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Surface deformations observed by GPS and its relation to groundwater variations in France

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The Global Positioning System (GPS) measures surface displacements in response to time-varying terrestrial water mass variations. Components of surface water storage include water in lakes and reservoirs, snow, and soil moisture. Groundwater depletion or recharge will also contribute to the overall water storage. Understanding the nature of the observed GPS displacements related to the continental water variations is important to help identify which compartment in the total water storage controls the water changes in any particular region. In this study, we demonstrate the potential of GPS to observe the surface displacements induced by groundwater variations in France. In-situ groundwater observations from boreholes in France are used to be compared with GPS displacements. Groundwater data are processed to obtain the Equivalent Water Height (EWH) and used to forward model surface deformation. Displacements predicted using EWH variations from the WaterGAP Global Hydrology Model (WGHM) will also be compared to the GPS displacements.