Supplementary Figures

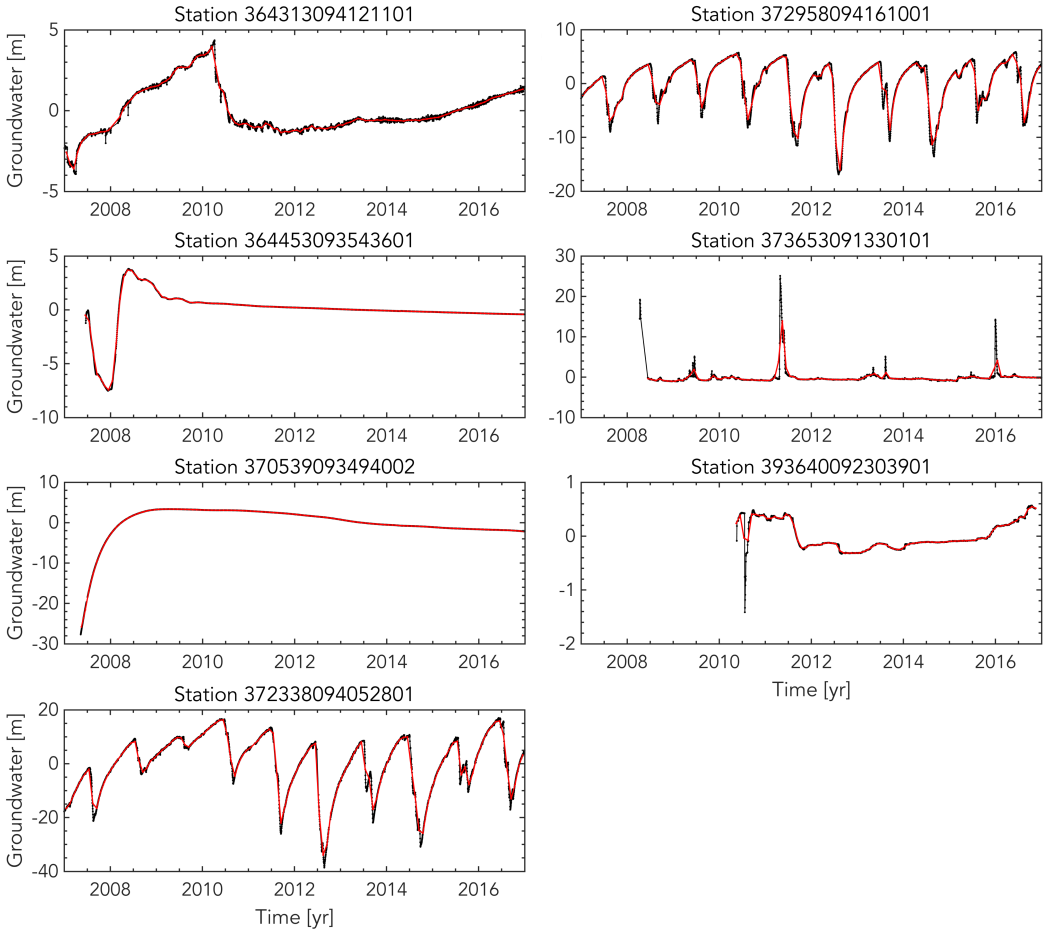
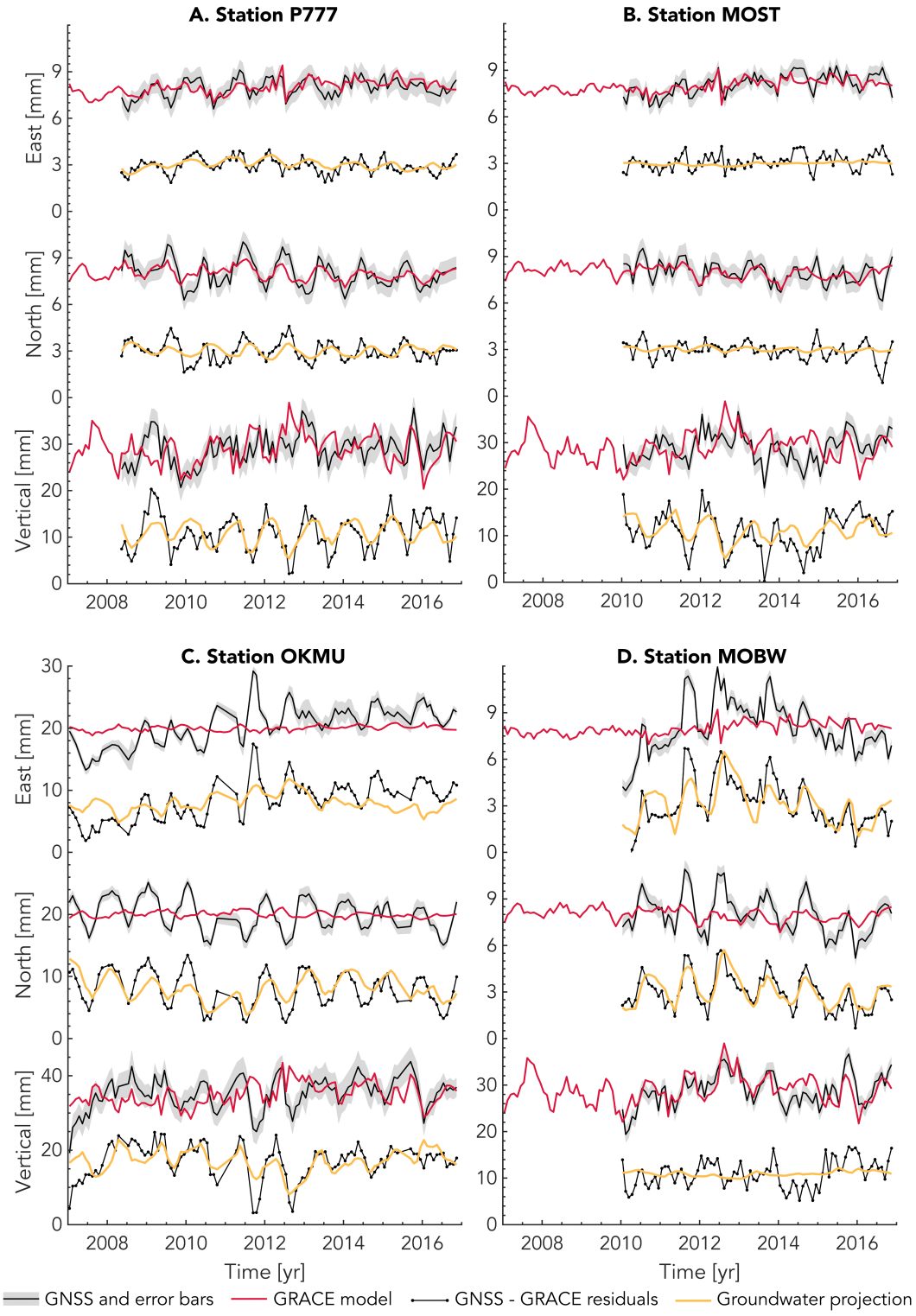


Figure S1. Groundwater time series excluded from the analysis. Black dots are the raw daily data and the red lines are the monthly averages. Stations 372958094161001 and 372338095042801 likely reflect local pumping effects.


A. Station P777
B. Station MOST
C. Station OKMU
D. Station MOBW
East [mm]
North [mm]
Vertical [mm]
Time [yr]
2008
2010
2012
2014
2016
GNSS and error bars
GRACE model
GNSS - GRACE residuals
Groundwater projection

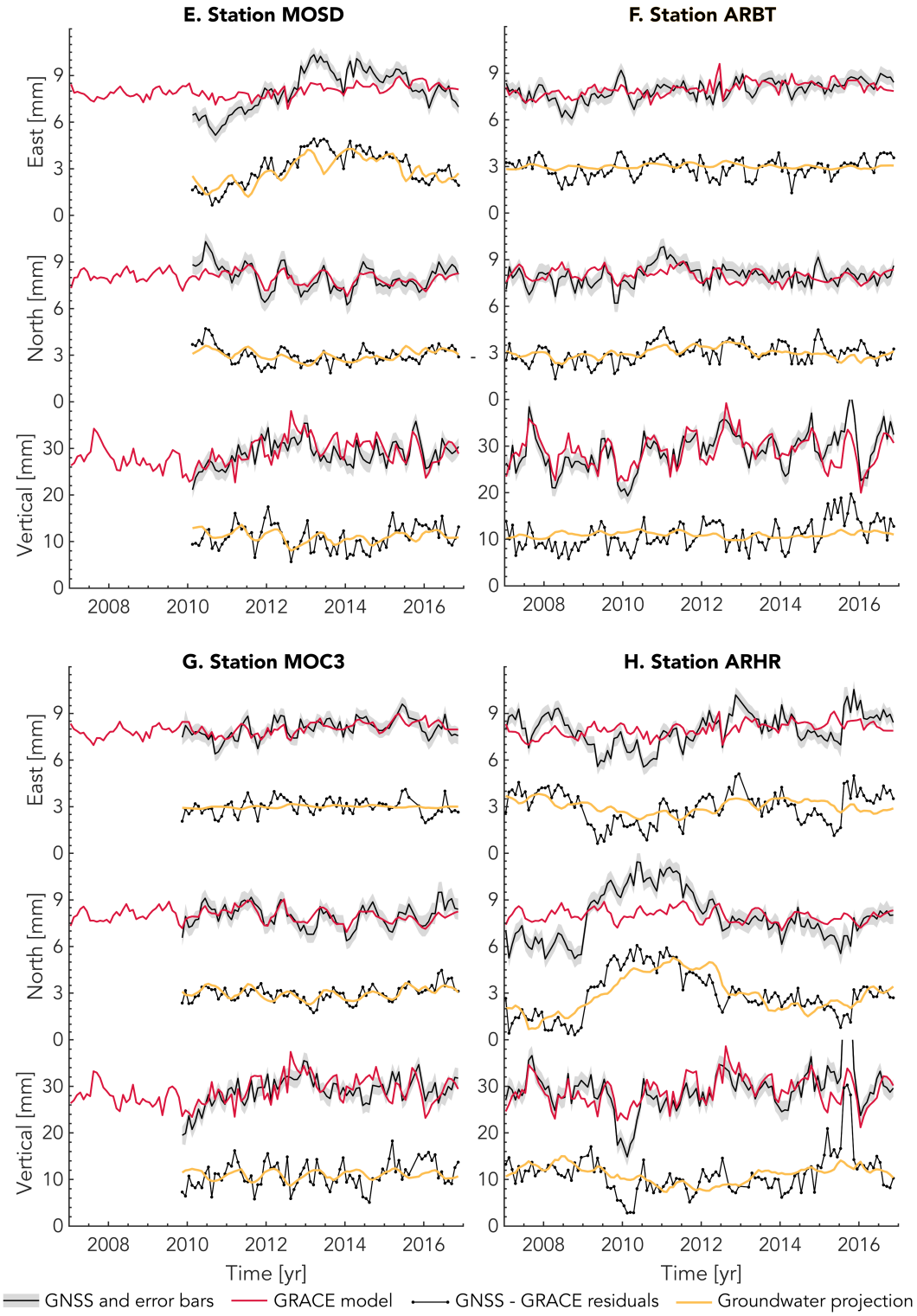


Figure S2. Additional examples of time series. Note the different scales for station OKMU.

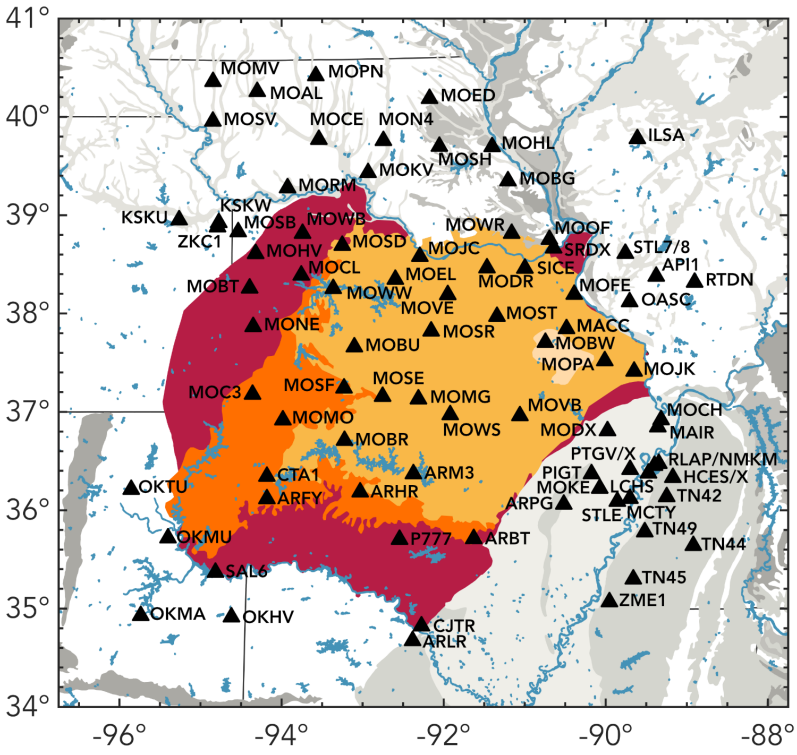


Figure S3. Names of the 86 GNSS stations retained for the analysis

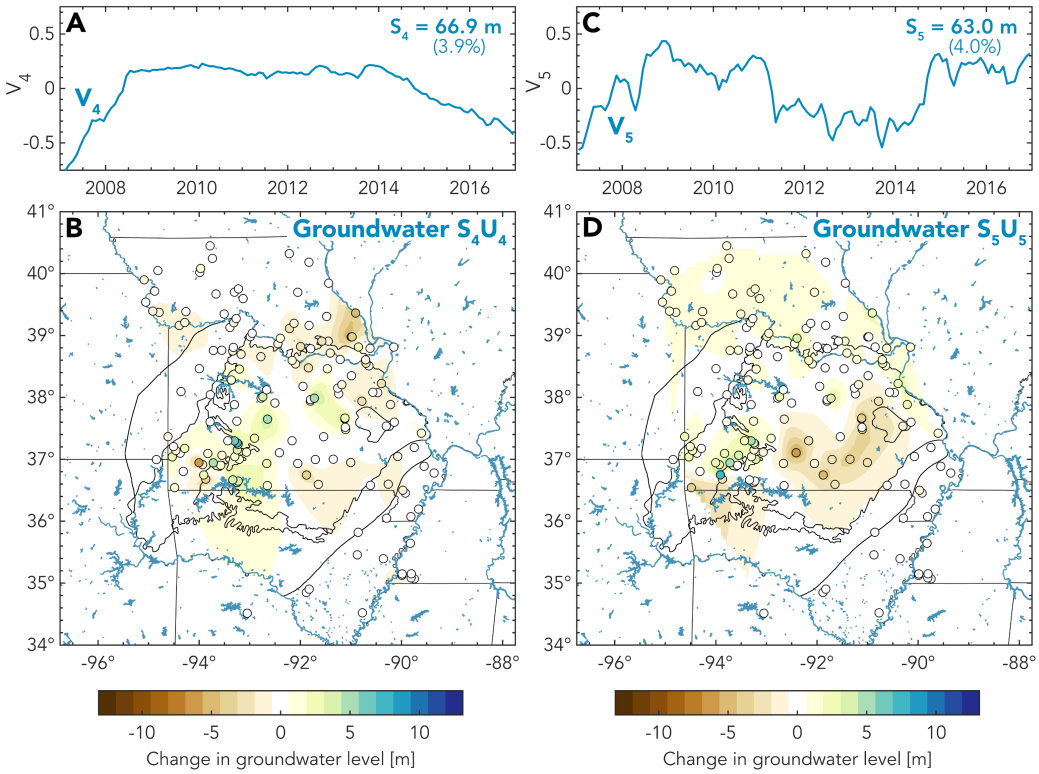


Figure S4. IC4 and IC5 of a 5 components groundwater ICA. IC1, IC2 and IC3 are similar to the 3 components ICA.

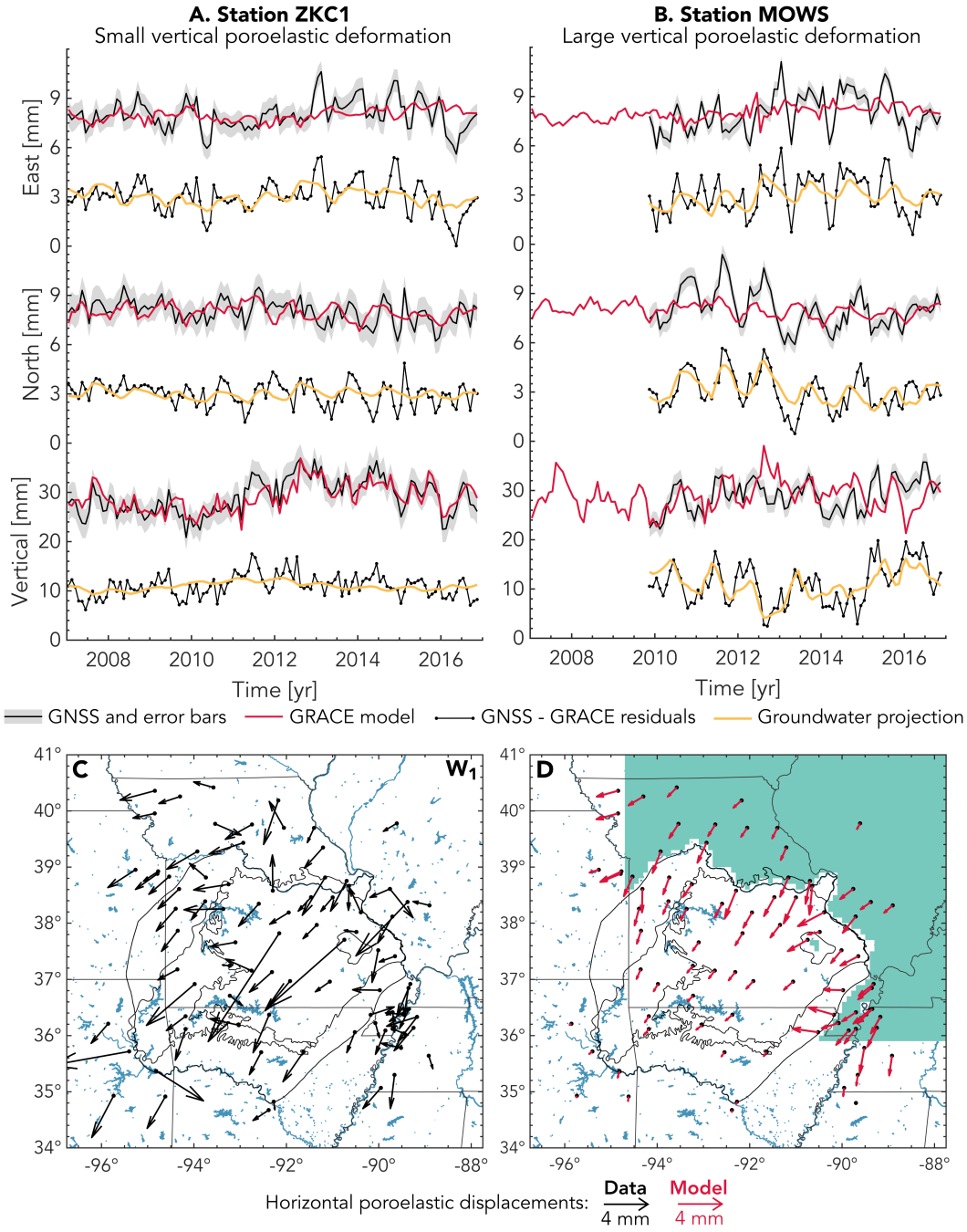


Figure S5. Common mode poroelastic signal from neighbouring aquifers. (A,B) Figure 8 but without removing horizontal common mode. (C) Horizontal poroelastic displacements inferred by projecting onto W_1 without removing common mode. (D) Modeled horizontal displacements due to eigenstrains outside OPAS in turquoise ($\Delta h = 10$m, $b = 1000$m).

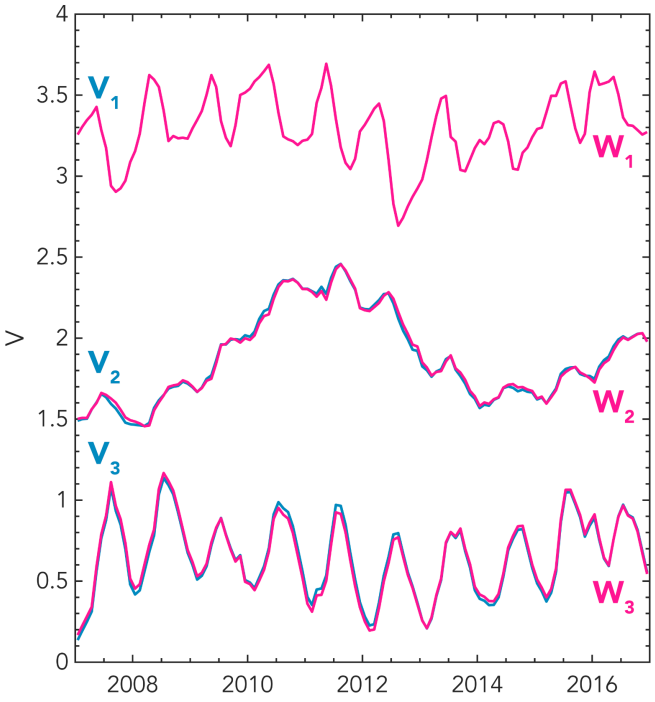


Figure S6. Original groundwater V's vs orthogonalized W's.

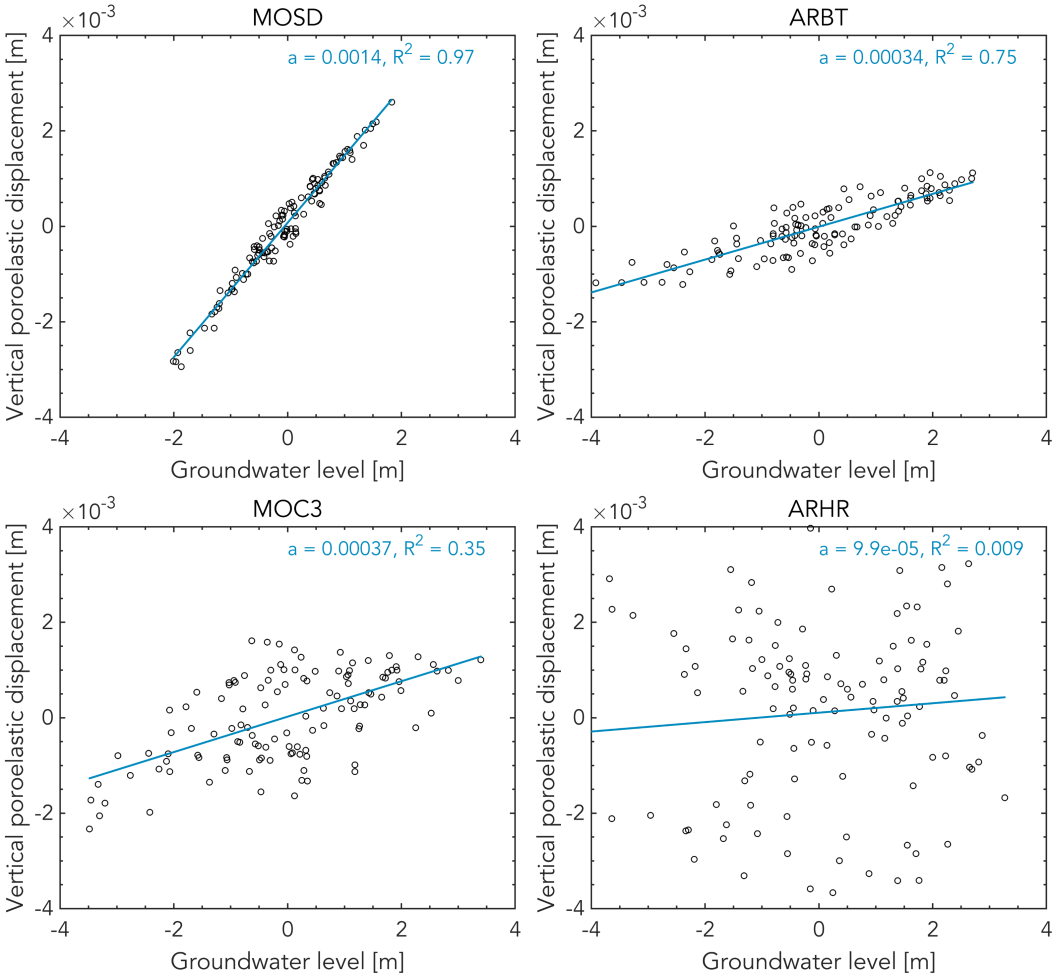


Figure S7. Coefficient of determination for stations shown in Figure 10. a is the slope of the best-fit line.

Rock	Confining stress [MPa]	Poisson ratio	Matrix bulk modulus [MPa]	Young modulus [MPa]
Blair Dolomite	0	0.25	83	125
Maxville Limestone	0	0.23	42	68
Berea Sandstone	10	0.25	6	9
Chattanooga Shale	0	0.16	5	11

Figure S8. Elastic properties from Ge & Garven (1992). Note that the Young moduli were computed from the reported values of Poisson ratio and bulk modulus.