

Critical Evaluation of Groundwater Monitoring Networks for Machine Learning Applications

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Abstract : Groundwater monitoring networks are critical in evaluating the vulnerability of groundwater resources to depletion and contamination, both in space and time. Groundwater monitoring networks typically grow over decades, often in organic fashion, with relatively little overall planning. The groundwater monitoring networks in the Madrid area, Spain, were reviewed for the purpose of identifying gaps and opportunities for improvement. Spatial analysis reveals the presence of various monitoring networks belonging to different institutions, with several hundred observation wells in an area of approximately 4000 km². This represents several thousand individual data entries, some going back to the early 1970s. Major issues included overlap between the networks, unknown screen depth/vertical distribution for many observation boreholes, uneven time series, uneven monitored species, and potentially suboptimal locations. Results also reveal there is sufficient information to carry out a spatial and temporal analysis of groundwater vulnerability based on machine learning applications. These can contribute to improve the overall planning of monitoring networks' expansion into the future.

Keywords : groundwater monitoring, observation networks, machine learning, madrid

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