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The poroelastic aquifer: river flux response to solid Earth tidal forcing JEROME NEUFELD, University of Cambridge, ERIC LAJEUNESSE, OLIVIER DEVAUCHELLE, Insitut de Physique du Globe de Paris — The water flux through rivers is chiefly determined by the intermittent charging of groundwater in laterally extensive shallow aquifers aquifers by rainfall and drawdown by seepage to the river bank. Here we show that the pattern of drawdown is modulated by the small-scale forcing of shallow poroelastic aquifers by the solid Earth tides. We use a shallow poroelastic model of flow in a deformable matrix to show that the modulation of the solid stress by solid Earth tides gives rise to the observed 2-4 cm height variation in the far-field aquifer depth. This oscillatory groundwater table also drives a modulation of the water flux into the river which is apparent in long-term records of stream flux. By understanding the poroelastic response of aquifers to solid Earth tides as observed in the river flux data, we are therefore able to infer properties of distributed aquifers from readily available records of the river flux. The fluid dynamical modelling, motivated by observations at the Quick creek catchment, Guadeloupe, also demonstrates a generic framework for understanding the interaction between periodic solid stresses and fluid flow in deformable porous media.

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