Stability of Tigris river between Samarra and Baghdad

Article · December 2020

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STABILITY OF TIGRIS RIVER BETWEEN SAMARRA AND BAGHDAD

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KEY WORDS: Remote-Sensing,Geology,Hydrology,Interpretation,Recognation,Land sat,Thematic,Image.

ABSTRACT

Shifting and changing of rivers properties (Bed,Cross Section, banks, pattern) are the most important features noticed at the Maturity and old stages of Tigris river down Samarra (150 km north Baghdad).

Satellite records (Landsat 4,5 and Spot) Arial photographs, pattern recognition, was done as office work to detect the old courses of the river, Also field work was done to measure the bank retreat for a period of one year by using pins pierced on the banks, Also included the observation of the changing river bed and cross section of six selected places and comparing the results with scientific work done at 1976,1979.

Other sdtudies by using Remote sensing and field work was done to notice the evolution of river islands with time (last fourty years). Many control points choosed along the present course as a references by measuring the distance to the river, Then comparing the distances with old data to detect the direction of shift.

The general conclusion that the present course of River is the fourth generation since pliestocene, And Tigris now more active in building up than erosion , it is not likely to change it's course suddenly but may shift to East if the enviromental condition or tectonic stability are changed.

1. Introduction

There are many features noticed at the maturity and old stages of Tigris river down Samarra (150 km north Baghdad) These features give us primary idea about the location of old courses of the rivers, Then the probability of river shifting and its direction, Its have very important result at the river banks at towns, Agriculature Land, Industrial places, Water intake pipes for differint purposes, Bridges, Nevigation.

Then the anti-erosion action of banks could help to save the plases and be alwayes in safty condition.

2. Geology

The studied area coverd with Quaternary sediment specialy Alluvial deposits with appearnce of three index set of river Terraces west of the present course.

3. Data

Many types of data used to detect the old courses and the recent condition of the river.

a- Satellite Landsat-TM 4 and TM 5-1989 and Spot record-1989.

b- Airal photographs 195701982.

c- Historical references .

d- Scientific research reports.

4. Field work

4.1- Pins: 66 set pierced along studied area with different hights above the water level on the banks, Each pin long 50 cm (35cm pierc on bank and 15 cm appears verticaly also refernce points tock place on river leeve to measure the retrat of banks in active erosion places ((more than 35 cm/period)). These pins checked and measurred at the four scasons per one year 1994, To notice the rate of erosion of banks sediment a ssociated with water level (winter & Spring) high level and (Sammer & Autum) low level.

The result show different cases range from no change or few cms in very high pins out of reach of water to more than 6m in active places mostly at outer arc of river meander.

4.2- Changing of river bed and banks: measured at six places choosed carefuly along the stuided area, by using Echosounder c-10 and currentmeter WA521/M.

The result copmared with old scientific Research reports 1976-1979, That showing the changing happened at the depth's and location of the course with the slow down of current vebcity a bout 50% less than the velocity at that years.((Fig 1)).

4.3- Bank sediment samples: About 50 sample of Bank sediment collected and processed labratory , Drying - weighting- seiving then measuring the cohesion of sediment. The result show about 83% of banks sediment are sand with low cohesion forces for that we expect the river bank easy to erode by action of water and other effecting factors.

4.4- Nevigation : The river nevigation of diffirent sizes of boat's may generat different the banks and withen time eroded them depending upion the velocity and size of the boat and the nevigation distance way of bank. To measure the hight and namber of waves reaching the banks we used 3 types of boats ((Table 1)). Each boat passed with and against the current of water and at 1/4, 1/2 , 3/4 witdth of river (total width 327m). Tow nevigation speed used 20 km/hr and 50 km/hr. The hight of wares measured at the bank. ((Fig 2))

5. Remote Sensing Techniquc.

5.1- To detect the shifting of the river many control points choosed along the river as areferences, Then comparing the distances to the river to detect the direction of shift ((Table 2)).

5.2- Detection of the old courses By using Spot Records and with special image processing like edges enhansment and histogram stretch we could define the location of the ancient rivers, which at the present coverd with recent sediment. Three courses detected fitting to match with three index terraces:

1. Upper Mutawakkil 450.000 year (M.Pleistocene).
2. Middle Mutasim 100.000 year (L.Pleistocene).
3. Lower Mahdy. Holocene (Abbasin 13-14 century).

The upper one far of the present course about 30km,(Distance which Tigris shifted withen pliestocene and Holocene)).

These trraces recognized by pattern recognition Clissification of Landsat records. ((Fig 3)).

5.3- The evolution of river islands : Borning of any new river island give a prove that the river built more than erode the sediment for general idea about stability.

Comparing the recent course with the old one show how the island borne continually and increasing their areas.((Fig 4)) show the upper part ot studied area and ((Table 3)) for all the area.

6. conclusio

Remote sensing technigue successfuly applied to detecting the old buriad courses of Tigris river also the recent changing.

The present course is the fourth generation after three old stages of courses and river terracces associated with the ancient rivers cours were recognized by pattern reccognition clissitication.

Tigris river now is more active in building -up of the banks and islands than erosion, it is not likely to change it's cours suddenly but may shift to the East it the enviromental contion or tectonic stability are changed.

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Table 1

Size (m) -	Length (m) -	Width (m) -	deep (cm)	- type -	speed
Small -	5 -	1.5 -	30 -	Propeller	- 20 km/hr 50 km/hr
Medium	16	4.5	150	Propeller	- 20 km/hr 50 km/hr
Large	24	10	90	Torpo	- 20 km/hr 50 km/hr

Table 2

Control point *	Distance (km)	year	reternce
1- C. P. 1	Bank 3.25 3.65 3.7	836 1948 1957 1994	Historical maps Sosa maps Airal Photographs Field work
2- C. P. 2	0.49 0.7 0.72	1948 1984 1989	Sosa maps Airal Photographs Spot images
3- C. P. 3	1.935 1.975 2.180	1948 1957 1989	Sosa maps Airal Photographs Spot images
4- C. P. 4	13.677 13.950 12.6	1948 1957 1989	Sosa maps Airal Photographs Landsat images
5- C. P. 5	3.850 3.775 3.66	1948 1957 1989	Sosa maps Airal Photographs Spot images
6- C. P. 6	3.50 3.350	1957 1989	Airal Photographs Landsat images
7- C. P. 7	0.620 0.960 1.000 1.180 0.950	1766 1908 1938 1963 1989	Historical map Historical map Historical map Historical map Landsat images

* Location of points shown at Fig. (3)

Table 3

Year	No. of islands	Total area (km^2)	Width of river (m)
1949	13	9.25	597
1957	28	14.2	773
1977	14	12.2	582.3
1989	37	24.9	675

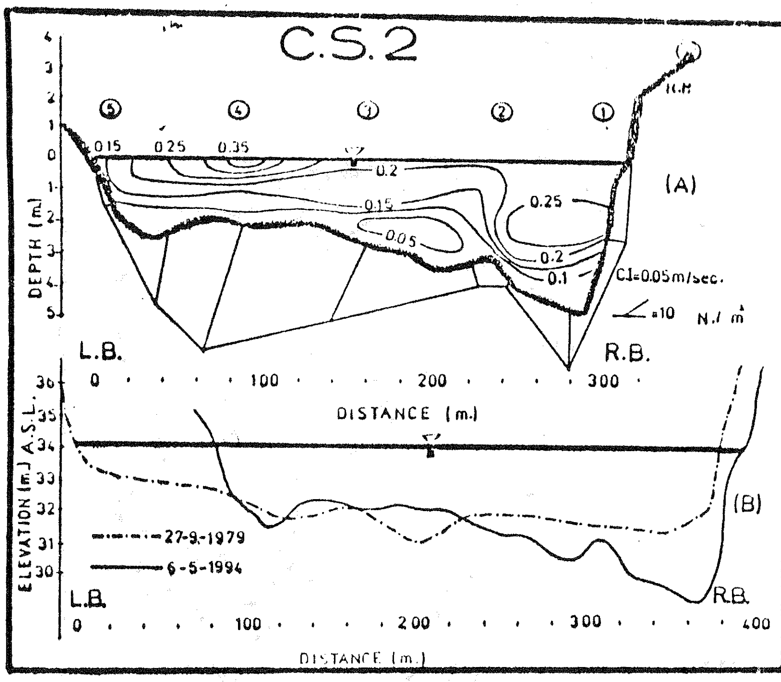
C.S.2
(A)
(B)
DEPTH (m)
ELEVATION (m) A.S.L.
DISTANCE (m.)
L.B.
R.B.
CI=0.05m/sec.
=10 N./ m
27-9-1979
6-5-1994

Fig.(1)

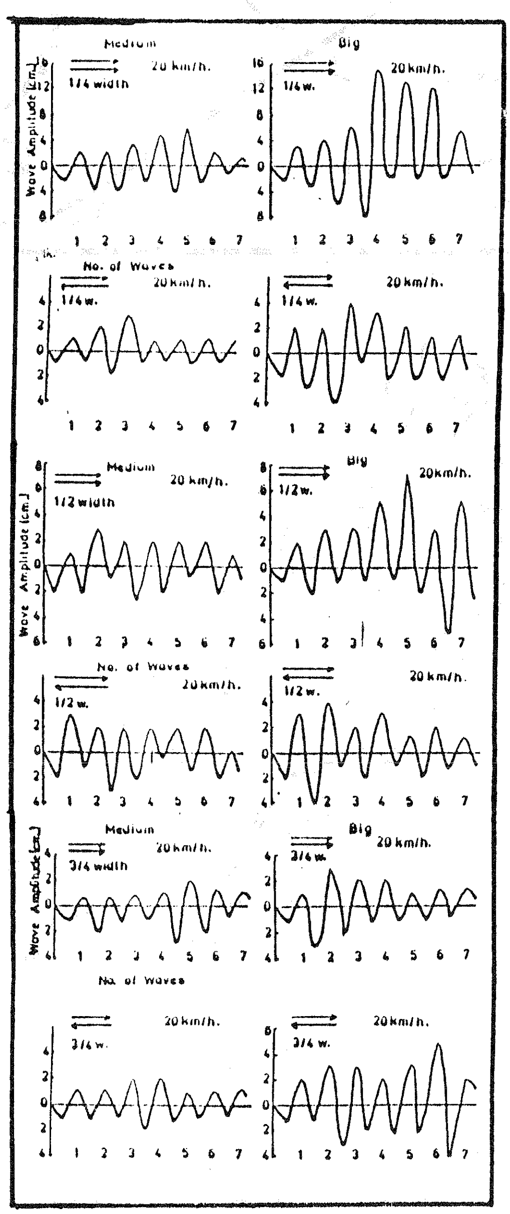
Medium
Big
Wave Amplitude (cm.)
No. of Waves
20 km/h.
1/4 width
1/2 width
3/4 width

Fig.(2)

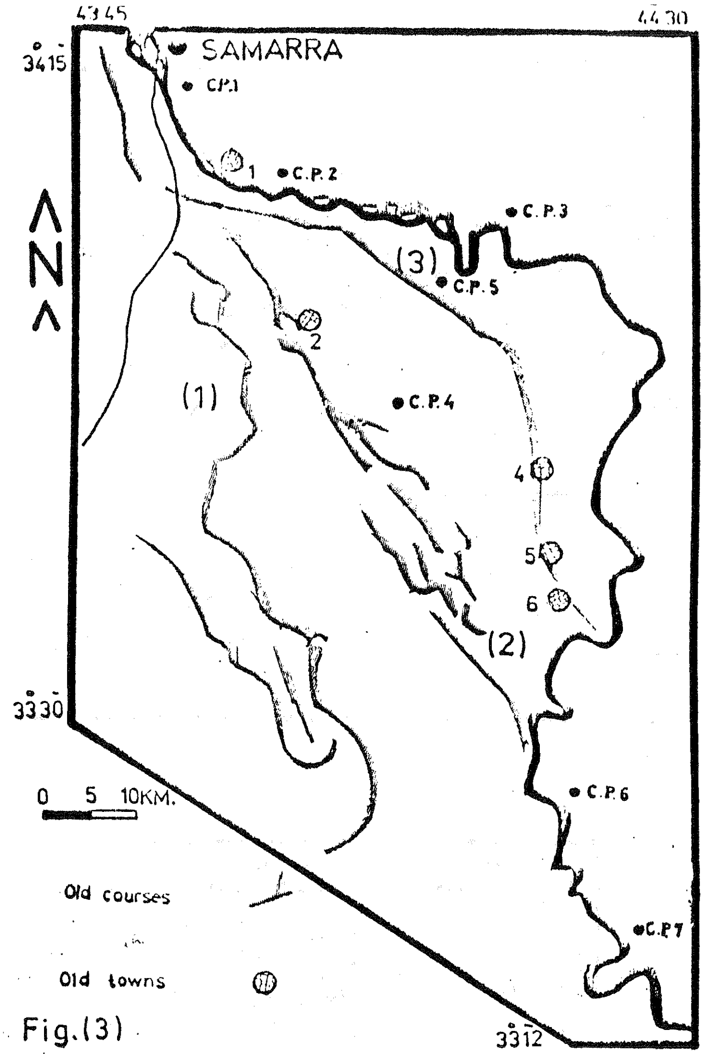
43 45
44 30
34 15
SAMARRA
C.P.1
1
C.P.2
C.P.3
N
(3)
C.P.5
2
(1)
C.P.4
4
5
6
(2)
33 30
0 5 10KM.
C.P.6
Old courses
C.P.7
Old towns
33 12

Fig.(3)

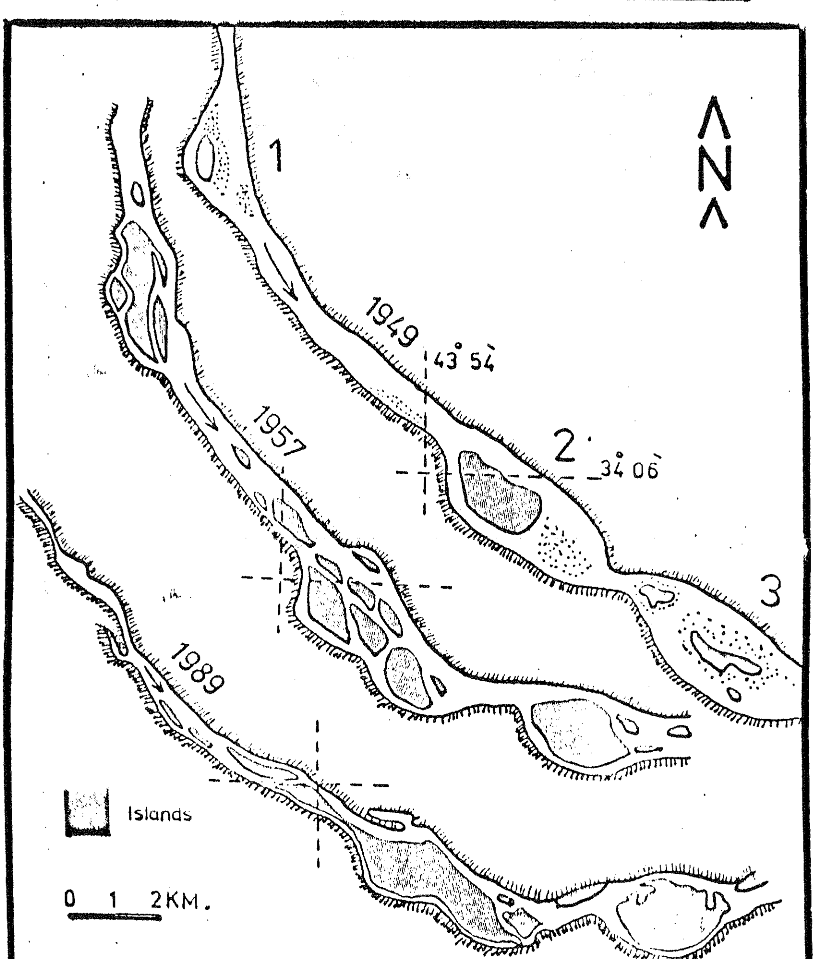
1
N
1949
43 54
2
34 06
1957
3
1989
Islands
0 1 2KM.

Fig. (4)