

PRE-DEFINED PARAMETERS

$$N_{\text{seg}} = 512, N_{\text{fft}} = 256, f_1, f_m, f_h = 1, 3, 5 \text{ Hz}, C_{2P} = 77 \text{ psi V}^{-1} \text{ (Appendix B)}$$

ONBOARD CALCULATIONS

Reshape raw voltage signals

Convert each 1D signal to a 2D array ($N_{\text{blk}}, N_{\text{seg}}$)

Discard non-profiling data

Use W_{min} threshold ($\propto \min |\Delta V_P(t_i)|$, Eq. 14, Appendix B)

Record T and P voltage quantities for each block

$$\langle V_{T1} \rangle, \langle V_{T2} \rangle, V_P(N_{\text{seg}})$$

Despike shear voltages

Apply 3σ threshold to V_{s1} and V_{s2} (Appendix E)

Calculate voltage spectra

$$\Psi_{s1}(f), \Psi_{s2}(f), \Psi_{T11}(f), \text{ and } \Psi_{T12}(f)$$

Fit shear spectra over two ranges

$$\left. \begin{array}{ll} \sum_f f^{1/3} \Psi_{s1}(f) / \sum_f f^{2/3} & \text{over } f_1-f_m \\ \text{---} & \text{---} \\ \text{---} & \text{---} \\ \sum_f f^{1/3} \Psi_{s2}(f) / \sum_f f^{2/3} & \text{over } f_1-f_m \\ \text{---} & \text{---} \\ \text{---} & \text{---} \end{array} \right\} \text{(Eq. 24)}$$

Fit Tt spectra over two ranges

$$\left. \begin{array}{ll} \sum_f f^1 \Psi_{T11}(f) / \sum_f f^2 & \text{over } f_1-f_m \\ \text{---} & \text{---} \\ \text{---} & \text{---} \\ \sum_f f^1 \Psi_{T12}(f) / \sum_f f^2 & \text{over } f_1-f_m \\ \text{---} & \text{---} \\ \text{---} & \text{---} \end{array} \right\} \text{(Eq. 34)}$$

POST-PROCESSING

Calibrate averaged voltages

T_1 and T_2 (Eq. 6), P (Eq. 12), and W (Eq. 13)

Derive viscosity and thermal diffusivity

Use measured T and P together with S from SOLO-II CTD

Calculate four ‘initial’ turbulent dissipation values

For S_1 and S_2 , get $\varepsilon_{\text{init}}$ for f_1-f_m and f_m-f_h (Eq. 24)

Repeat step above for thermal dissipation

For T_{t1} and T_{t2} , get χ_{init} for f_1-f_m and f_m-f_h (Eq. 34)

Calculate the correction factors

$$F_{\text{Na}} \text{ (Eq. 21) and } F_{\text{Kr}} \text{ (Eq. 31)}$$

Correct initial estimates

$$\varepsilon_{\text{init}} \rightarrow \varepsilon \text{ (Eq. 17) and } \chi_{\text{init}} \rightarrow \chi \text{ (Eq. 30)}$$

Combine f_1-f_m and f_m-f_h fit values

ε (Eqs. 25 and 27) and χ (Eq. 35)

Calculate goodness of fit of spectra

ε fit score (Eq. 26) and χ fit score (Eq. 36)