**Estimation of 52 years of groundwater level through Ordinary Kriging in the San Joaquin Valley, California**

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**Abstract.** The San Joaquin Valley, one of the most agriculturally significant areas of California, has experienced large groundwater withdrawal. This study presents the estimation of long-term (1971-2023) groundwater level data over large area of San Joaquin Valley. Available groundwater level records were analyzed, and the groundwater level data was interpolated for the entire region using Ordinary Kriging with a spherical variogram. Each year's model accuracy was assessed using a 5-fold K-fold cross-validation procedure. The result showed considerable shift in groundwater levels between 1971 and 2023, with the levels falling over most of the region. The findings also uncovered a reduction of up to 210 feet in the water table in 2023 when compared to the levels observed in 1971. Our Validation approach showed diverse performance metrics across different years: MAE (17.111 to 71.156), RMSE (30.27 to 101.54), ME (-2.83 to 3.708), NRMSE (0.045 to 0.138), and r² (0.512 to 0.93). Notably, there was a sharp fall of the water table after 2010. This study revealed that the fall in groundwater table has been compounded by the effect of drought occurring at various intervals in the 52-year time span. The result of this research can be used for analyzing long term groundwater modeling and water level analysis in the San Joaquin Valley. We will also combine Ordinary Kriging with the Small Baseline Subset Approach (SBAS), which uses change in head across different time periods to minimize noise by leveraging data from overlapping years. Following this, we will also evaluate the yearly changes in head derived from both approaches and compare the results.