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Long-term interactions between man and the fluvial environment – case of the Diyala alluvial fan, Iraq

Vanessa M.A. Heyvaert (1,2), Jan Walstra (3), and Clément Mortier (3)

(1) OD Earth and History of Life, Geological Survey of Belgium, Royal Belgian Institute of Natural Sciences, Brussels, Belgium, (vanessa.heyvaert@naturalsciences.be), (2) Department of Geology and Soil Science, Universiteit Gent, Gent, Belgium, (3) OD Earth and History of Life, Geological Survey of Belgium, Royal Belgian Institute of Natural Sciences, Brussels, Belgium, (jan.walstra@naturalsciences.be)

The Mesopotamian alluvial plain is dominated by large aggradading river systems (the Euphrates, Tigris and their tributaries), which are prone to avulsions. An avulsion can be defined as the diversion of flow from an existing channel onto the floodplain, eventually resulting in a new channel belt. Early civilizations depended on the position of rivers for their economic survival and hence the impact of channel shifts could be devastating (Wilkinson 2003; Morozova 2005; Heyvaert & Baeteman 2008). Research in the Iranian deltaic part of the Mesopotamian plain has demonstrated that deliberate human action (such as the construction of irrigation canals and dams) triggered or obstructed the alluvial processes leading to an avulsion on fluvial megafans (during preconditioning, triggering and post-triggering stages) (Walstra et al. 2010; Heyvaert et al. 2012, Heyvaert et al.2013). Thus, there is ample evidence that the present-day alluvial landscapes in the region are the result of complex interactions between natural and anthropogenic processes.

Here we present a reconstruction of the Late Holocene evolution of the Diyala alluvial fan (one of the main tributaries of the Tigris in Iraq), with particular attention to the relations between alluvial fan development, changes in channel pattern, the construction of irrigation networks and the rise and collapse of societies through historic times. The work largely draws on the use of remote sensing and GIS techniques for geomorphological mapping, and previously published archaeological field data (Adams 1965). By linking archaeological sites of known age with traces of ancient irrigation networks we were able to establish a chronological framework of alluvial activity of the Diyala alluvial fan.

Our results demonstrate that centralized and technologically advanced societies were able to maintain a rapidly aggradading distibutary channel system, supplying water and sediment across the entire alluvial fan. As a consequence, during these periods (Parthian, Sasanian and again in modern times), significant human modification of the landscape took place. Periods of societal decline are associated with reduced human impact and the development of a single-threaded incising river system.

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