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4D physics-based pore pressure monitoring in the shallow subsurface of Groningen, the Netherlands

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We previously developed a physics-based model relating changes in pore pressure and vertical stress to seismic velocity variations and validated the model in a small area of Groningen gas field. Using the entire Groningen seismic network, near-surface velocity changes are estimated over a three-year period, using passive image interferometry. Using our developed model, we invert these observations of velocity change for pore pressure variations as a function of space and time, and thus we construct a 4D pore pressure model for the shallow subsurface of Groningen. Pressure-head recordings in the southeastern region of Groningen allow us to calibrate our inference tool.