SeaSonde 10
Wave file formats
Oct 13, 2008

There are three type of wave files.

Wave_XXXX_YYYY_MM_DD_HHMM.wv4	contains an hourly wave spectra.
WVLS_XXXX_YYYY_MM_DD_HHMM.wl4	contains *wave spectra* data over time.
WVLM_XXXX_YYYY_MM_DD_HHMM.wl4	contains *wave model* data over time.

Each of these files has the same basic structure using the **CODAR Table Format** layout.
Please read the **File_CodarTableFormat** document as a prelude to this format.

Wave Model History Files:

The files are created by a new set of wave processing tools as of **July 2004** based upon a modeled wave analysis. These files are very similar to the Wave Spectra History files, but do not contain the estimated wave height and period columns. These files are plotted by WaveDisplay 10.1.1 or later. Earlier versions of WaveDisplay will not recognize these files.

As of **July 2005**, newer wave model tools produce wave results for multiple ranges. Each range distance is stored in the file as a series of separate tables. The format is mostly compatible with the previous file format as WaveDisplay 10.1.1 to 10.2.5 will plot the first range of these files. To plot any range or multiple ranges requires WaveDisplay 10.2.6 or later. The subtype for multiple range wave files will identify whether it uses multiple ranges or not. The multirange files will also have distance and range cell columns to make them easier to import into other applications like MatLab®.

As of **Sept 2008**, newer wave model tools add three more columns: doppler points used, wave method used and a wave vector indicator flag, which are described below for column types WDPT, MTHD, and FLAG

Identification of the file:

The first keyword in the file must be
%FileType <type> <subtype> <name>
The **<type>** must be '**WVMD'**

The **<subtype>** indicates the file variation
'**WVM1'** for the first version.
'**WVM2'** for the second version of single range wave model data, in which the table data was expanded to show full date of each entry
'**WVM3'** for multiple ranges (one range per table) wave model data. Table data is expanded to show range distance and spectra range cells. (These have a flaw where the range distance is off by one range cell spacing; WaveDisplay 10.3.3 or later will display the correct distance)
'WVM4' for multiple ranges where the range distances are not offset by one range cell. (These have a flaw where the wave direction can be severely off if the coastline is not north/south; The only fix is to reprocess with Radial 10 Release 5 or later)
'WVM5' for multiple ranges where wave directions are correct.

The wave files will typically have a filename extension of '.ctf', '.wls' or '.wl4'

To determine if the file is a WAVE type, you should read the first ten lines looking for the '%Filetype' keyword. The **<type>** value will be **'WVMD**. The **<subtype>** value tells you which variation it is.

'WVM6' added columns of wave doppler points WDPT and wave method MTHD. These files were only produced by pre-release software.

'WVM7' added columns of wave doppler points WDPT, wave method MTHD and vector flag FLAG. WVM7 adds the following metadata: %TimeZone:, %TimeCoverage:, %RangeResolutionKMeters:, %AntennaBearing:, %RangeCells, %DopplerCells, %TransmitCenterFreqMHz, %TransmitBandwidthKHz:, %TransmitSweepRateHz:, %CurrentVelocityLimit:, %BraggSmoothingPoints:, %WaveBraggNoiseThreshold:, %WaveBraggPeakDropOff:, %WaveBraggPeakNull:, %MaximumWavePeriod:, %WaveBearingLimits:, %WaveUseInnerBragg:, %WavesFollowTheWind:, %WaveMergeMethod:.

File Naming:

Filename should be use for archiving the data, NOT as a software determination of whether the file is a valid wave file.

Following the CodarTableFormat the files name use is
WVLM_XXXX_YYYY_MM_DD_HHMM.wls
Where XXXX is site code.
YYYY_MM_DD is year month day.
HHMM is hour minutes.

Keywords:

%CTF: 1.00
Columnar Table Format version.

%FileType: WVMD <subtype> <name>
Identifies the file as a Wave History file. The <subtype> identifies version of this format.

%UUID: D1D12866-7794-403F-9481-0A840978F8A9
A universally unique identifier for each file.

%Manufacturer: CODAR Ocean Sensors. SeaSonde.
Identifies that the file came from SeaSonde. If you create the Wave History file, put your Identity here.

**%Site: XXXX "" **
Contains the four-character site code followed by optional user friendly site name.

%TimeStamp: 2008 10 13 00 00 00
Identifies the center time in year, month, day, hour, minute, second of the data collected in the file.

%TimeZone: "PDT" –7.000 1
Identifies the timezone used as label, hours from UTC, and non zero if daylight saving time was in effect.

%Origin: 38.3173167 -123.0724667

Is the <latitude> <longitude> of the SeaSonde Site.

%TimeCoverage: 0.250 hours
The time each vector covers is plus & minus half this value from the timestamp.

%RangeResolutionKMeters: 2.92572 km
Range resolution of each range cell from the processed cross spectra.
%AntennaBearing: 180.0
Antenna bearing CW from True North.

%RangeCells: 100
Number of range cells from the processed cross spectra.
%DopplerCells: 512
Number of doppler cells from the processed cross spectra.
%TransmitCenterFreqMHz: 13.475000
Transmitter center frequency from the processed cross spectra.
%TransmitBandwidthKHz: -51.269531
Transmitter bandwidth from the processed cross spectra. Negative value is a down sweep.
%TransmitSweepRateHz: 2.000000
Transmitter sweeprate from the processed cross spectra.

%CurrentVelocityLimit: 150
Maximum allowed current velocity used to determine first order Bragg.

%BraggSmoothingPoints: 3
Doppler cell point smoothing used to determine first order Bragg.

%WaveBraggNoiseThreshold: 3.0
Noise factor threshold used to determine first order Bragg.

%WaveBraggPeakDropOff: 100.0
Peak dropoff factor used to determine first order Bragg.

%WaveBraggPeakNull: 50.0
Peak null factor used to determine first order Bragg**.**

%MaximumWavePeriod: 17.0
Maximum allowed wave period to calculate.

%WaveBearingLimits: 0.0 359.0 %% Left,Right Deg NCW
Sector to limit where waves are allowed to come from. (NOTE: WVM7 has these values reversed from comment labels. The wave sector is from the second bearing clockwise to the first bearing.

%WaveUseInnerBragg: 0 %% 0 No, 1 Yes
Was processing using the inner Bragg energy.

%WavesFollowTheWind: 0 %% 0 No, 1 Yes
Was processing told to have waves always follow the wind direction.

%WaveMergeMethod: 2 %% 0 None, 1 Average, 2 Median
Wave merging method used. Waves are calculated for each CSS spectra. They are merged by either averaging or median filtering. The spectra count column indicates the maximum number of CSS spectra that

went into the result. The actual count used for each datum can be less since wave height, period, & direction can come from different calculations where one is calculable but the others are not.

Columnar Table Data:

The first table in the file should have a **%TableType:** key.

%TableType: WAVL <subtype>

<type> must be **WAVL** which indicates table is Wave History

<subtype> is **WVM7** to which columns are in use. The preferred method is to use the columns type codes to decode each column instead of relying on this table subtype.

After the TableType key is the '**%TableColumnTypes:**' key which describes the data in each column. Using this key will provide compatibility with future unknown **%TableType** <subtype>. The **%TableColumnTypes:** contains a list of fourcharcodes describing each column of the table data in order.

The known column codes are:

TIME seconds of the wave info from the date stamp

MWHT wave model height in centimeters for every one of three waves. A value of 999 indicates that the height was not calculable.

MWPD wave spectra period in seconds. A value of 999. indicates that the period was not calculable.

WAVB wave from direction in degrees. A value of 1080. indicates that the direction was not calculable.

WNDB wind from direction in degrees.

ACNT number of CSS that went into averaging the result. (May be less than maximum possible CSS during coverage time due to uncalculatable entries not included in average.)

DIST distance of the result from the site origin in kilometers.

RCLL range cell of result from cross spectra.

TYRS year of data point.

TDAY day of the month of the point

THRS hour of the day of the point

TMIN minute of hour of the point

TSEC seconds of the minute of the point

WVPD number of second order doppler cells used for the wave calculations.

MTHD wave method used.
Method 1 is previous model fit of period when doppler shift is <.3 x Bragg index.
Method 2 is model fit of period + wave direction when doppler shift >.3 x Bragg index
Method 3 is model fit of period + wave=wind direction when periods is < 5 seconds.

FLAG wave vector composite flag (think binary) where
0 is a standard vector
+1 is when wave direction averaging used at least one bearing at the bearing limits.
+2 is when wave direction averaging where all at the bearing limits. A later WaveDisplay application will not plot these. This is also set when are no valid directions to average for which you will get a +2 value without the +1 value.
+4 is when different wave methods where used for the average result.

%TableRows: <count>

tells reader software how much data to expect.

%TableColumns: <count>

can be used with the table type and subtype to determine if all the expected columns are in the file. Use this to parse the column data to ensure that you are always compatible with future column changes.

```
%TableColumnTypes: TIME MWHT MWPD WAVB WNDB ACNT DIST RCLL TYRS TMON TDAY THRS TMIN TSEC
```

The table data should then be preceded by a
%TableStart: <tablenumber>
<tablenumber> will be missing for the first table.
Before the table data starts two comments are added to help visually identify the data columns
Example:

```
%TableStart:
%%  Time      --------Wave--------   Wind
%% FromStart  Height Period   Dir.    Dir. Spectra  Distance  Range    Time
%% (seconds)    (m)    (s)   (deg)   (deg)  Count     (km)    Cell     Year Mo Dy  Hr Mn  S
     1137600     0.1    4.3  268.0   268.0      5      0.500     1     2006 11 14  04 00 00
```

Followed by a line for each Table Row of data. Each line is preceded by a space. Spaces (no Tabs) are used between columns.

Data is followed by
%TableEnd:
%ProcessedTimeStamp: 2004 07 09 11 24 43
%End:

Wave Spectra File

The Wave Spectra is a single result in time of Wave Spectra processing.

Identification of the file:

The first keyword in the file must be
%FileType <type> <subtype> <name>
The **<type>** must be '**WAVE**'
The **<subtype>** is '**WAV1'** for the first version.

The wave files will typically have a filename extension of '.ctf', '.wv' or '.wv4'

To determine if the file is a WAVE type, you should read the first ten lines looking for the '%Filetype' keyword. The **<type>** value will be **'WAVE'**. The **<subtype>** value tells you which variation it is.

FileNaming:

Filename should be use for archiving the data, not as a software determination of whether the file is a valid file.

Following the CodarTableFormat the files name use is

Wave_XXXX_YYYY_MM_DD_HHMM.wv
Where XXXX is site code.
YYYY_MM_DD is year month day.
HHMM is hour minutes.

Keywords:

%FileType: WAVE <subtype> <name>
identifies the file as a Wave file. The <subtype> identifies new version of this format.

%Manufacturer: CODAR Ocean Sensors. SeaSonde.
Identifies that the file came from SeaSonde. If you create the Wave file, put your Identity here.

%Site: XXXX “”
Contains the four character site code followed by optional user friendly site name.

%TimeStamp: 1999 08 16 13 00 00
Identifies the center time in year, month, day, hour, minute, second of the data collected in the file.

%Origin: 28.033333 -90.016667
Is the <latitude> <longitude> of the SeaSonde Site.

%WaveRangeDistance: 3 km
Identifies what distance from the SeaSonde Radial Site the wave data was processed.

%RangeResolutionKMeters: 1.5 km
Identifies the SeaSonde Radial Site Range step. Dividing this into WaveRangeDistance give you the cross spectra range cell used to calculate the wave data.

%TimeCoverage: 60 Minutes
Identifies the coverage time in minutes of the data collected in the file.

%SpectralWaveHeight: 1.00 m 1of3
Identifies the spectral calculated wave height for every one of three waves.

%SpectralWavePeriod: 15.0 seconds
Identifies the spectral calculated wave period.

%EstimatedWaveHeight: 1.00 m 1of3
Identifies the estimated wave height for every one of three waves.

%SpectralWavePeriod: 15.0 seconds
Identifies the estimated wave period.

%WaveDirection: 123.0 degrees
Identifies the calculated Wave from direction.

%WindDirection: 100.0 degrees
Identifies the calculated Wind from direction.

%SecondOrderWaves: 0
Identifies whether the Wave information contain second order if not zero.

Columnar Table Data:

The first table in the file should have a **%TableType:** key.

%TableType: WAVS <subtype>

<type> must be '**WAVS'** which indicates table is Wave Spectra
<subtype> is 'WAV1' to identify the first version which contains period, energy, direction info.
After the TableType key is the
'%TableColumnTypes:' key which describes the data in each column. Using this key will provide compatibility with future unknown **%TableType** <subtype>. The **%TableColumnTypes:** contains a list of fourcharcodes describing each column of the table data in order.
The known column codes are:
'**WPER'** is the wave period in seconds
'**NRGY'** is the wave energy.
'**WDIR'** is the wave from direction in degrees.

%TableRows: <count>
tells reader software how much data to expect.

%TableColumns: <count>
can be used with the table type and subtype to determine if all the expected columns are in the file. Use this to parse the column data to ensure that you are always compatible with future column changes.

The table data should then be preceded by a
%TableStart: <tablenumber>
<tablenumber> will be missing for the first table.
Before the table data starts two comments are added to help visually identify the data columns
Example:

```
%% Period  Energy   Direction
```

Followed by a line for each Table Row of data. Each line is preceded by a space. Spaces (no Tabs) are used between columns.

Followed by a
%TableEnd:
key after the data.

Wave Spectra History File

The Wave Spectra History is a list of wave spectra results over time (typically a month).

Identification of the file:

The first keyword in the file must be
%FileType <type> <subtype> <name>
The **<type>** must be '**WLST**'
The **<subtype>** is '**WVL1'** for the first version.

The wave files will typically have a filename extension of '.ctf', '.wls' or '.wl4'

To determine if the file is a WAVE type, you should read the first ten lines looking for the '%Filetype' keyword. The **<type>** value will be '**WLST**'. The **<subtype>** value tells you which variation it is.

FileNaming:

Filename should be use for archiving the data, not as a software determination of whether the file is a valid file.

Following the CodarTableFormat the files name use is

WVLS_XXXX_YYYY_MM_DD_HHMM.wv4
Where XXXX is site code.
YYYY_MM_DD is year month day.
HHMM is hour minutes.

Keywords:

%FileType: WVLS <subtype> <name>
identifies the file as a Wave History file. The <subtype> identifies version of this format.

%Manufacturer: CODAR Ocean Sensors. SeaSonde.
Identifies that the file came from SeaSonde. If you create the Wave History file, put your Identity here.

%Site: XXXX ""
Contains the four character site code followed by optional user friendly site name.

%TimeStamp: 1999 08 16 13 00 00
Identifies the start time in year, month, day, hour, minute, second of the data collected in the file.

%Origin: 28.033333 -90.016667
Is the <latitude> <longitude> of the SeaSonde Site.

Columnar Table Data:

The first table in the file should have a **%TableType:** key.

%TableType: WAVL <subtype>
<type> must be '**WAVL**' which indicates table is Wave History

<subtype> is 'WAV1' to identify the first version which contains period, energy, direction info.
After the TableType key is the
'%TableColumnTypes:' key which describes the data in each column. Using this key will provide compatibility with future unknown **%TableType** <subtype>. The **%TableColumnTypes:** contains a list of fourcharcodes describing each column of the table data in order.
The known column codes are:
'**MCDT** is the timestamp of the wave info in seconds from 1904
'**WSHT'** is the wave spectra height in centimeters for every one of three waves.
'**HSPD'** is the wave spectra period in seconds.
'WAVB' is the wave from direction in degrees.
'WNDB' is the wind from direction in degrees.
'EWHT' is the estimated wave height in centimeters for every one of three waves.
'EWPD' is the estimated wave period in seconds.
'CUSP' is the WaveSonde picked current vector speed.
'CUBR' is the WaveSonde picked current vector bearing.
'DATE' is a quote encased date month/day/year hour:minute.
'QUAL' is the number of spectral bins found with wave energy.

%TableRows: <count>
tells reader software how much data to expect.

%TableColumns: <count>
can be used with the table type and subtype to determine if all the expected columns are in the file. Use this to parse the column data to ensure that you are always compatible with future column changes.

The table data should then be preceded by a
%TableStart: <tablenumber>
<tablenumber> will be missing for the first table.
Before the table data starts two comments are added to help visually identify the data columns
Example:

```
%%            ---- Spectral -----         --- Estimated ---  -- WaveSonde --
%%  Time      Height Period Dir.   Wind   Height   Period    Current Dir.     Date
%% (1904secs)  (cm)    (s)    (deg)  (deg)    (cm)     (s)      (cm/s)  (deg)    mm/dd/yyyy hh:mm
```

Followed by a line for each Table Row of data. Each line is preceded by a space. Spaces (no Tabs) are used between columns.

Followed by a
%TableEnd:
key after the data.

Document Version History.
081013 – Added WVM6 & WVM6 information.
070214 – Added WVM4 & WVM5 information.
061207 – Indicate that all wave/wind directions are the FROM direction.
061207 – Some minor clean up work.
061207 – Reorganize so that Wave Model comes first.