



*Supplement of*

## **Statistical hypothesis testing in wavelet analysis: theoretical developments and applications to Indian rainfall**

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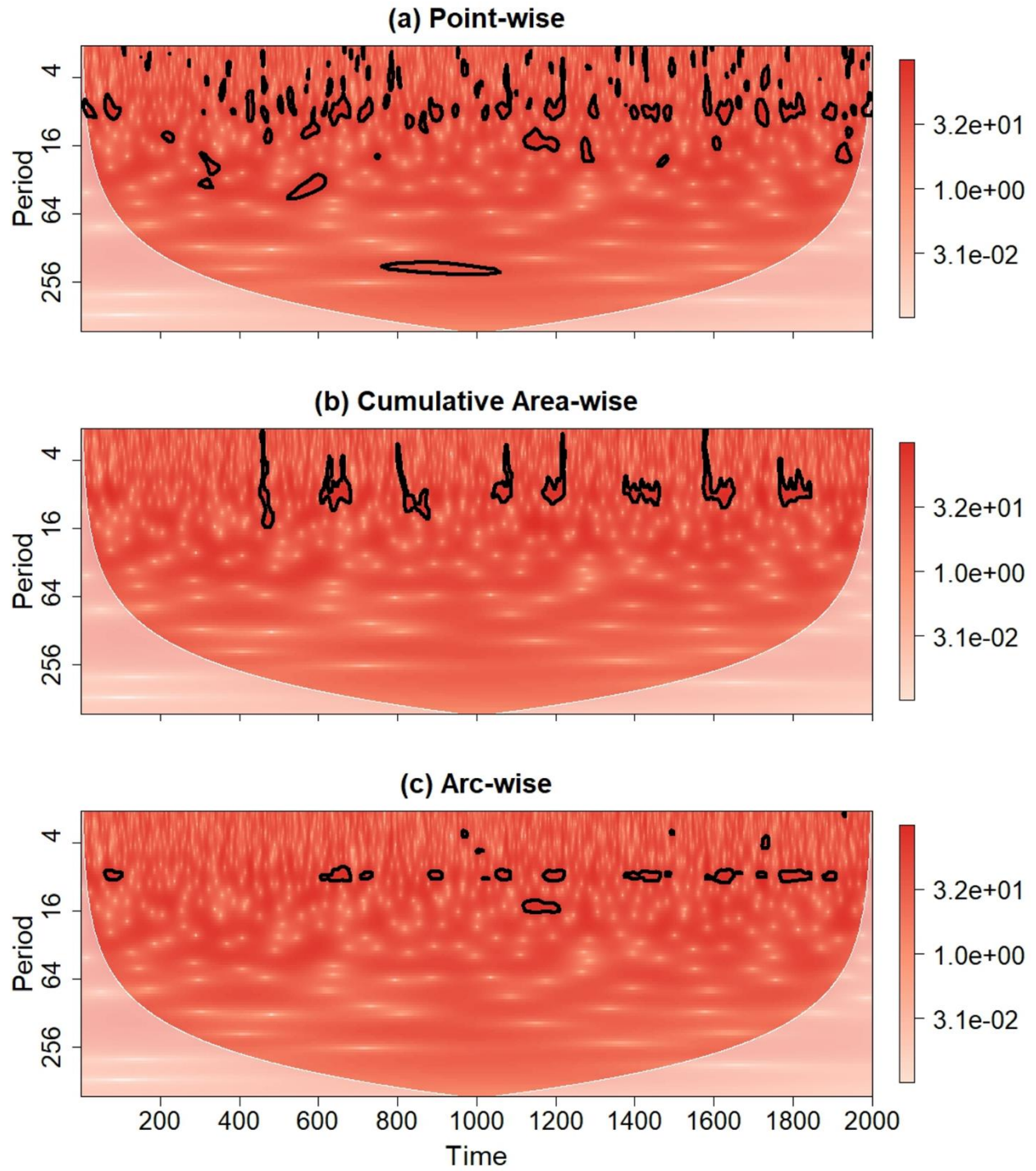


Fig. S1. Results of the (a) point-wise, (b) cumulative area-wise, and (c) cumulative arc-wise tests when applied to the wavelet power spectrum of a time series that is the superposition of a sinusoid with period of 8 and additive noise. The noise is a realization of a red-noise process with lag-1 autocorrelation coefficient equal to 0.7, and the signal-to-noise ratio is 0.4.

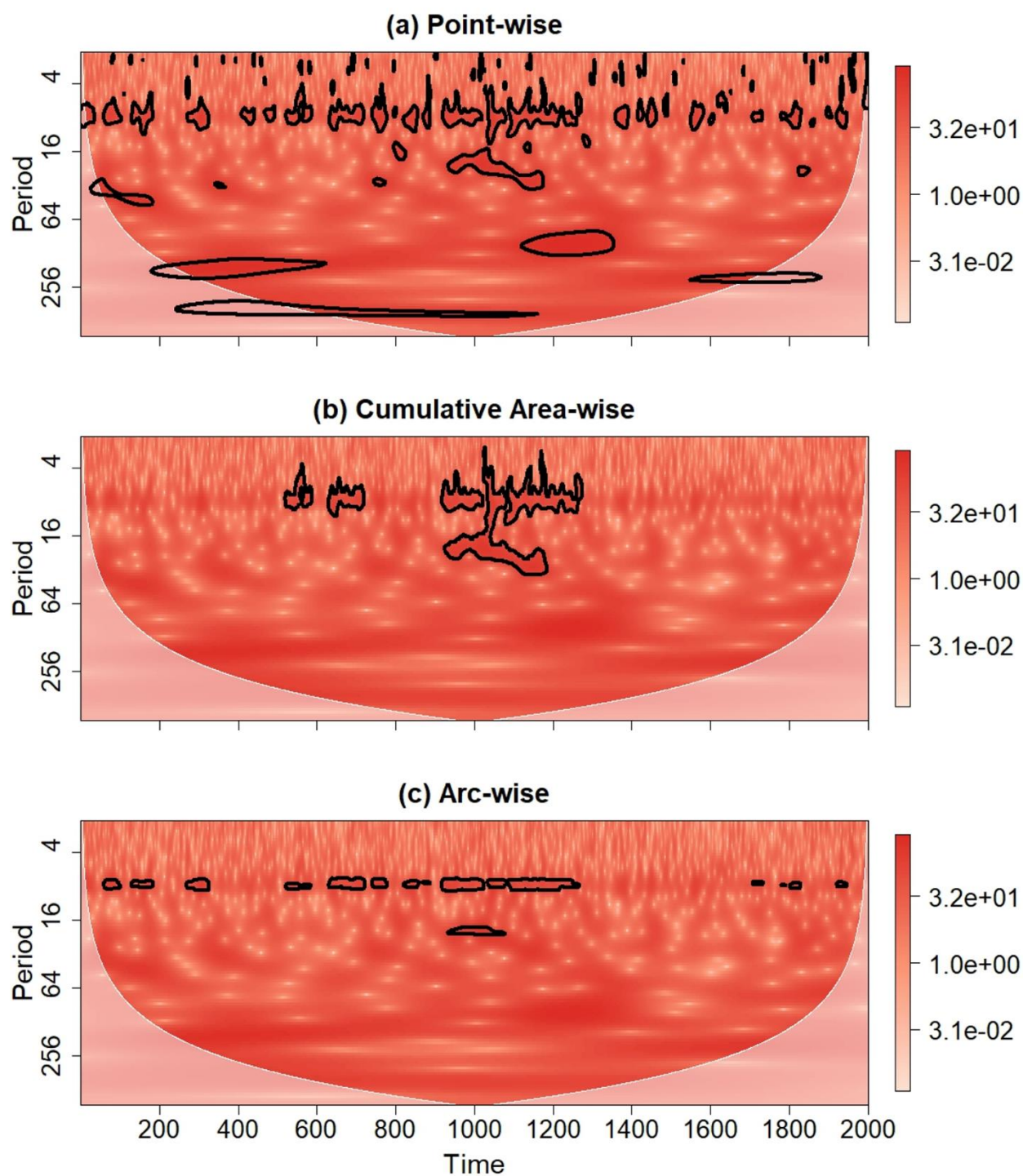


Fig. S2. Results of the (a) point-wise, (b) cumulative area-wise, and (c) cumulative arc-wise tests when applied to the wavelet power spectrum of a time series that is the superposition of a sinusoid with period of 8 and additive noise. The noise is a realization of a red-noise process with lag-1 autocorrelation coefficient equal to 0.95, and the signal-to-noise ratio is 0.2.

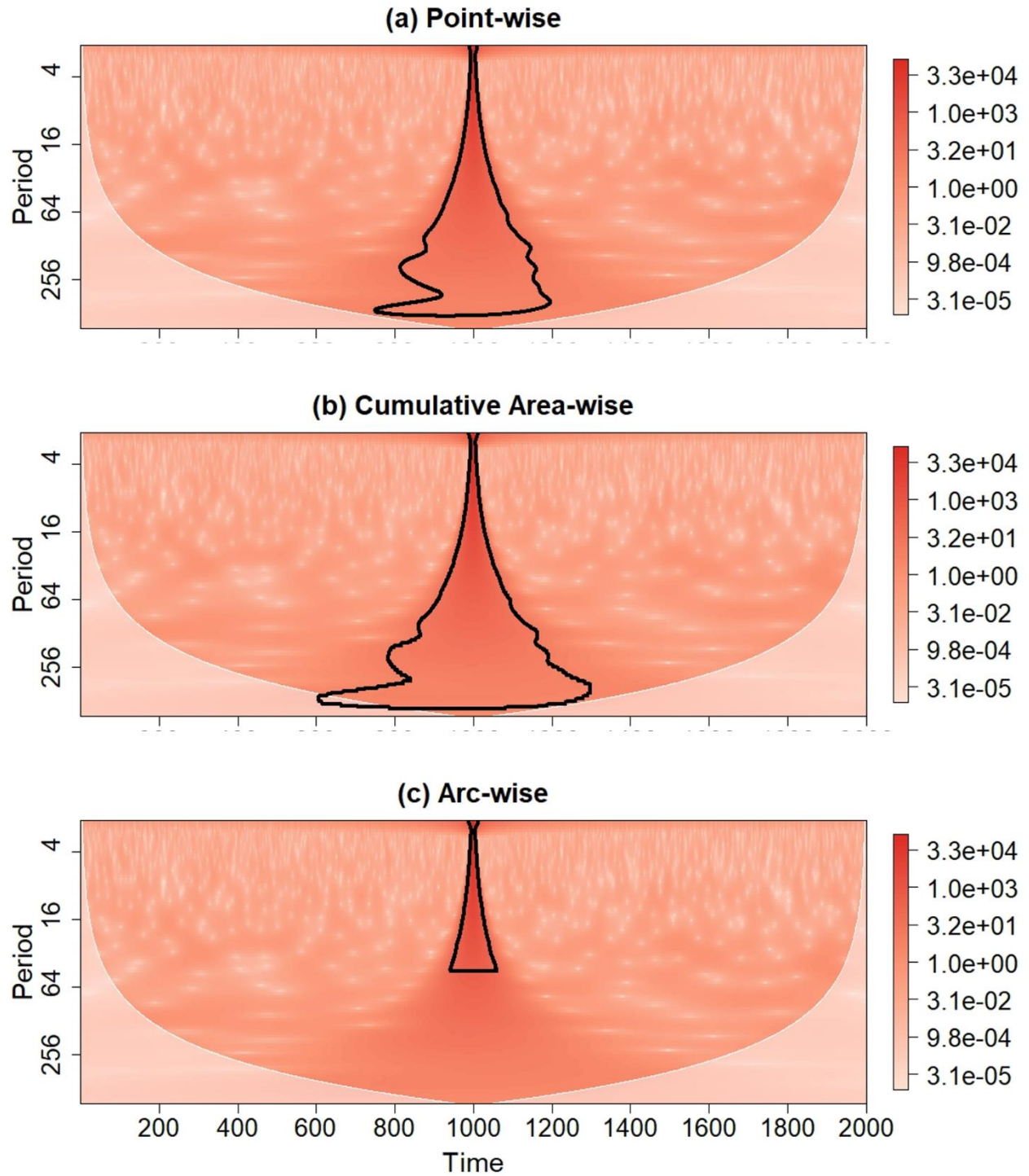


Fig. S3. Results of the (a) point-wise, (b) cumulative area-wise, and (c) cumulative arc-wise tests when applied to the wavelet power spectrum of a time series that is the superposition of a singularity at  $t = 1000$  and additive noise. The noise is a realization of a red-noise process with lag-1 autocorrelation coefficient equal to 0.95, and the signal-to-noise ratio is 20.



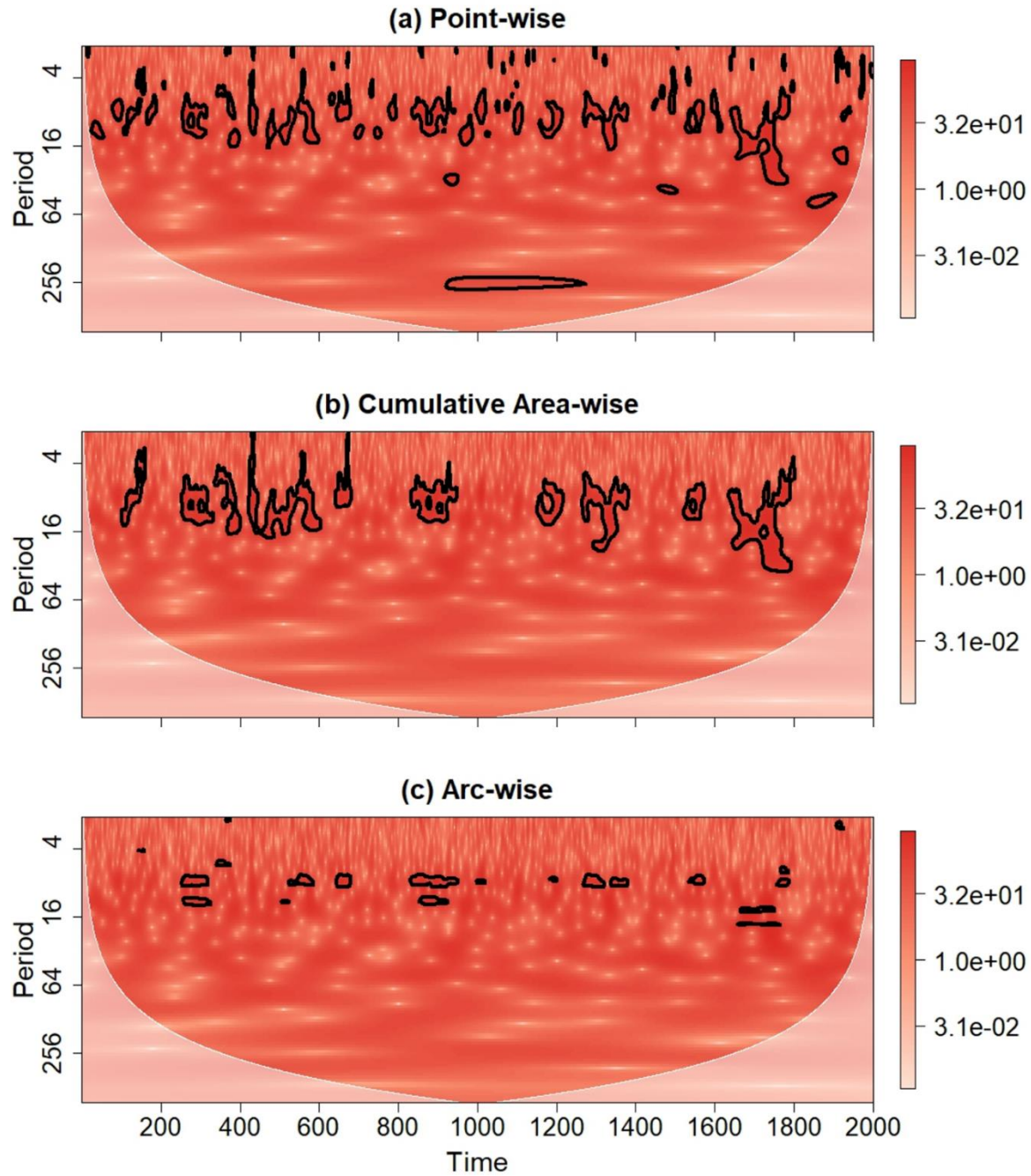


Fig. S4. Results of the (a) point-wise, (b) cumulative area-wise, and (c) cumulative arc-wise tests when applied to the wavelet power spectrum of a time series that is the superposition of a sinusoid with period 8, a sinusoid with period 12, and additive noise. The noise is a realization of a red-noise process with lag-1 autocorrelation coefficient equal to 0.8, and the signal-to-noise ratio is 0.3.

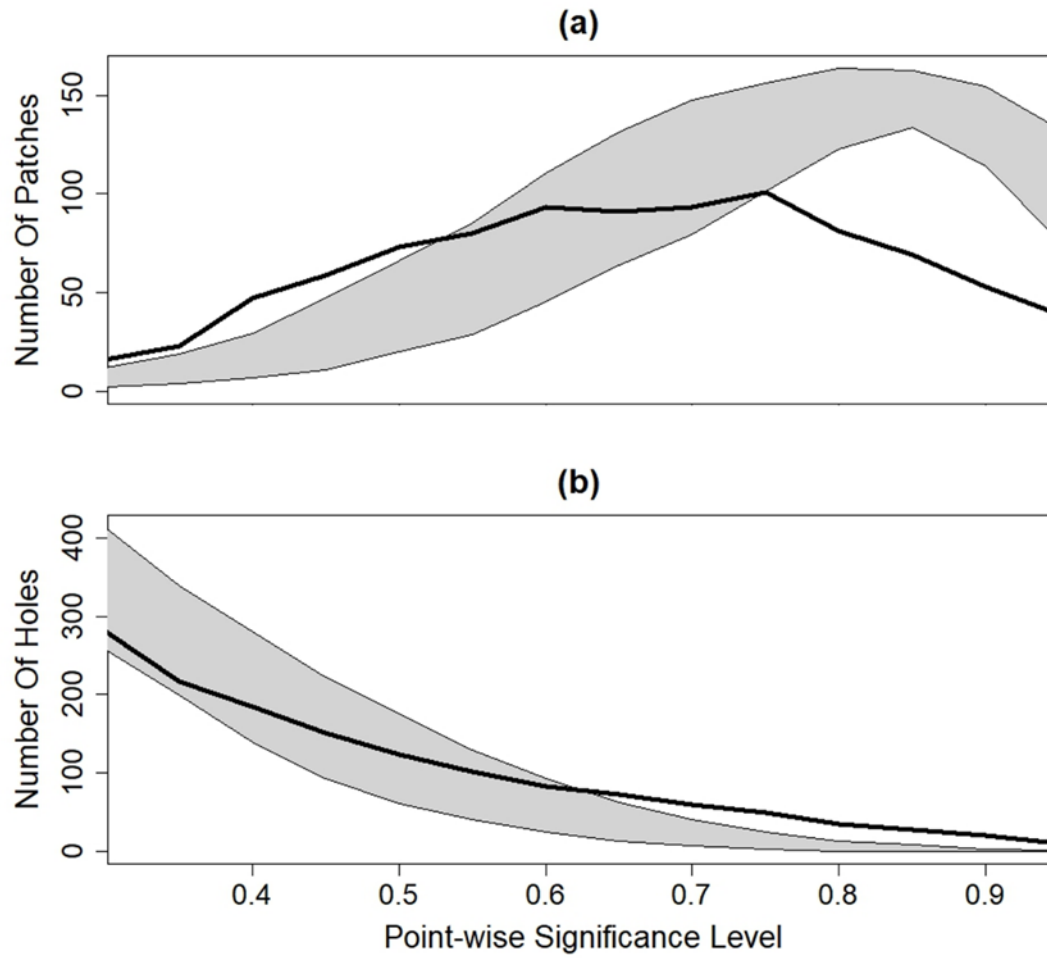


Fig. S5. (a) The 0-dimensional and (b) 1-dimensional persistent homology profiles associated with the wavelet power spectrum shown in Figure S4. Gray shaded region is the non-rejection region of the topological significance test applied at the 0.05 significance level. The non-rejection region was calculated by generating 100 realizations of a red-noise process with lag-1 auto-correlation coefficients equal to 0.8.