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Technologies across time and space

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Recognition criteria for canals and rivers in the Mesopotamian floodplain

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Abstract

The ability to distinguish between the remaining traces of rivers and those of canals would greatly increase our understanding of water history and management within a given area. Such an understanding would lead in turn to a greatly enhanced understanding of the landscape, social structure, political life and economy of that area. For the Mesopotamian floodplain, intensive water-management activities, together with the frequent avulsions of the Euphrates and Tigris rivers, have rendered channel networks complex and interlocked. This complexity has long confused researchers in regard to channel origins, and whether they are natural or anthropogenic, or a combination of the two. It is a challenging task, but the present work proposes and discusses seven key differences between the two types of channels, namely topographical cross-sections, crevasse splays, marshes, meandering, cut-offs and oxbow lakes, channel patterns, and stream directions. The discussion is based on geomorphological, remote-sensing, historical and archaeological data. It is concluded that, for a given channel, these differences may be sufficient to establish its origin.

The floodplains of Mesopotamia

The floodplain of the Tigris and the Euphrates is a relatively flat area with a low topographic relief, occupying a part of the foreland basin of the Zagros fold and thrust belt (Garzanti et al., 2016). On one hand, rivers in this region are unstable as they are commonly laterally shifted, completely or partially avulsed, seasonally flooded and occasionally desiccated (Morozova, 2005; Jotheri et al., 2016). On the other hand, this region is considered one of the origins of complex societies and has been continually occupied from the Mid-Holocene; here, people have relied on natural and constructed canals for life, irrigation, transport and fortification (Wilkinson, 2003).

The origin of the ancient channels, whether natural or anthropogenic, in some cases cannot be determined with absolute confidence. This can occur when a canal has a long history of use and becomes similar to a river. However, in the present study, the focus is on channels that are now abandoned and dry, regardless of their history, in other words on the final condition of the channel when it is dried out and on whether it was modified and shaped by human activity or there are indications that it was a natural river.

There are many types of anthropological activities, but several of them have led to a re-formation of the landscape, including the creation of irrigation and trading canals, the cleaning and maintenance of the channels, the opening of channel levees, the reclamation of marshes and the strengthening of channel levees (Walstra et al., 2010; Heyvaert et al., 2012; Husain, 2016). The idea of human utilisation of surface water in southern Mesopotamia was developed over time. It started as a simple means of irrigation, such as the crevasse splay style of the fourth millennium BC, when canals of a few metres were dug to control water to supply a small farm (Wilkinson et al., 2015). This construction process did not end until large irrigation canals, such as the gigantic Nahrawan Canal, extended for hundreds of kilometres across the floodplain during the early first millennium AD.

State interventions in water and irrigation systems would lead to high levels of water management and, as a result, to the flourishing of the state and of rural communities. The challenges presented by river changes led to the development of water management over time. The three main reasons for state intervention are political, to gain more control and to tackle sudden change in the environment (Rost, 2017).

Previous work has dealt with mapping archaeological sites and ancient channels in southern Mesopotamia. It includes Jotheri and Allen (in press), Hrits and Wilkinson (2006) and Pournelle (2012). Satellite