands surrounding the peak. This removes the dependency on the frequency banding. This definition is generally used for evaluation

- TM (0, 1) The Mean Wave Period. The difference between total, wind-sea (0) and swell (1) is the integration bounds on the frequency and direction domains.

$$T_m = \left[\frac{\int E(f) df}{\int f^{-1} * E(f) df} \right]$$

- TM1 (0, 1): First Moment of Mean Wave Period. The difference between total, wind-sea (0) and swell (1) is the integration bounds on the frequency and direction domains:

$$T_{M1} = \left[\frac{\int f * E(f) df}{\int E(f) df} \right]^{-1}$$

- TM2 (0, 1): Second Moment of Mean Wave Period. The difference between total, wind-sea (0) and swell (1) is the integration bounds on the frequency and direction domains

$$T_{M2} = \left[\frac{\int f^2 * E(f) df}{\int E(f) df} \right]^{-1/2}$$

- WAVD (0, 1): Vector mean wave direction over the entire spectrum The difference between total, wind-sea (0) and swell (1) is the integration bounds on the frequency and direction domain

$$\theta_{MEAN} = \arctan(X_{COMP}, Y_{COMP})$$

Where:

$$X_{COMP} = \frac{\iint \cos\theta \cdot E(f,\theta) df\, d\theta}{\iint E(f,\theta) df\, d\theta} \; ; \quad Y_{COMP} = \frac{\iint \sin\theta \cdot E(f,\theta) df\, d\theta}{\iint E(f,\theta) df\, d\theta}$$

- SPRD (0, 1): Directional Spread. The difference between total, wind-sea (0) and swell (1) is the integration bounds on the frequency and direction domains (X_{COMP} and Y_{COMP} are defined above)

$$\sigma = \sqrt{2.0 * (1 - \sqrt{X_{COMP}^2 + Y_{COMP}^2}}$$

Contact the Wave Information Studies

http://wis.usace.army.mil/contacts.shtml