



## Examining the evolution of an ancient irrigation system: the Middle Gila River Canals

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Studying ancient irrigation systems reinforces to understand the co-evolution process between the society and water systems. In the prehistoric Southwest of America, the irrigation has been a crucial feature of human adaptation to the dry environment. The influences of social arrangements on irrigation managements, and implications of the irrigation organization in social developments are main issues that researchers have been exploring for a long time. The analysis of ceramics pattern and distribution has assisted to the reconstruction of prehistoric social networks. The existing study shows that, a few pottery fragments specially produced by the materials of the middle Gila River valley, were found in the Salt River valley; however, very few specialized ceramics of the Salt River valley occurred in the middle Gila River valley. It might indicate that there were trades or exchanges of potteries or raw materials from the middle Gila River valley to the Salt River valley. The most popular hypothesis of trading for the potteries is crop production. Based on this hypothesis, the ceramics trade was highly tied to the irrigation system change. Therefore, examining the changing relationship among the ceramics distribution along the middle Gila River, canals flow capacity, and available streamflows, can provide an insight into the evolutionary path among the social economy, irrigation and water environment.

In this study, we reconstruct the flow capacity of canals along the middle Gila River valley. In combination with available streamflow from the middle Gila River, we can simulate how much water could be delivered to the main canals and lateral canals. Based on the variation and chronology of potteries distribution, we may identify that, the drama of the middle Gila River receiving insufficient flows for crop irrigation caused the development of ceramics exchange; or the rising of potteries exchange triggers the decline of irrigation in the study area.