

Remote Sensing revealed a morphotectonical view point on the deviation of Hirmand (Helmand) river courses



Reza Derakhshani

Ph.D. student in Tectonics, Department of Earth Sciences,
P.O. Box. 1673-71454, College of Sciences, Shiraz University, Shiraz, Iran.
rezaderakhshani@yahoo.com



Godratollah Farhoudi

Professor, Department of Earth Sciences,
P.O. Box. 3000-71454, College of Sciences, Shiraz University, Shiraz, Iran.
gfarhoudi@yahoo.com



Azizollah Vahed

Water Authority of Sistan and Balouchestan, Zahedan, Iran.
reza_1217@yahoo.com

Abstract

The Satellite captured remotely sensed images, provide unique and advanced possibilities in understanding the various morphotectonic features. This has been possible because of the synoptivity, multispectral photocapacity and the repetitively of the orbital satellites. Taking advantage of this technology, the raw and digitally processed IRS 1D satellite data and Landsat 7 ETM satellite data were interpreted for parts of Hirmand river courses, East of Iran and Southwest of Afghanistan. Combining Landsat data processing, geological investigations, geomorphological evidence, and field observations

with archeological information and historical documents, it is concluded that tectonic uplifts of southern parts or subsidence of northern parts of the study area are responsible for deviations of Hirmand river courses. It should be noted that, high rate of sedimentation of river can causes, locally, some instabilities and deviations in Hirmand river. These investigations recognize seven different deltas in the study area (which are located based on their relative ages) by revealing the deviations of Hirmand river in past time.

Introduction:

Hirmand river also spelled HELMAND, HELMUND, or HILMAND, Persian DARYA-YE HELMAND, Latin ERYMANDRUS, river in southwestern Afghanistan and eastern Iran, about 1150 km long. Its width varies between 200 to 900m by a depth of 2 to 5m. Rising in the Baba Range in east-central Afghanistan, it flows southwestward across more than half the length of Afghanistan before flowing northward for a short distance through Iranian territory and emptying into the Helmand (Sistan) swamps on the Afghan-Iranian border. It receives several tributaries, including the Arghandab and Tarnak, and drains more than 160,000 square km. The purpose of this article is to investigate the tectonic and geomorphic evidence that influences the courses of this river.

Discussion and Conclusion:

Tectonic setting of an area could be an important factor in canalizing and (or) deviation of drainage and rivers of that area. Faults are tectonic structures that by forming of weak lines or offsetting of some structures can control the courses of drainages or of a river. However in some regions, tectonic uplift are mainly responsible for deviation of streams. Landsat 7 ETM satellite data processing, geomorphic indications, geological investigations and field observations in Sistan area, show that the Hirmand river has been often changed. Kochak river, Sheileh river, Biaban river, Sanaroud river, Sistan river and Paryan river are branches that Hirmand river have passed, while now, Paryan river is the main branch of Hirmand river in the most north part of the area and Sistan river as a minor branch is flowing in the south of Paryan river. Historical and archeological evidence of the study area, also confirm the migration of Hirmand river to the north whereby the delta of Hirmand, now is active in the northern part of the study area.

The alternative deviation of Hirmand river in recent thousands years, could be assumed as a neotectonic phenomena that is because of uplift of southern parts and (or) subsidence of northern parts of the area. Processing and interpreting of IRS 1D satellite data and Landsat 7 ETM satellite data for Hirmand river courses locate seven different deltas in the study area, which are of different ages.

Today, only some detached patches of delta no. 1 with about 7m height could be seen in the main branch of Hirmand river, before its deviation. This delta is a related to the time that Hirmand was emptied into just depression. Delta no.2 that is related to Biaban river, is the widest and the most recognizable old trend of Hirmand river in the Sistan plain. Delta no.3 is Saroutar delta in the eastern part of Hirmand river where was emptied to Laleh navar depression in Afghanistan. Traghoun delta, is delta no.4 that is the most southern delta of Hirmand river where it emptied to Goad zereh depression. Delta no.5 is Sanaroud delta that has a smaller width than that of Biaban roud or Kochak roud. Delta no.6, present delta of Hirmand river which is younger than the last ones. The youngest delta is delta no.7 where it is formed by Paryan river in Hamoun pouzak. Although the museum winds, which have duration about four months in the area sand erosion and sand movement, it seems that tectonics has a greater influence in changes of river courses.

References:

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