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Changes in streamflow and sediment discharge and the response to human activities in the middle reaches of the Yellow River

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Abstract. The changes in streamflow and sediment discharge in the middle reaches of the Yellow River are a focus. In this paper, based on the precipitation, streamflow and sediment discharge series data (1950–2008), the streamflow and sediment discharge variation and its impact on precipitation/response to human activities have been analysis. The results show that significant decreasing trends in annual streamflow and sediment discharge have existed since the late 1950s in the middle reaches of the Yellow River ($P = 0.01$). Change-point analyses further revealed that transition years existed and that abrupt decline in streamflow and sediment discharge began in 1985 and 1981, respectively, in the middle reaches of the Yellow River ($P = 0.05$). Adoption of conservation measures in the 1980s and 1990s corroborates the identified transition years. Double-mass curves of precipitation vs. streamflow (sediment) for the periods before and after the transition year show remarkable decreases in proportionality of streamflow (sediment) generation. Compared with the period before the transition year, cumulative streamflow and cumulative sediment discharge reduced respectively by 17.8% and 28% during 1985–2008, which was caused by human intervention, in the middle reaches of the Yellow River. It is, therefore, concluded that human activities occupied a dominant position and played a major role in the streamflow and sediment discharge reduction in the middle reaches of the Yellow River.


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