Supplementary material

Scenarios of nutrient-related solute loading and transport fate from different land catchments and coasts into the Baltic Sea

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Power spectral density – Implementation description

For the Kalmar County coast case, where the coastal water flow situation is relatively unidirectional southwards, Power Spectral Density (PSD) results are shown for average values (Figure S1) in comparison with the results using point values in Figure 4. For the Vistula River coast case, the coastal flow field is more complex and averaging values over all points there dampens fluctuations and thereby obscures information. Therefore, results using the values at the different points are shown for comparison in the Vistula case (Figure S2 and S3).

1.1 Power Spectral Density (PSD) for the Kalmar case

Results using average variable values across all nine coastal observation points for northwards water velocity, eastwards water velocity and solute concentration are shown in Figure S1 and Figure S2, and show similar correlation with Figure 4 and Figure 6a, where a point value of Point No. 7 is being used. That means the chain of influence from (negative) northwards wind velocity to (negative) northwards and eastwards water velocity and further coastal solute concentration exists for the whole strait, where the flow is relatively unidirectional.

1.2 Power Spectral Density (PSD) for the Vistula case

For the points at the two sides of the Gdansk Bay that are mostly controlled by local currents (e.g. Point No. 2 and No. 9; Figure S3 and Figure S4), similar correlations are exhibited with Figure 5 and Figure 6b with the value from Point No.7. However, at the middle points (e.g. Point No. 4 and No. 6) which are occupied by the strong stable currents from the main Baltic Sea (blue current around Gdansk Bay in Figure 1a), solute concentration is weakly correlated with the local forcing variables, as shown in Figure S5 and Figure S6.

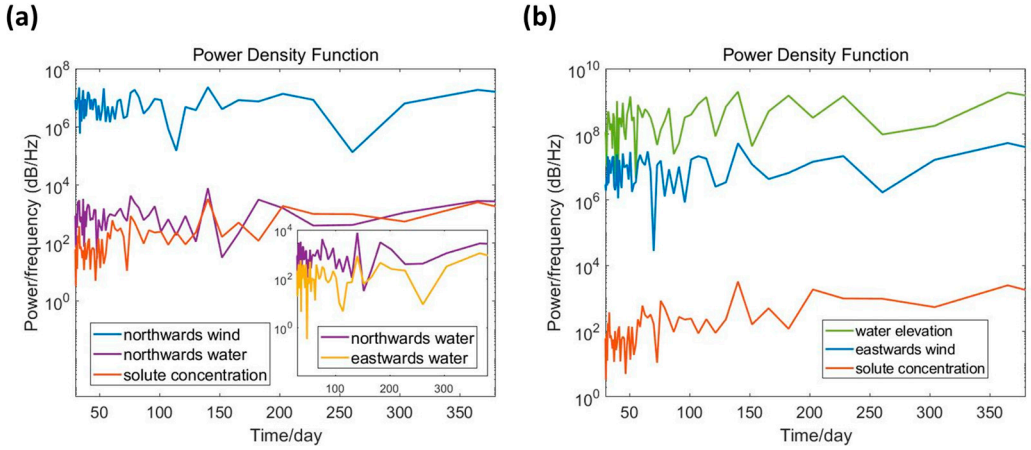

Figure S1. Power Spectral Density (PSD) analysis for the Kalmar County coast case using average value for water velocity and solute concentration. (**a**) PSDs of relatively strongly correlated variables; (**b**) PSDs of weakly correlated variables.

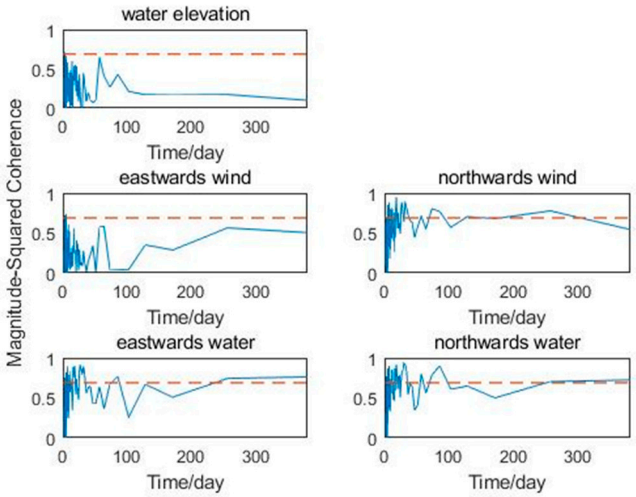

Figure S2. Magnitude-Squared Coherence of solute concentration with different forcing variables for the Kalmar County coast case using average value for water velocity and solute concentration. Red dashed line shows coherence at 95% significance level.

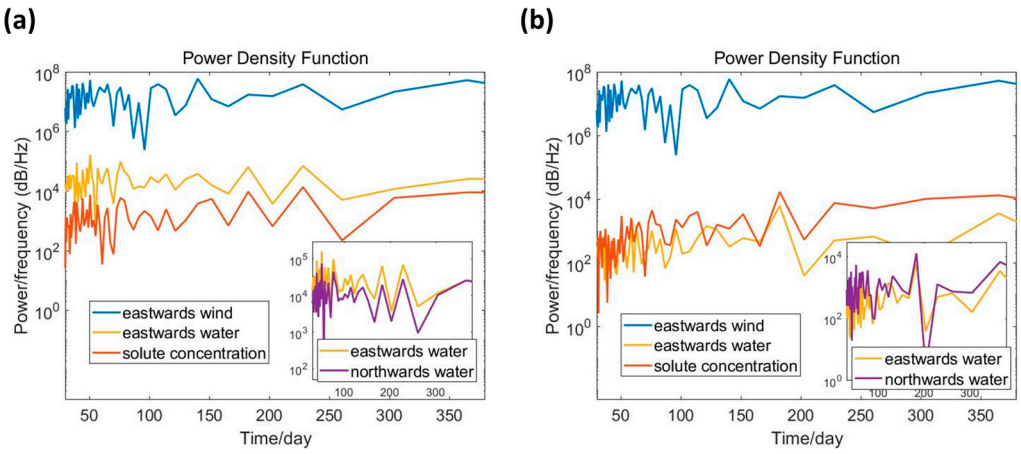

Figure S3 Power Spectral Density analysis of relatively strongly correlated variables for the Vistula River coast case using point values for water velocity and solute concentration. (**a**) Point No. 2; (**b**) Point No. 9.

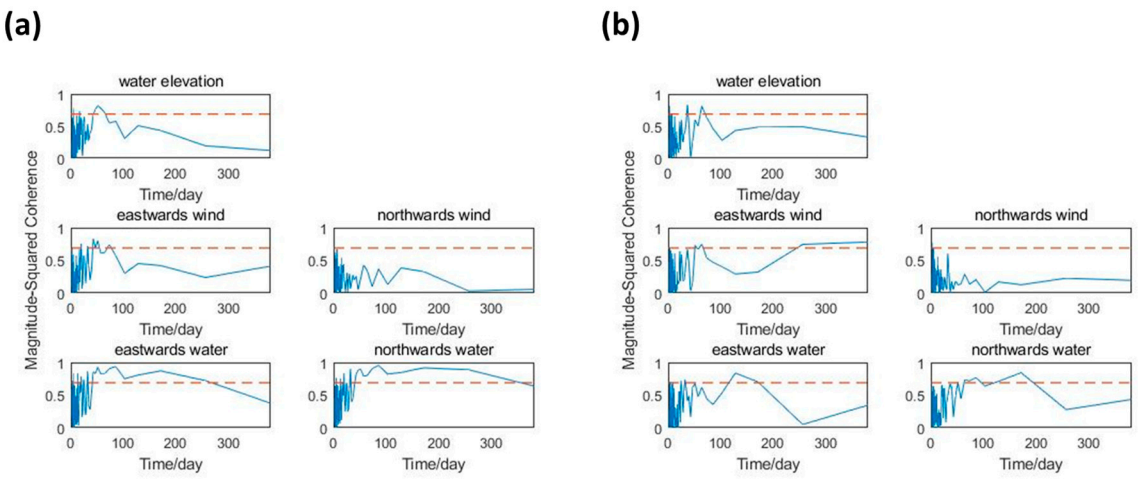

Figure S4. Magnitude-Squared Coherence of solute concentration with different forcing variables for the Vistula River coast case using point values for water velocity and solute concentration. (a) Point No. 2; (b) Point No. 9. Red dashed line shows coherence at 95% significance level.

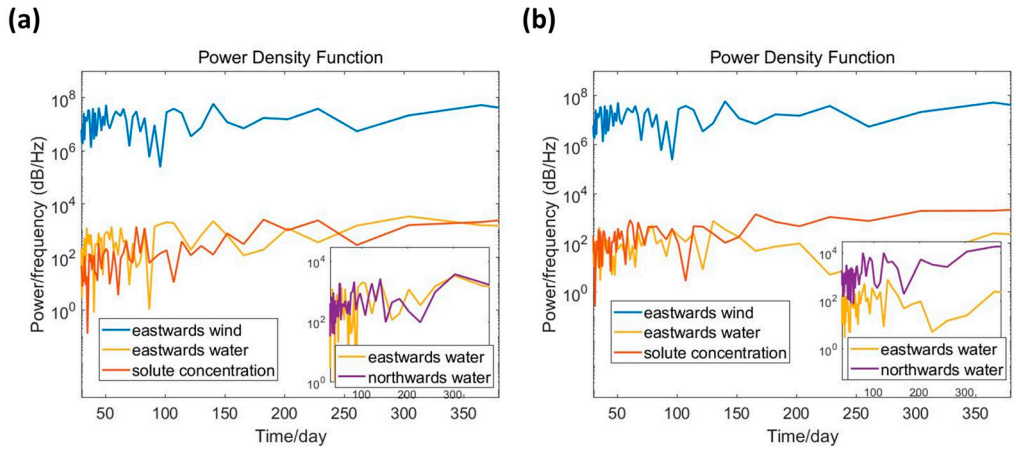

Figure S5. Power Spectral Density analysis for the Vistula River coast case using point values for water velocity and solute concentration for comparison with Figure S3. (a) Point No. 4; (b) Point No.6.

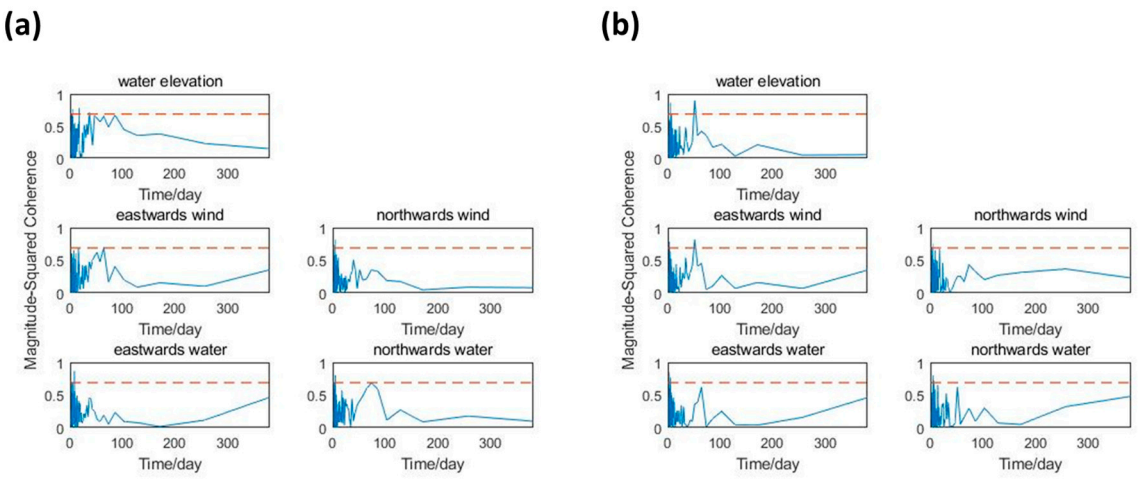

Figure S6. Magnitude-Squared Coherence of solute concentration with different forcing variables for the Vistula River coast case using point values for water velocity and solute concentration. (a) Point No. 4; (b) Point No. 6. Red dashed line shows coherence at 95% significance level.