**Supplementary Material**

**Groundwater level trends and recharge event characterization using historical observed data in semi-arid Chile**

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The cross-correlation and wavelet analysis for all wells are presented below.

Cross-correlation analysis



**Figure S1.** Cross-correlograms of GWLs with the closest discharge station (in blue), and GWLs with the closest raingauge station (dashed black). Station locations are given in Table 1 and Figure 5 of the main article.



**Figure S2.** Cross-correlograms of GWLs with the closest discharge station (in blue), and GWLs with the closest raingauge station (dashed black). Station locations are given in Table 1 and Figure 5 of the main article.



**Figure S3.** Cross-correlograms of GWLs with the closest discharge station (in blue), and GWLs with the closest raingauge station (dashed black). Station locations are given in Table 1 and Figure 5 of the main article.

Wavelet analysis



**Figure S4.** Wavelet power spectrum of the corresponding GWL. Black lines represent the cones of influence of GWL, where edge effects might distort the picture outside the cones.



**Figure S5.** Wavelet power spectrum of the corresponding GWL. Black lines represent the cones of influence of GWL, where edge effects might distort the picture outside the cones.



**Figure S6.** Wavelet power spectrum of the corresponding GWL. Black lines represent the cones of influence of GWL, where edge effects might distort the picture outside the cones.