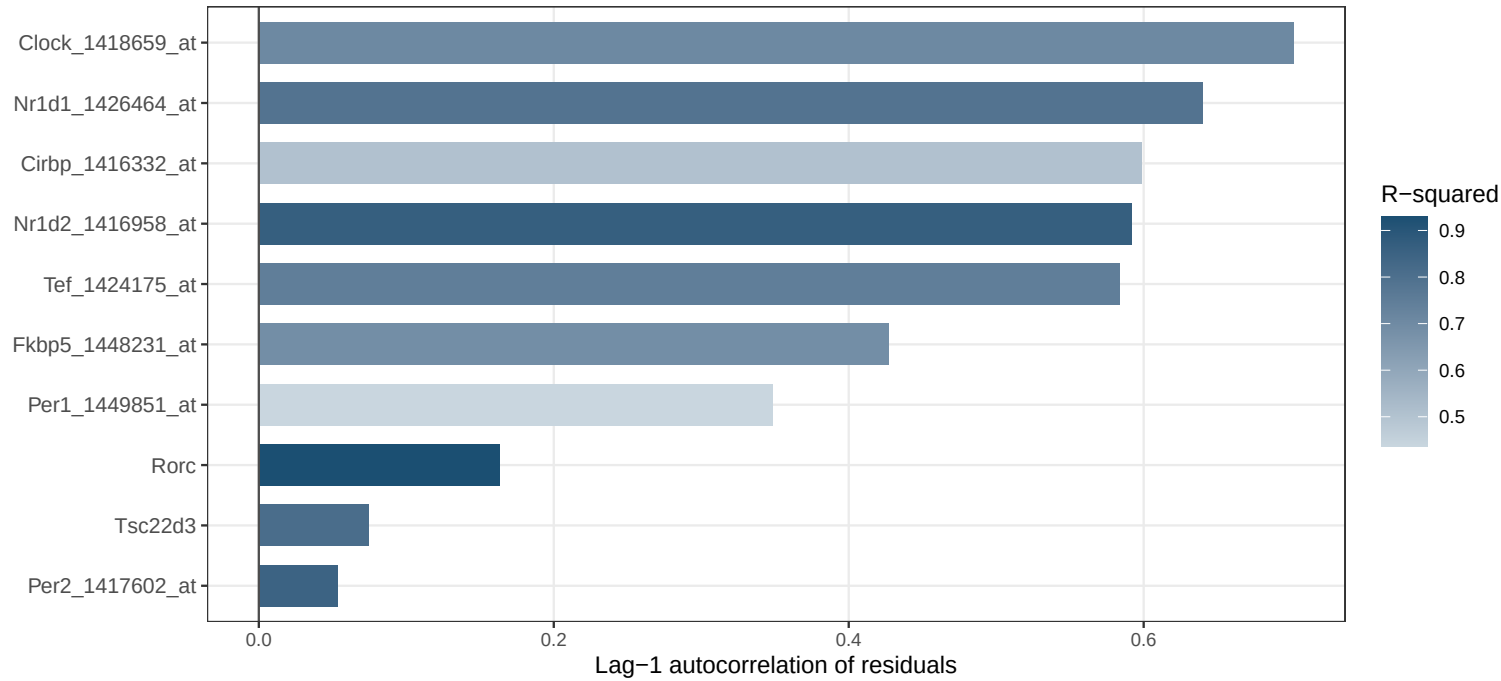
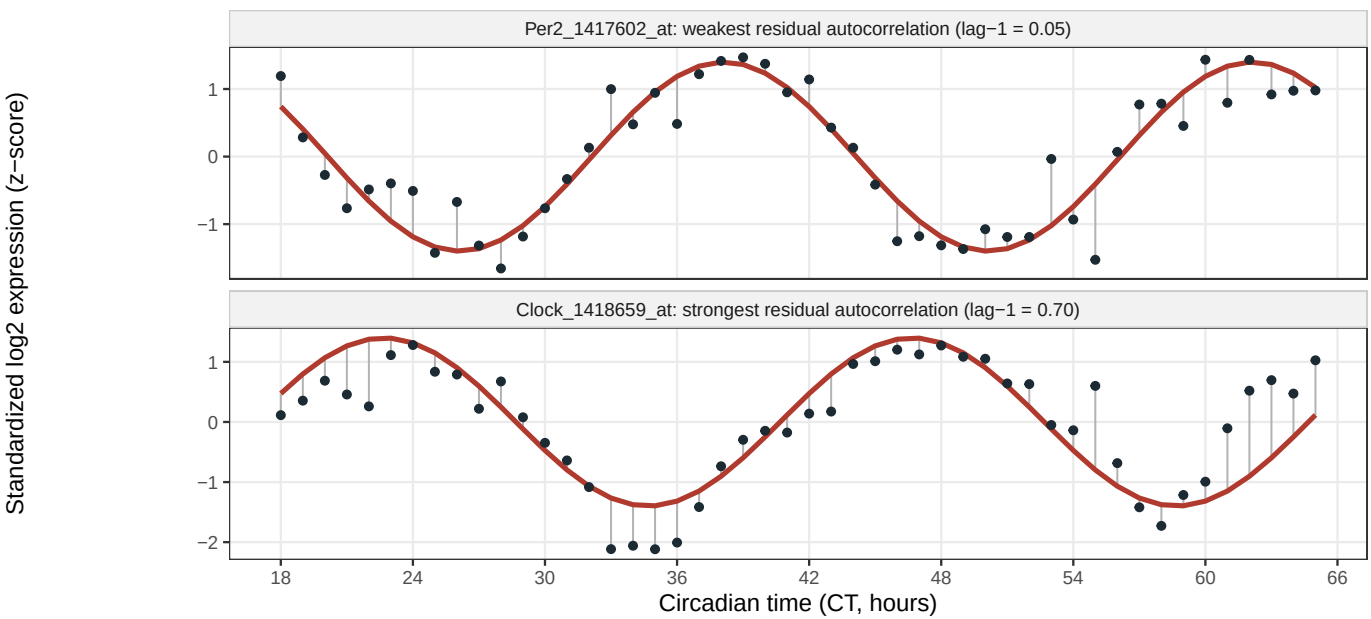
The 24 h cosine captures phase better than waveform shape

Residuals from the 48−point fit; lag−1 autocorrelation near 0 means unstructured noise, larger values mean the sinusoid leaves systematic short−range structure

A Residual autocorrelation at 1 h lag



B Observed vs fitted waveform for two high−amplitude genes



Descriptive diagnostics only: hourly samples are pooled arrays, not independent biological replicates; no individual−level confidence is implied.