Geomechanical modeling of the recent post-industrial uplift in Brussels and comparison with geodetic InSAR measurements

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Radar interferometry (InSAR) measurements have provided recent evidence of ground movements, particularly a slight uplift in north-western areas near the center of Brussels in response to changes in groundwater pumping and drainage linked to decreased industrial activities within the city. Historical potentiometric head changes between 1970 and 2020 are translated in water pressures transmitted to 1D vertical models coupling the vertical flow (and subsequent water pressure variations) with geomechanical swelling/consolidation calculations. The discretization of the 1D model is refined in the most compressible layers to obtain an accurate transient propagation of the water pressure changes and thus a better estimation of the swelling/consolidation values. The total uplift (or subsidence) is compared to the estimations obtained from the InSAR data processing. A detailed interpretation of such a comparison is not straightforward. Many factors and uncertainties can also play an important role in the estimated values from the processing of the InSAR measurements, as in the calculated values from the coupled hydrogeological-geotechnical models.

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