



Calibrating vadose zone models with time-lapse gravity data: a forced infiltration experiment

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A change in soil water content is a change in mass stored in the subsurface, and when large enough, can be measured with a gravity meter. Over the last few decades there has been increased use of ground-based time-lapse gravity measurements to infer hydrogeological parameters. These studies have focused on the saturated zone, with specific yield as the most prominent target parameter and with few exceptions, changes in storage in the vadose zone have been considered as noise. Here modeling results are presented suggesting that gravity changes will be measureable when soil moisture changes occur in the unsaturated zone. These results are confirmed by field measurements of gravity and georadar data at a forced infiltration experiment conducted over 14 days on a grassland area of 10 m by 10 m. An unsaturated zone infiltration model can be calibrated using the gravity data with good agreement to the field data. The potential for gravity data to be used for the calibration of unsaturated zone model parameters is discussed.