# AZFP Sv and TS

The AZFP instrument measures and records acoustic backscatter returns. For further details about the instrument, equations and file format refer to the ASL Environmental Sciences AZFP Operator's manual.

**Note**: TVG range correction is not applied to AZFP Sv or TS. Our current understanding, however, is that an offset of half a pulse length is probably appropriate, as for other instruments, e.g. Simrad EK80 etc. This can be applied in an ECS file by setting TvgRangeCorrection to Standard.

Sv and TS are calculated as follows:

$$S_v = EL_{max} - 2.5/a + N/(26214a) - TVR - 20logV_{TX} + 20\log R + 2\alpha R - 10log\left(\frac{c\tau\psi}{2}\right) + CalibrationOffsetSv$$

$$TS = EL_{max} - 2.5/a + N/(26214a) - TVR - 20logV_{TX} + 40\log R + 2\alpha R + CalibrationOffsetTS$$

Where:

| Equation variable | Description |
|---|---|
| $EL_{max} =$ | The echo level (dB re 1uPa) at the transducer that produces full scale output. |
| | This value is read from EL in the data file and is referred to as **AzfpEchoLevelMax** on the Calibration page of the Variable Properties dialog box. |
| $a =$ | The slope (Volts/dB) of the detector response. |
| | This value is read from DS in the data file and is referred to as **AzfpDetectionSlope** on the Calibration page of the Variable Properties dialog box. |
| $TVR =$ | The transmit voltage response of the transducer (dB re 1uPa/Volt at 1 m). |
| | This value is read from TVR in the data file and is referred to as **AzfpTransmitVoltageResponse** on the Calibration page of the Variable Properties dialog box. |
| $V_{TX} =$ | The voltage sent to the transducer. |
| | This value is read from VTX0 in the data file and is referred to as **AzfpTransmitVoltage** on the Calibration page of the Variable Properties dialog box. |
| $N =$ | The recorded digital value which is linearly related to the output voltage of the detector in the receiver. $N$ is read from the data file. |
| | **Note**: AZFP averaged data is back-converted to $N$. |
| $c =$ | Speed of sound (m/s) on the Calibration page of the Variable Properties dialog box. |
| | The value is user specified and may not be available from the data file. |
| $\tau =$ | Transmitted pulse length (s) on the Calibration page of the Variable Properties dialog box. |
| | This is read from the data file (but Echoview may display the value in units of ms). |
| $=$ | $N$ |

$R$     Range (m) for $N$.

$R$ = SampleStartRange + (SampleThickness/2)

Where:
SampleThickness (m) = SoundSpeed/(2*DigitizationRate)

SampleStartRange (m) = (-0.5 + SampleIndex)*SampleThickness

SoundSpeed (m/s), DigitizationRate (samples/second) and SampleIndex (for $N$) are read from the data file.

**Notes**:

- The AZFP system may use a nominal sound speed of 1500 m/s. Echoview can apply a user specified sound speed via an ECS file.

- The SampleIndex is the sequential number of echo values recorded from a ping. It is derived using the time of the echo and does not include a receiver delay time.

$\Psi$ = Two way beam angle (dB re 1 Sr) on the Calibration page of the Variable Properties dialog box.

The linear value $\Psi$ is read from BP in the data file. $\Psi$ = 10 log $\psi$.

ASL Environmental Sciences calculates it using an approximation that includes the instrument's 3 dB beam angle.

$\alpha$ = Absorption coefficient in dB/m on the Calibration page of the Variable Properties dialog box.

The value is user specified and may not be available from the data file.

$CalibrationOffsetSv$ = CalibrationOffsetSv can be added to the AZFP Sv equation to adjust Sv values.

$CalibrationOffsetTS$ = CalibrationOffsetTs can be added to the AZFP TS equation to adjust TS values.

## See also

ASL Environmental Sciences data files
Calibration settings for ASL Environmental Sciences data

Echoview Help file 10.0.38 for Echoview 10.0.257 1st August 2019

Please report any errors or omissions to support@echoview.com.