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Spatial-temporal variation analysis and prediction of water quality in the Yellow River basin, China

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With the implementation of relevant policies on pollution control, the water environment of the Yellow River basin has been improved during recent years. However, for the river basin management agency, there remains an urgent need for gaining better knowledge of the changing patterns of water quality throughout the basin in order to get early warnings of water quality deterioration and make decisions on water allocation schemes. In this study, we collected water quality data including 24 routine monitoring parameters during 2014-2019 from over 100 monitoring stations located along the Yellow River. After assessing the water quality grade for each section according to the Environmental Quality Standards for Surface Water in China, we identified the key parameters that affect the water quality condition of the basin. The spatial and temporal variations of the key water quality parameters, in particular the relationships with driving factors which include natural factors (i.e., precipitation, temperature and evaporation) as well as anthropogenic factors (i.e., land cover and land use, pollution emission, population and social economy), were presented by conducting correlation analysis. Furthermore, based on the characteristics of the water quality time series and the significances of the driving factors to water quality, we built several data-driven models to predict the water quality condition at a monthly scale for the Yellow River basin, such as seasonal autoregressive model (SAR), multivariate linear regression (MLR) and artificial neural network (ANN), while the performances of those models were evaluated. This study provides critical information for understanding the response relationship between water quality and its related factors for a typical river basin, thus facilitating the dynamic assessment of water resources.