

3DACM WAVE Internal Wave Processing

Introduction

The purpose of the application note is to explain how to configure the 3DACM WAVE to analyze ocean waves using the internal algorithms contained in the 3DACM WAVE.

Version 4.0 of the 3DACM WAVE firmware has been enhanced to include the significant wave calculations currently being performed by WavePost. Using the post processing capabilities allows the user to reduce the amount of data stored to memory. To perform this task, the 3DACM WAVE processes the raw velocity and pressure data in the instrument by running the post processing algorithms at the end on the ON BURST Time (OBT). The output from the post processing is logged to 32 Meg flash card memory and can be retrieved later. The post processing and logging of significant wave data eliminates the need to upload the raw velocity and pressure data, which reduces the file size, and download time.

Because the 3D Wave does not contain enough memory to perform these calculations, a one megabyte SRAM PCMCIA card must be installed in the second PCMCIA slot. This reduces the available logging memory by half, but this is offset by the reduced logging requirements of the post-processed data.

As with the previous version of the firmware, the instrument can run in burst mode, averaging mode or a combination of both. Post processing is performed on the burst mode data at the end of the OBT. Burst mode data need not be logged for post processing. The instantaneous data is kept in the SRAM card while running in burst mode and processed from SRAM.

The interval time must be set to a sufficient amount of time to allow the post processing to finish and the instrument to turn off. The post processing time varies according to the number of points being processed between 5 and 20 minutes.

Operation

Data Collection

When running in burst mode, the V_n , V_e and pressure values are stored in the SRAM PCMCIA card. Up to 4096 scans can be used for post processing. If the OBT is longer than the time required to collect the number of post processing points given the sampling rate, the first 4096 points are used and the rest ignored. An OBT less than the required time to collect the specified number of points is not allowed by the firmware. This check is made at interval start time.

The data will not be process unless the WPOST command is set to ON. If WPOST is OFF then the instrument will not process the burst data. When the instrument enters an interval, a message is displayed indicating whether or not post processing is on.

Sample Size

The APTS command allows the number of analysis points to be specified. This number should be a power of 2 and evenly divisible by the number of points used in the FFT functions (See NFFT command). A maximum of 4096 points can be used. In general, the more points, the smoother the resulting processed data.

NFFT Command

The NFFT command sets the number of points to use in the FFT function. This should be a power of 2 and a minimum of 512. This command implicitly sets the number of segments that the data will be processed in by dividing the sample size by NFFT. More segments will produce smoother processed data.

Processing Time

The time to process the wave data is proportional to the sample size and can vary from 5 minutes for 512 samples to 20 minutes for 4096 samples. The off interval time should allow for this processing to be completed and the instrument to turn off. Overlap of the post processing and the next ON time will result in malfunctioning of the instrument. Therefore, minimum ITIME should be OBTIME + 5 mins.

Example: APTS=4096, SRATE=4, OBTIME = OTIME = APTS/SRATE/60 = 17.06.
ITIME = OBTIME + 20 = 37. These values are minimums. If depth correction is on (DCUT > 0), the processing time (ITIME – OBTIME) may need to be longer. Note that the ON interval will not end until post processing is complete. Therefore, if the processing time is too short, the next on interval will not begin.

To determine how long the post processing is taking, examine the last 2 entries in the burst log for any one ON interval. The time difference between these 2 entries is the actual post processing time.

ON BURST Time and Sample Size

The ON BURST time must allow for the specified sample size to be collected at the current sampling rate. The firmware will check for this condition at interval start time. OBTIME must be at least APTS/Sampling_Rate secs. Set OBTIME as close to this value as possible for maximum accuracy.

Post Processing Specific Commands

APTS – specifies the number of analysis points to collect. Max of 4096. Power of 2. Evenly divisible by NFFT.

NFFT – specifies the size of the data block used by the FFT function. Power of 2.

WPOST{=ON/OFF} read/set the post processing flag. WPOST=ON enables post processing.

PMODE – switches the logging output mode to use the post processing portion of the data log. Logging operations (LGPTR, DLEN, DDMP) are performed on post processing data memory in this mode. Does not enable/disable post processing.

ATM – sets the atmospheric pressure to use to correct the pressure measurements in millibars.

DCUT – sets the depth cutoff for the depth correction. Use 31.63 meters. If zero, depth correction is disabled.

BHT – sets the height of the instrument off the bottom, in meters

MVAR – sets the magnetic deviation from true north to get the wave directions in degrees true. +E, -W.

RLDP or P – read last processed data. Displays/uploads the last post processing data record. The format is;

Average VN, Average VE, Average VU, Significant Wave Height, Peak Period, Peak Frequency, Mean Zero (spectral), Average Period, Max. Wave Height, Max Period, Mean Zero, Mean Wave Direction, Tide, Time, Date

RLDB or B – read last burst data. Displays/uploads the last burst data record. The format for this command will vary depending on what channels are on or off. Use the RDMB to determine which channels are on.

RLD or D – read last average data set. Displays/uploads the last average data record. The format for this command will vary depending on what channels are on or off. Use the RDM to determine which channels are on.

Summary

To summarize the post processing sequence there are a few things to remember. First WPOST must be set to ON. You may use the default values for all other commands and the 3DACM WAVE will process the burst data. The 3DACM WAVE will not process data in continuous run or average modes. It will only process data at the end of a Burst Interval. Therefore, the 3DACM WAVE must be running in either Interval Burst mode (BMODE) or in mixed average and burst mode (IMODE) to process wave data.

The 3DAcm97 software will configure the 3DACM WAVE to process wave data. It is recommended that you use the software to simplify the configuration of the 3DACM WAVE instrument.

If you have any questions or concerns please contact fsi-tech@falmouth.com or software@falmouth.com.

