Hydrological loading deformation around Lake Mead, Nevada-Arizona, USA

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ABSTRACT

As the largest US reservoir by volume, Lake Mead has been facing the effects of a devastating prolonged drought, this causes the lake water levels to plummet. The aim of this research is to model the three-dimensional crustal loading/unloading deformation in the Lake Mead region. Using surface water level changes, we estimated surface mass load decrease and modeled its unloading effect on surface deformation. Continuous Global Positioning System (GPS) data ranging from 2012 to 2021 at six locations were also used to compare the modeled results. Our preliminary results indicated that the modeled deformation due to the reduction in mass load within the reservoir is smaller than the GPS measurement. Our results indicate a strong association between observed and modeled surface deformation from soil moisture and lake at the station P006. However, there seems to be a detectable discrepancy between GPS observation and the modeling results using soil moisture from the Global Land Data Assimilation System (GLDAS) model. This suggests there could be other hydrological components that are not yet included in the model but are also experiencing mass loss due to the drought, such as groundwater. As the next step, we will further investigate the impact of local groundwater on the crustal deformation around this region.