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Assessment of ecological flow regime variation of the Yellow River in the past 60 years

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The variation of ecological flow regime is fundamental for assessment of river ecological status and river management. This study analyzed the temporal and spatial variations of the flow discharge and sediment load in the Yellow River basin, China in the past 60 years. The relationships were explored between the flow alteration and the ecological responses indicated by the Indicators of Hydrologic Alteration (IHA). Daily long-term datasets covering all the 27 existed hydrological stations along the main stem of the Yellow River were employed to calculate the metrics of IHA. Principal component analysis (PCA) assisted in dividing the river basin into five separated sections based on the hydrologic features. In each section, at least 10 IHA indices were determined as the representative metrics for the hydrologic variations and ecological responses. Wavelet analysis detected the changes in the variance of the monthly discharge series, indicating change points after the year 1985 occurred at 23 of the 27 stations. Most records showed reduction in flood magnitudes and flow variabilities due to reservoir construction and regulation. Sediment rating curves was applied to detect the variations in the temporal and spatial relationship between discharge and sediment load. The influence of human activities on the flow and sediment load variation was discussed based on comparison of most of the existed reports.