



## **Application of remote Sensing Techniques to Map the Paleochannels of Shatt Al-Arab and Khor Al-Zubair, Southern Iraq**

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### **Abstract**

The study area covers the eastern and western part of Shatt Al-Arab River to Khor Al-Zubair channel and the north western coast of the Arabian Gulf. The application of remote sensing techniques on the satellite image Landsat 7 ETM+ (2003) indicates many local and regional interesting observations, which explain many geomorphological features in this area. This geomorphological analysis show five paleochannels; two of them located to the west and the other three to the east of the actual channel of Shatt Al-Arab River, respectively. The image processing reveals also that there are many extinct paleo irrigation systems connected to that five paleochannels and ending to the northern coast of the Arabian Gulf. The isopach maps of equal elevations provide the presence of levee's less than 3m in height. These levee's match with the actual meandering in the Shatt Al-Arab River. This could explain the paleo irrigation of the southern part of Shatt Al-Arab River and Behmashir River channels. Two paleo river lines are also distinguished around the actual channel of Khor Al-Zubair. These observations could be related to the tectonic settings of this area.

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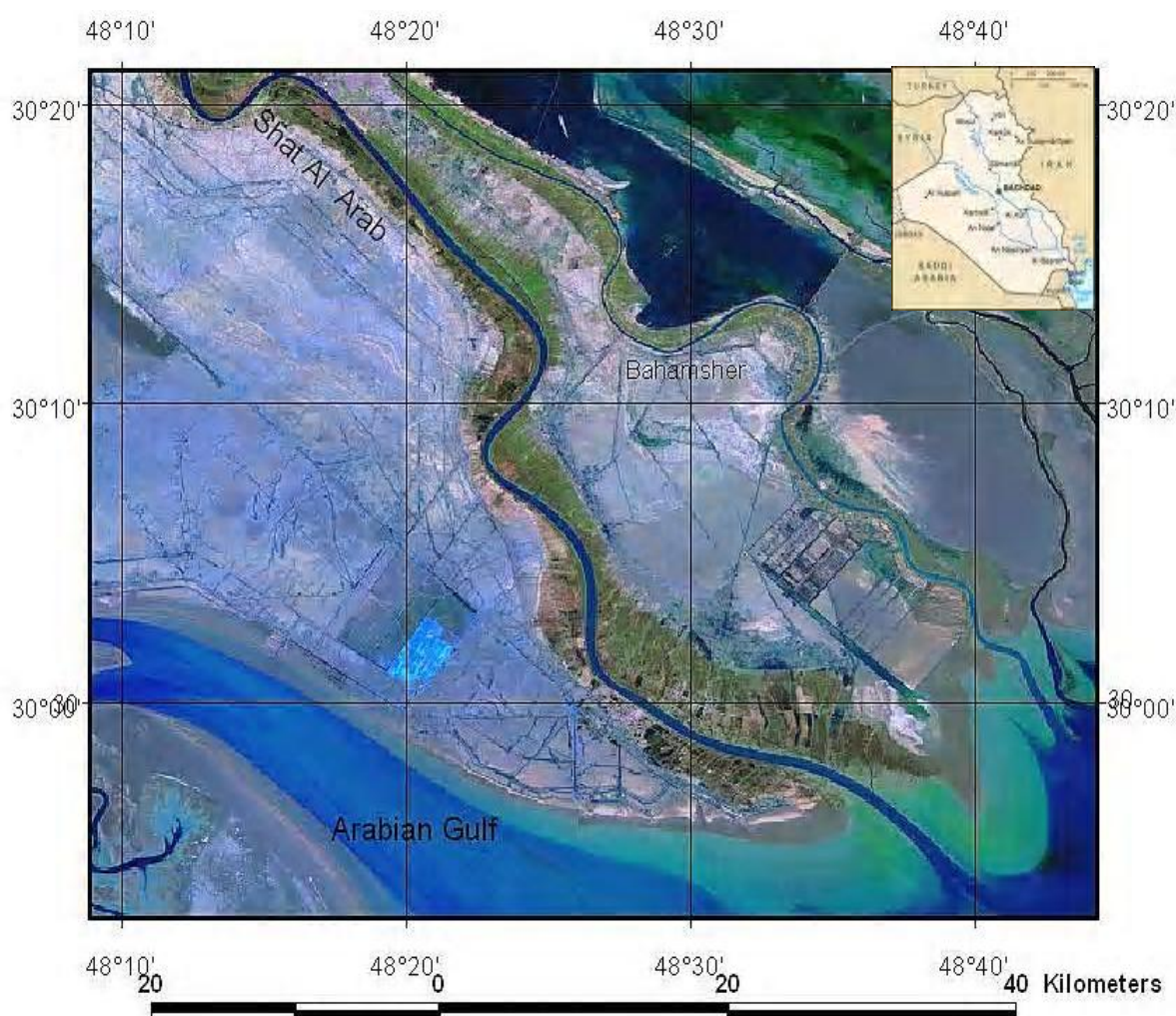
## **1- Introduction**

The river channel is a subject to many variations, starting from its tributaries to the last stage of estuary due to hydrological, geological, meteorological and land use factors. For that the migration of river channel with time is an important mechanism which changes the geomorphology of the river. River channel migration phenomenon is well known in the low relief area of the delta plain, especially in the area which covered by unconsolidated sediments. In the Perstrative phase the river bank is low which suffered from the flooding period.

The study area is characterized by low relief (Almulla, 2005), where the maximum elevation is no more than 3 m.

above sea level, and the surface is extended horizontally around Shatt Al-Arab and Behmashir Rivers to the inland sabkha. This area covers by Quaternary sediments, and is a subject to sea level fluctuation and meteorological variation which entrain a local contrast in the lithofacies and geomorphological features , ( Jassim and Goff, 2006).

This study deals with the paleogeographic map of irrigation channels and their migration with time by application of remote sensing techniques.



**Fig (1) Landsat Image ( ETM + , 2002 ) , showing the study area.**

## 2-Methods:

The study area is located between the longitudinal  $47^{\circ} 38'$  and  $48^{\circ} 57'$  E, and latitude  $29^{\circ} 44'$  and  $30^{\circ} 49'$  N, (Fig. 1). Landsat image (ETM+) (2004) of all spectral bands within the visible to infrared used for this purpose. Erdas imagine 8.4 program was applied to made a several image possessing such as, geometric

correction, subset images, spatial and radiometric enhancement and layer stack. Finally, the program Arcview GIS 3.2 was also applied to produce the maps of different scales and coordinates for the study area. Aerial photographs of scale (1: 33,000) (1960) was also employed to match the observations with topographic maps of 1: 100000. f Digital maps

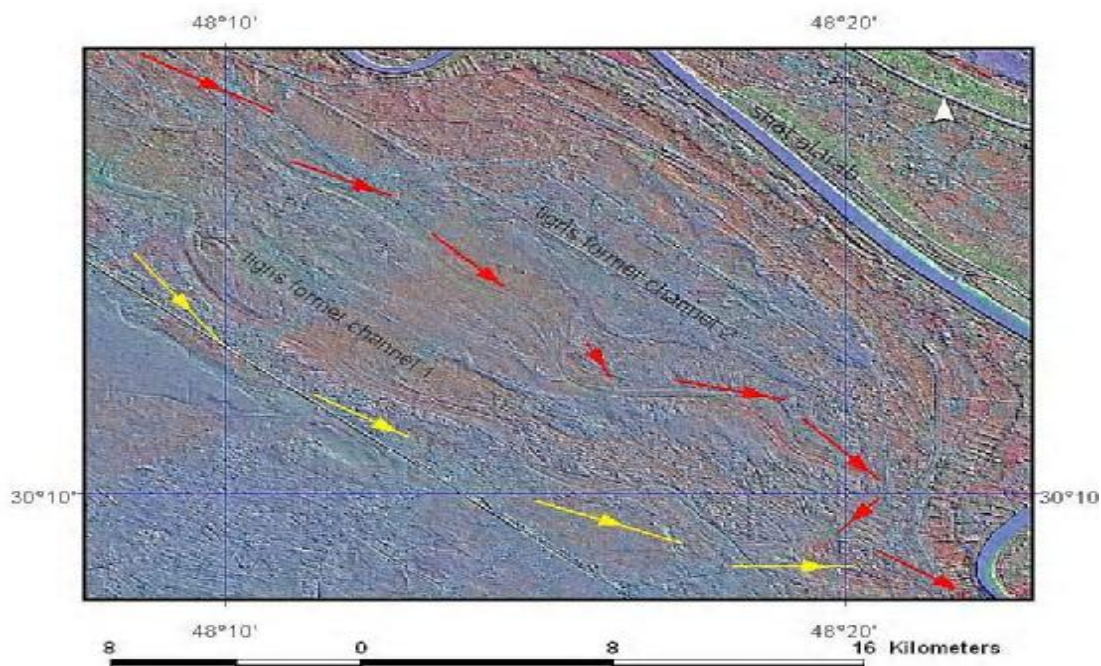
of three dimension views in geomorphic details; accurate and easy interpretation has been obtained.

### **3-Results and discussion:**

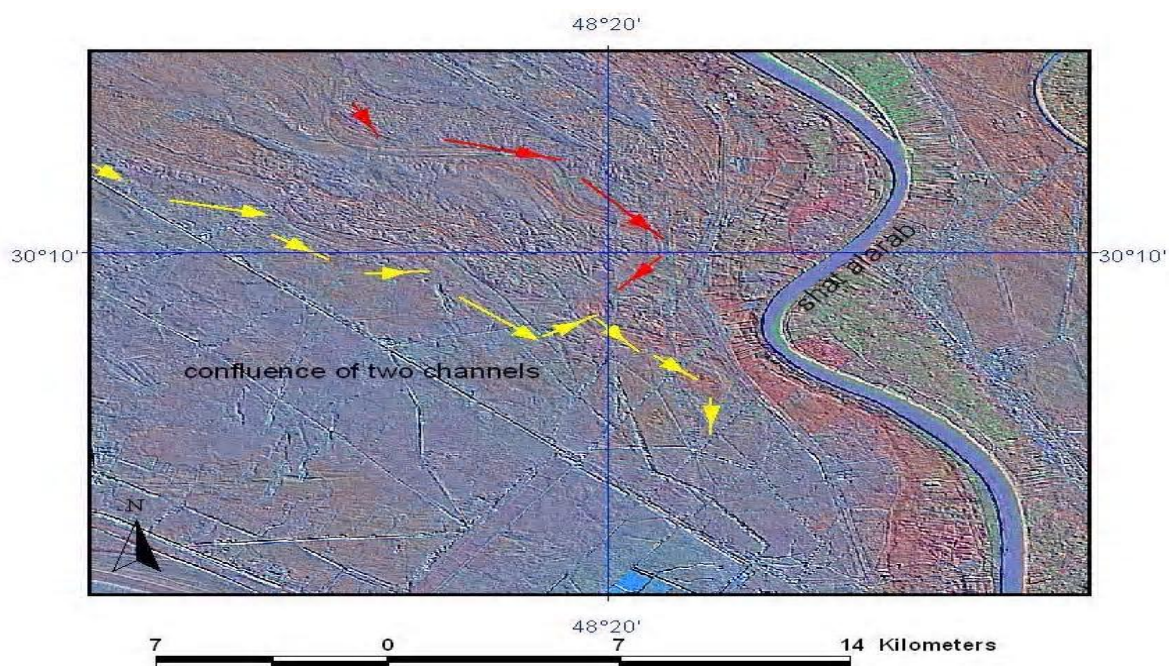
Edge enhancement and convolution techniques help to specify the course of extinct paleochannels of Tigris River in the sabkha region between actual position of Shatt Al-Arab River and Khor Al-Zubair (Fig. 2 and 3 ). In these figures, there are two extinct paleochannels located to the west of actual channel of Shatt Al-Arab. Historical evidences suggest that these two channels represent old migrated channels of Tigris River before it reaches the Arabian Gulf at that time (Lees and Falcon, 1952 and Hansman, 1978). The sharpness techniques with the other assist to reveal the old flood plain of these channels, and indicate the presence of paleo irrigation systems around the channels, which could be used for cultivation and soil reclamation in the southern part of the delta (Al-Mulla, 1999). In the east of Shatt Al-Arab River, the Landsat image reveals also two extinct

channels (Fig.4 ) which could belong to the Karun and Behmashir Rivers before they reached the Arabian Gulf. This continuous migration of channels could submit to geological factors (Al-Sakini, 1993).

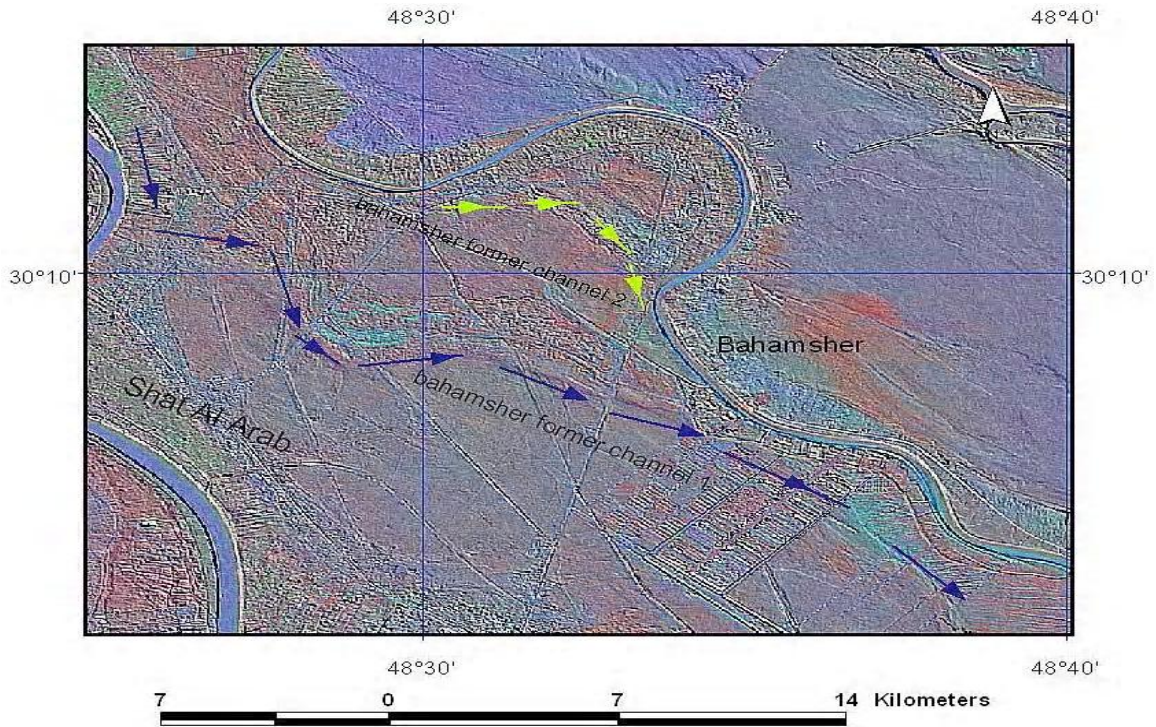
Satellite image and large scale aerial photographs reveal two extinct paleo river lines in the tidal flat of Khor Al-Zubair to the west of the study area (Fig. 5. 6 ). These rivers could participate in reshaping the geomorphologic and sedimentologic features of the area. One of these paleo rivers appears as a relic of clear relief connected to the north eastern part of Khor Al-Zubair, which called Khor Hardan . The other one could be active in the past and responsible for refiguring the north western part of Khor Al-Zubair, which could belong to the ancient Euphrates River. The trace of this river is parallel to the west of river basin and crossing the actual channel of Khor Al-Zubair to the south of Khor Al-Zubair port and finally disappeared under the tidal flat of the Khor to the east.



**Fig ( 2 ) Ancient Tigris channels with their tributaries western shat alarab active channel**



**Fig ( 3 ) Ancient Tigris channels and their confluence western shat alarab active channel**



( 4 ) Ancient Bahmshir channels eastern shat alarab active channel

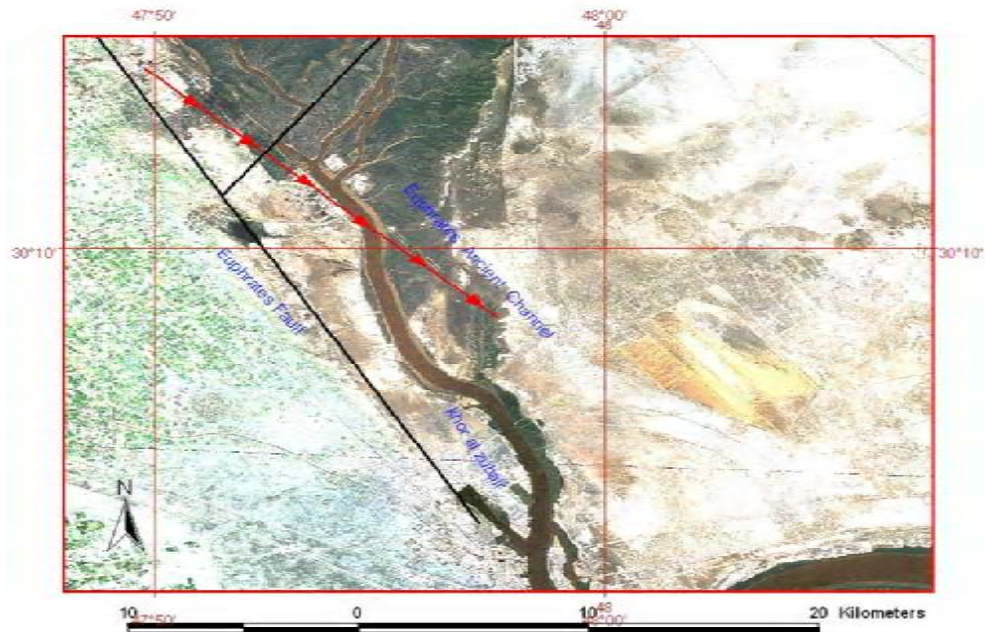


Fig (5 ) Ancient Channels of Euphrates and Abo al kasib in tidal drainage system of khor Alzubair

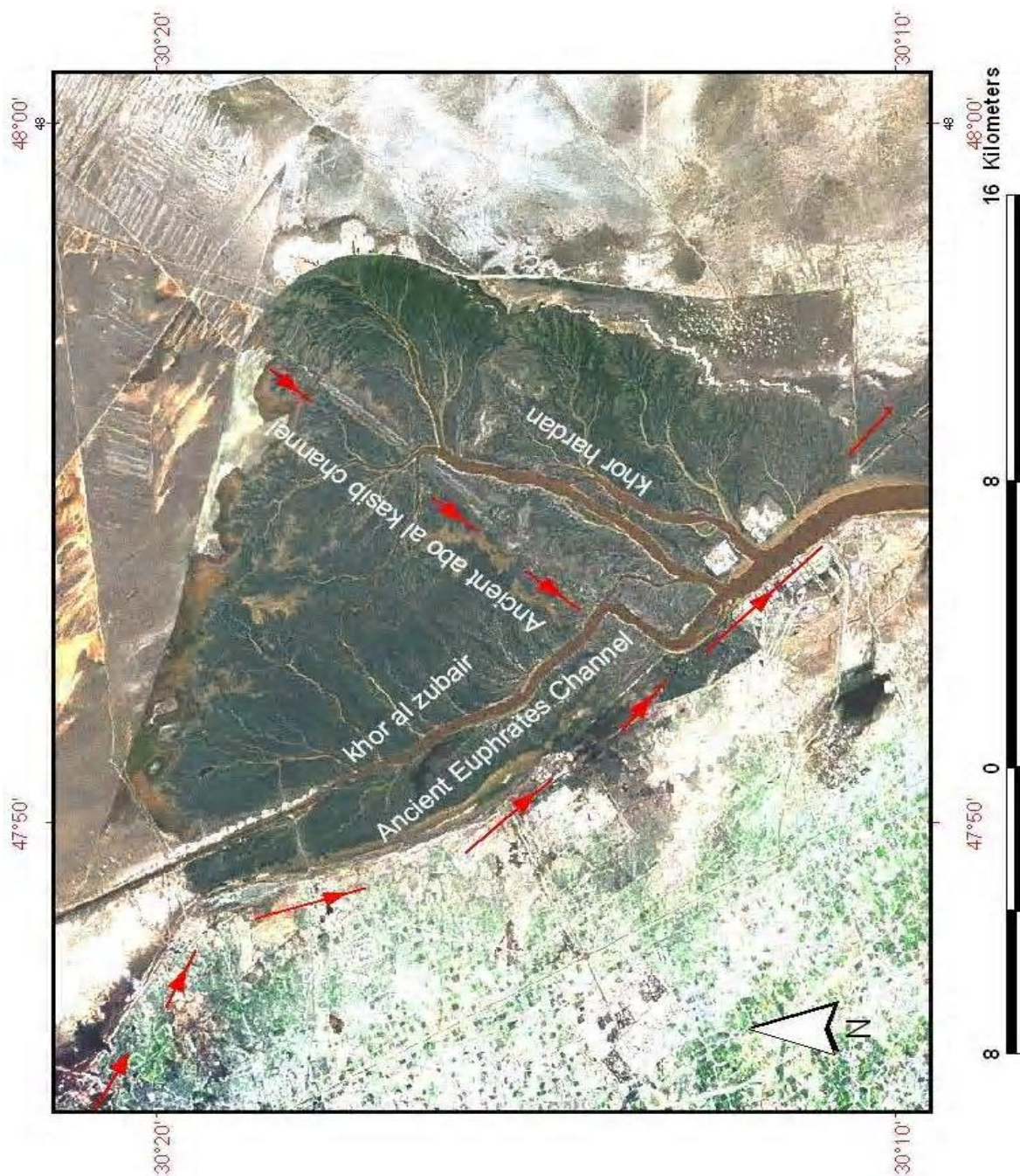


Fig (b ) Ancient Euphrates Channel in tidal drainage system of Khor Zubair

**4- Conclusions:**

Satellite images processing was assisted to delineate the paleogeographical map of the irrigation system in the southern part of Mesopotamian plain . Four extinct channels appeared on both sides of shatt Al-Arab River and two others near Khor Al- Zubair channel. These extinct channels could relate to the river migration in that area which could evolve to the tectonic settings .

**5- References:**

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## تطبيق تقنيات التحسس النائي للكشف عن القنوات القديمة لشط العرب وخور الزبير، جنوب العراق

سحر طارق الملا و بدر نعمة البدران و علي خالد العلي  
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### الخلاصة

تغطي منطقة الدراسة الجزء الشرقي والغربي لنهر شط العرب والى قناة خور الزبير وبضمنها الاجزاء الشمالية الغربية لسواحل الخليج العربي. طبقت تقنيات التحسس النائي على المرئية (2004) Landsat 7 ETM+ الفضائية والتي أظهرت وجود بعض المظاهر الموقعية والاقليمية والتي تفسر الطبيعة الجيومورفولوجية للمنطقة. أظهر التحليل الجيومورفولوجي عن وجود اربعة قنوات قديمة مندثرة. تقع اثنان منها الى الشرق واثنان الى الغرب من القناة الحالية لشط العرب. كما أظهر تحليل الصور الفضائية عن وجود أنظمة اروائية قديمة مندثرة متصلة بهذه القنوات وتنتهي عند السواحل الشمالية للخليج العربي. أعطت خرائط تساوي الارتفاع عن وجود مرتفعات جانبية للانهار لا يتجاوز ارتفاعها عن 3 متر عن مستوى سطح البحر، تطابقت هذه المرتفعات مع الانحناءات الحالية لشط العرب. أن هذه المعطيات يمكنها ان تفسر النظام الاروائي القديم للجزء الجنوبي من شط العرب وقناة بهمشير. كذلك تم تمييز قناتين حول القناة الحالية لخور الزبير. يمكن ان تعزى هذه المشاهدات الى الوضع التكتوني للمنطقة.