Exercise 6. Cross-Spectral Energy Density and Coherence Functions

Given the coherence/phase matrix for a trio of series

\[
\begin{array}{ccc}
  s_{11} & c_{012} & c_{013} \\
  f_{a21} & s_{22} & c_{023} \\
  f_{a31} & f_{a32} & s_{33}
\end{array}
\]

where \(c_0\)'s = coherence; \(f_a\)'s = phases; \(s\)'s = auto-spectra.

Compute coherence/phase functions using \texttt{l_specter} with section length = 200 (i.e. 101 spectral estimates from \(f = 0.0\) cph to \(f_N = 0.5\) cph) TAPER - yes; DECIMATION – no; for the indicated series:

A. **Synthetic Input Series**: sine10.n1
   sine10.n2
   sine100.n2
   - For each “cross-component” in the coherence/phase matrix use \texttt{Matlab} to produce a single-page, stack of plots with (top) autospectral energy density (appropriate log axis); (middle) coherence spectra (linear: 0 to 1.0); and (3) phase spectra (linear: 180° to +180°) versus a linear frequency axes between 0 cph and 0.5 cph. Plot the spectral energy on a log axis and the coherence and phase spectra on linear ordinate axes.
   - Plot the zero coherence level for the 95% confidence level on each coherence plot; and the 95% confidence interval for the coherence and phase at 0.10 cph.
   - Discuss your results.

B. **Measured Input Series**: aprsdb.mhr
   bosslp.mhr
   bosssp.mhr
   - For each “cross component” in the coherence/phase matrix use \texttt{Matlab} to produce a single-page, stack of plots with (top) autospectral energy density (appropriate log axis); (middle) coherence spectra (linear: 0 to 1.0); and (3) phase spectra (linear: 180° to +180°) versus a linear frequency axes between 0 cph and 0.5 cph. Plot the spectral energy on a log axis and the coherence and phase spectra on linear ordinate axes.
   - Plot the zero coherence level for the 95% confidence level on each coherence plot; and the 95% confidence interval for the coherence and phase at 0.07 cph.
   - Discuss your results.

C. How do the results for B differ, if the residual SL and SSP records were substituted?