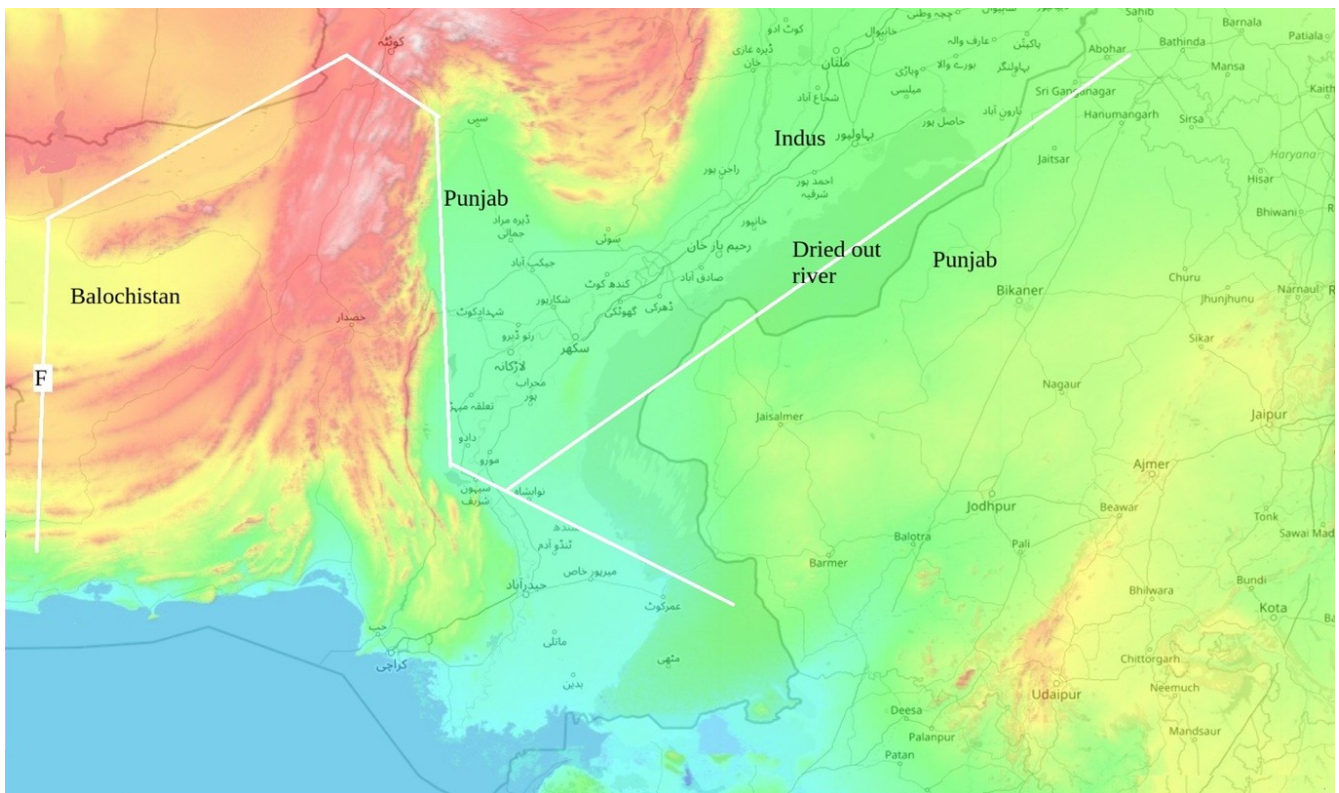


Indus River: An Archeological View

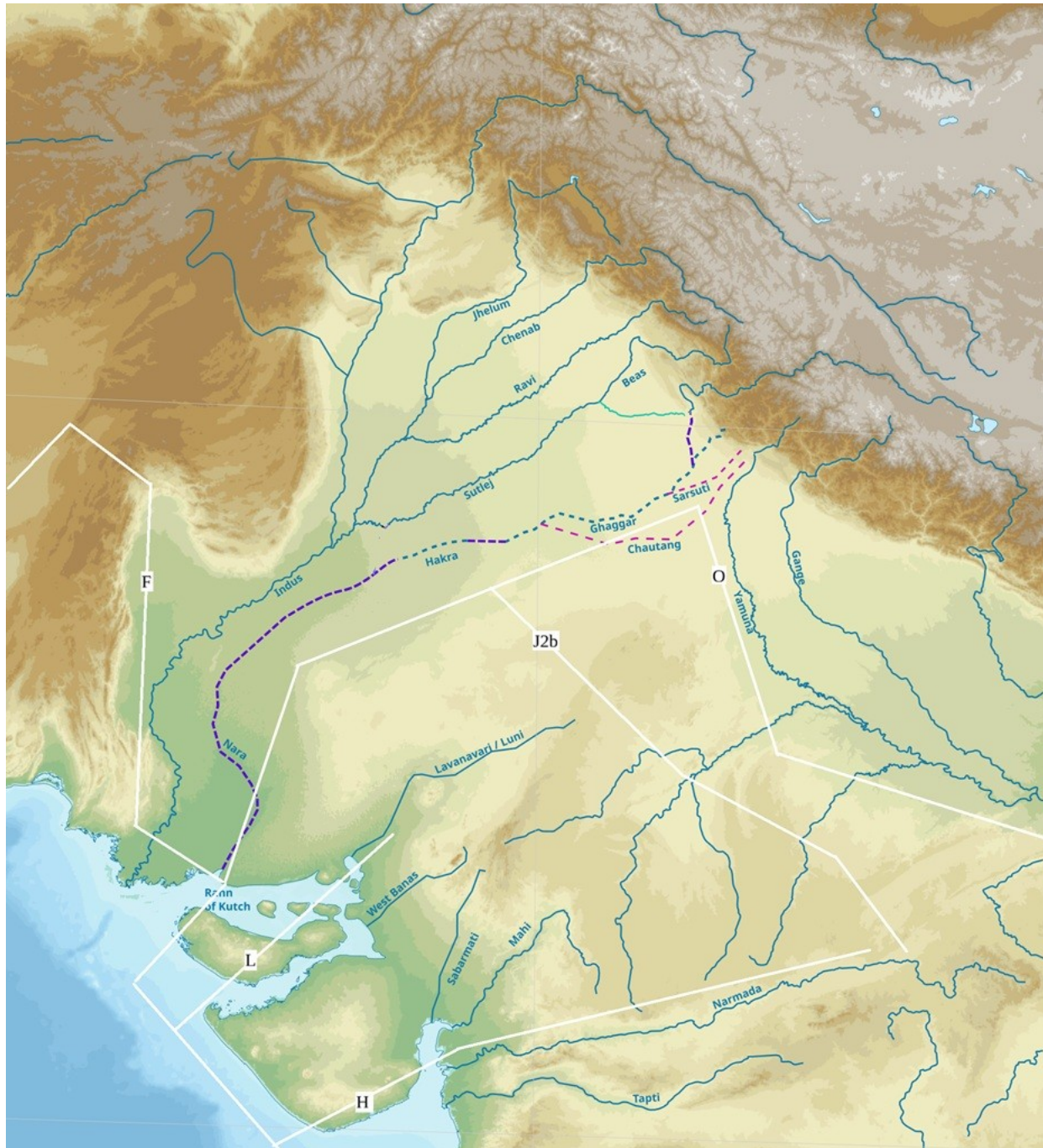
by Potluri Rao In Seattle ©2018 (CC BY 4.0)

The core samples of the Indus River sediment layers revealed that the current borderline between India and Pakistan was at one time a rainwater river that is now dried out. It alternated as an active and dormant river every 20,000 years due to the Earth's Axial tilt, called the 41,000-year cycle. The monsoon winds blew from the Arabian Sea to the Bay of Bengal in summer for 20,000 years and reversed direction and blew in winter for another 20,000 years. When the winds blew from west to east, the west side of the Aravalli Ridge was fertile land; when the winds blew from east to west, it was a wasteland. The rainwater river went dormant 4,000 years ago.

It was a different landscape when Hindus (DNA F) migrated from Somalia to Peninsular India. All the excavation sites were along the now dormant rainwater river, not the current Indus River. Hindus were rainwater people. They lived only along the rainwater river. People who were ignorant of geology falsely assumed that the excavation sites were along the current Indus River and invented a false theory of the Indus Valley Civilization. People who lived along the current Indus near Pakistan were recent European immigrants (DNA R1); they were falsely portrayed as Hindus (F).



The following image shows the now dormant rainwater river. The rainwater river and Yamuna River originated at the same place. One went on the west side and the other on the east side of the Aravalli Ridge. Some Hindus (DNA O) moved along the Yamuna to the Bay of Bengal, called Sunda.



The following pages are from a recent study of core samples of the Ghaggar (Ajit Singh, 2017).

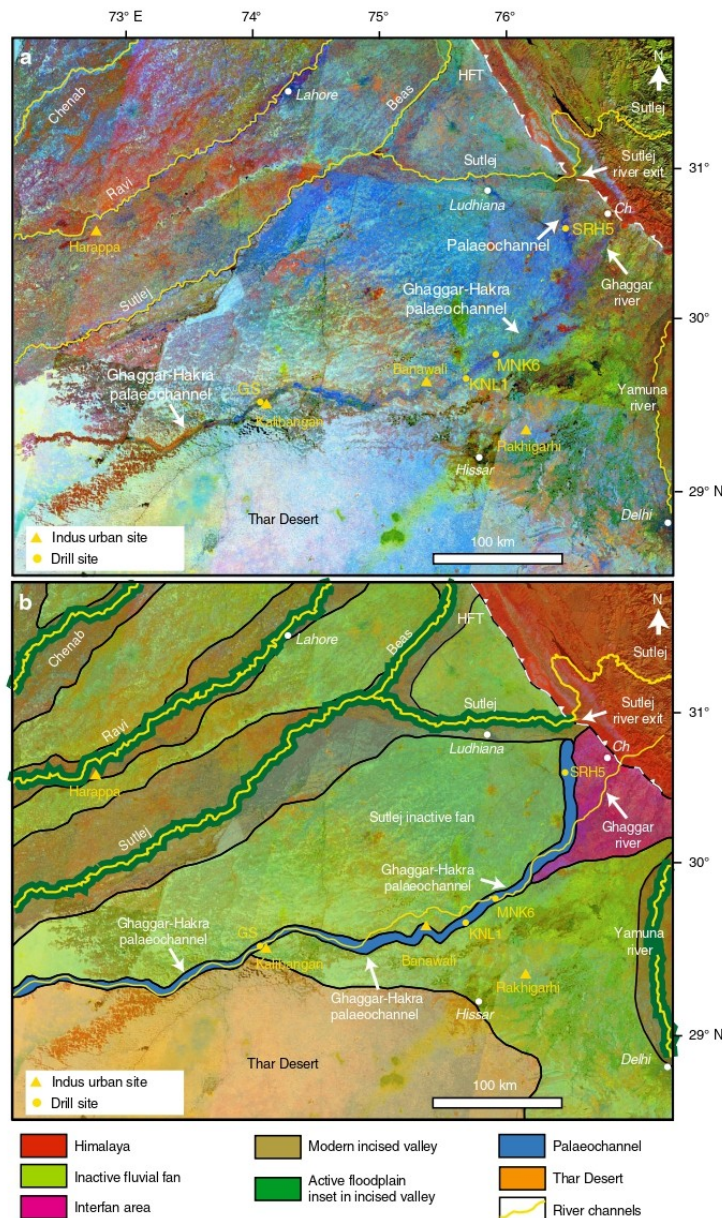


Fig. 2 Trace of Ghaggar-Hakra palaeochannel on northwestern Indo-Gangetic plain. **a** Background shows Landsat 5 TM colour composite mosaic (bands 456). The Ghaggar-Hakra palaeochannel is visible as a sinuous, dark blue feature. Location of GS core sites adjacent to the Indus urban centre of Kalibangan, along with core sites at KNL1, MNK6, and SRH5, are also indicated. Location of key Indus urban settlements indicated by triangles. **b** Geomorphological map showing major alluvial landforms in the study region. Ch, Chandigarh; HFT Himalayan frontal thrust

Indus civilisation^{24, 26, 31, 32}. The subsequent identification of this palaeochannel, known as the Ghaggar in India and the Hakra in Pakistan, on satellite imagery^{33–36} has led to intense discussion about its origin and its genetic link with nearby Indus settlements^{12, 25, 37–40}. The Ghaggar-Hakra palaeochannel has been claimed as the former course of a large Himalayan river that provided water resources to sustain these Indus settlements^{12, 33, 41, 42}, which include important sites such as Kalibangan,

Banawali, Bhirrana and Kunal. Moreover, the palaeochannel has been linked with the mythical Sarasvati River first referred to in Vedic texts^{12, 28–30, 41}. The modern landscape, by contrast, is characterised by ephemeral river courses, such as the Ghaggar River, which primarily flow during monsoon precipitation^{39, 43, 44}.

The drying up of the river that formed the Ghaggar-Hakra palaeochannel has been suggested as a major factor in the decline

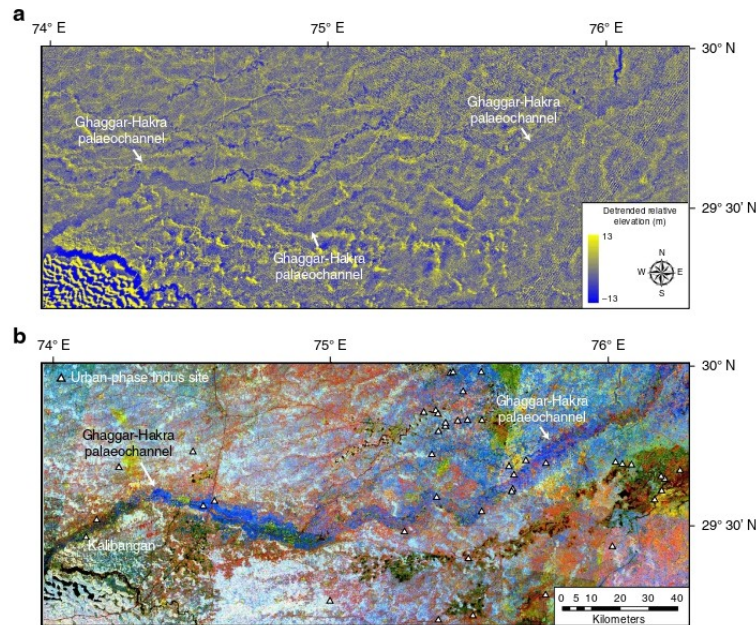


Fig. 3 Topography of Ghaggar-Hakra palaeochannel. **a** Detrended relative elevation map of Sutlej-Yamuna drainage divide, derived from NASA Shuttle Radar Topography Mission (SRTM)⁵³ 30 m DEM (2014 release) showing that Ghaggar-Hakra palaeochannel forms an incised valley. **b** Corresponding TM colour composite image (detail of Fig. 2) showing correspondence of Ghaggar-Hakra palaeochannel and incised valley. Locations of urban-phase Indus settlements along Ghaggar-Hakra palaeochannel are indicated

and abandonment of Indus urban centres in the region from ~4.0–3.9 ka B.P.¹⁴. This has led to speculation that drying of the river also contributed to the transformation or collapse of the Indus urban system^{24, 37, 41, 42}. For about a millennium after the decline of Indus urbanism, no large-scale urban centres developed in South Asia, until the early Historic period^{15, 18}. The disappearance of the river has been explained as a consequence of river diversion related to tectonic activity¹², or aridification due to climate change³⁹. However, there is no independent evidence for either of these mechanisms, and no constraint on the timing. Despite much speculation, and several recent studies^{39, 44–48}, the lack of detailed in situ constraints on the character, age and origin of the river deposits means that the specific role of river dynamics in the florescence and decline of Indus urbanism in this important region remains unresolved^{25, 38, 39, 43, 49, 50}. Here we resolve these issues by characterising the nature of late Quaternary fluvial deposition, up to and including the time of Indus Civilisation urbanisation, near the drainage divide of the Sutlej and Yamuna rivers (Fig. 1). By determining the chronology and provenance of fluvial deposits, we focus on the effects of river avulsion on the onset and long-term stability of Indus urbanism in northwestern India.

Results

Remotely sensed imaging of the Ghaggar-Hakra palaeochannel. To map the large-scale modern and palaeo-drainage configuration of the region, we analysed the geomorphology using remotely sensed optical imagery and a Synthetic Aperture Radar (SAR)-derived digital elevation model (DEM) focussing in particular on the Ghaggar-Hakra palaeochannel.

We generated a new colour composite image mosaic from Landsat 5 Thematic Mapper (TM) scenes using spectral bands 456 (near infra-red, short-wave infra-red and thermal infra-red

regions) displayed in the red, green and blue colour guns, respectively (Fig. 2; Supplementary Methods). The thermal infra-red (band 6) can be considered a proxy for surface temperature and shows the varying emittance of surface materials; during daytime imaging, damp conditions in the palaeochannel suppress both surface temperature and reflectivity, causing it to appear in a dark blue colour in Fig. 2. Areas outside the palaeochannel are characterised by drier conditions and therefore appear brighter and more reflective, while the Thar Desert is shown as white due to brightness in all bands (high reflectance in bands 4 and 5, and high emittance in band 6).

The large-scale geomorphology of the study area comprises two major fluvial fan depositional systems formed by the Sutlej and Yamuna rivers^{51, 52}. Both of these rivers are currently deeply incised into older fan deposits, such that the fan surfaces are relict features that are disconnected from modern Himalayan river flow. We observe a distinct ~5–6 km wide sinuous feature (the dark blue feature in Fig. 2) on the Sutlej fan surface that extends ~400 km from the Sutlej River exit at the Himalayan mountain front to the Thar Desert. Our analysis suggests that the darker blue tone represents relatively cooler and less reflective surface materials, interpreted as sediments with higher moisture content. We interpret this damp and sinuous feature to represent the trace of the Ghaggar-Hakra palaeo-drainage system.

We investigated the topographic character of this palaeo-drainage system using the NASA Shuttle Radar Topography Mission⁵³ (SRTMv3) DEM with a 1 arc-second or 30 m spatial resolution. Analysis of a relative elevation map derived from these data (Fig. 3) shows that the Ghaggar-Hakra palaeochannel observed in the colour composite image data corresponds to a topographic low in the landscape. This indicates that the palaeochannel forms an elongate and sinuous incised valley that is eroded several metres into the surrounding plains (Fig. 3).