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Distribution of water runoff between the Ili River Delta branches under anthropogenic impact

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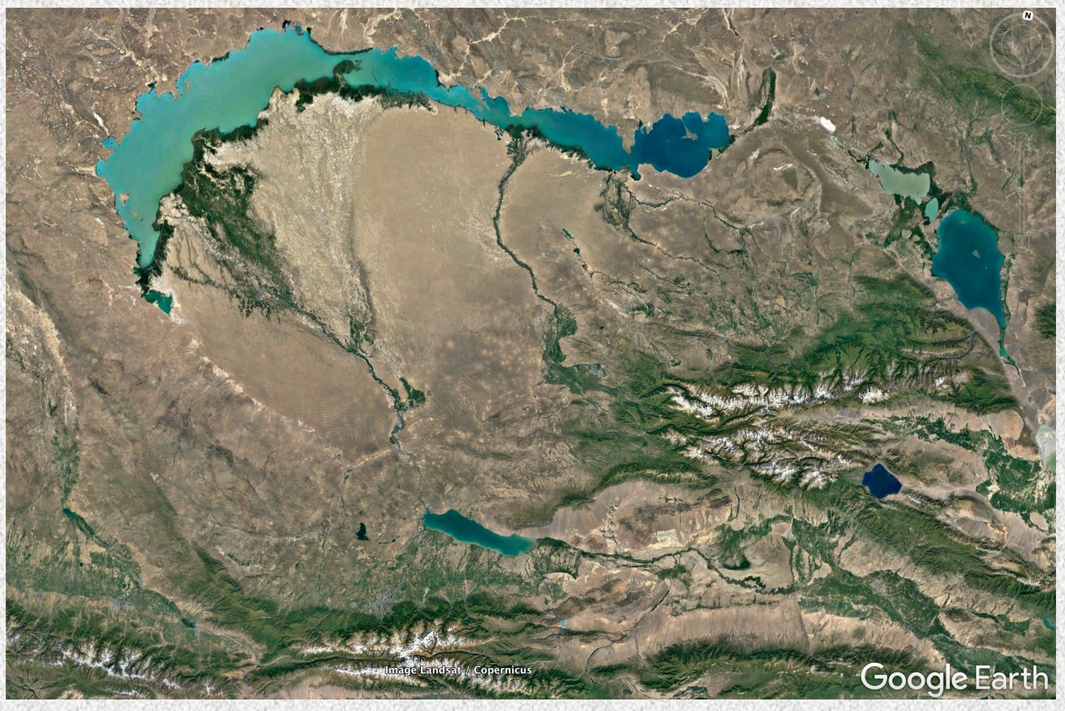
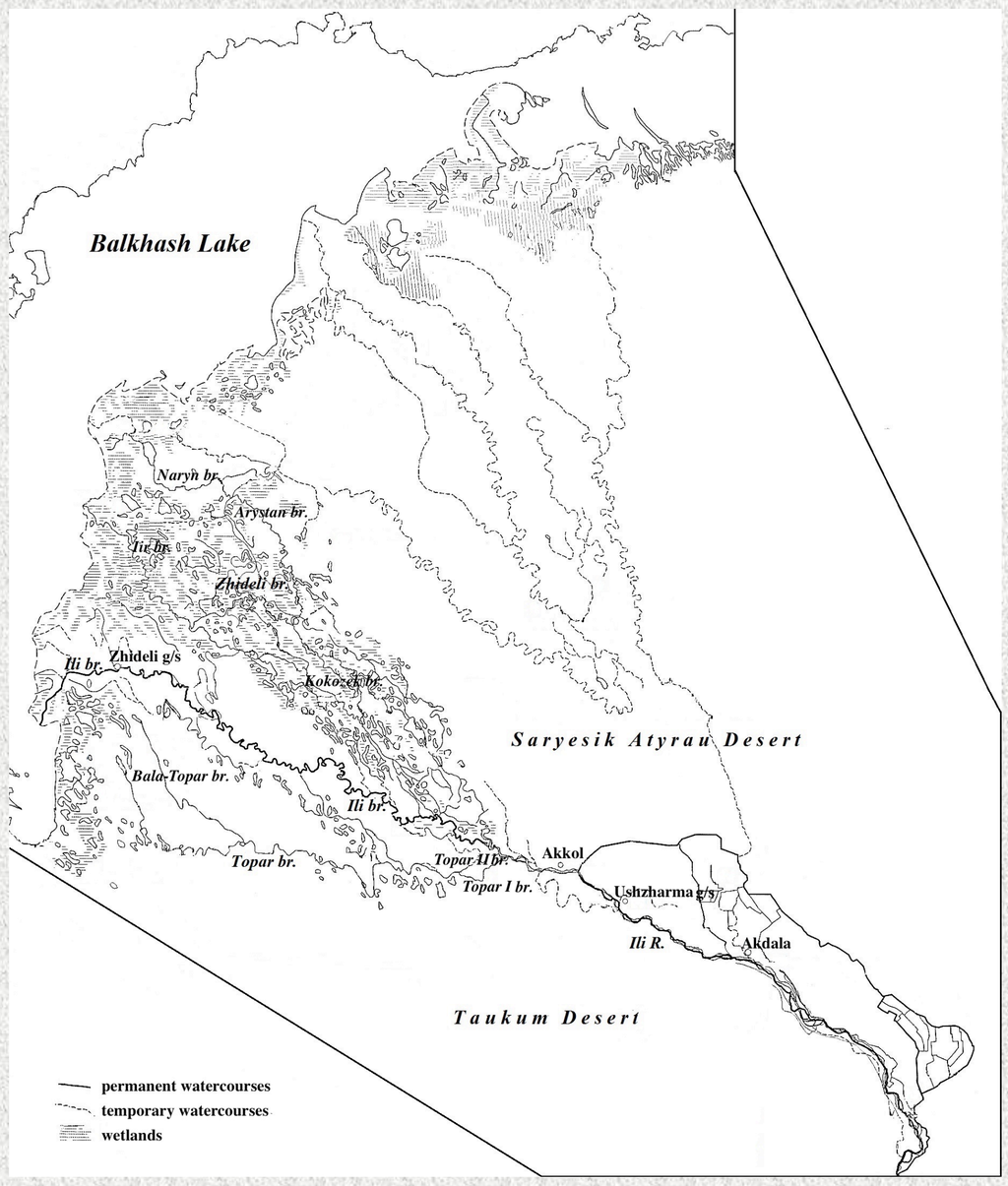
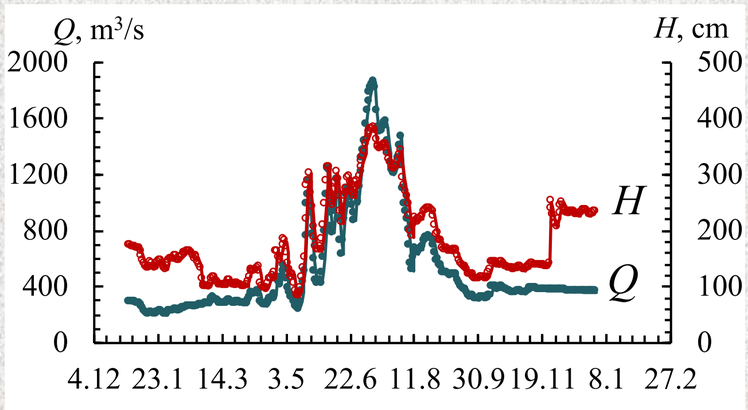
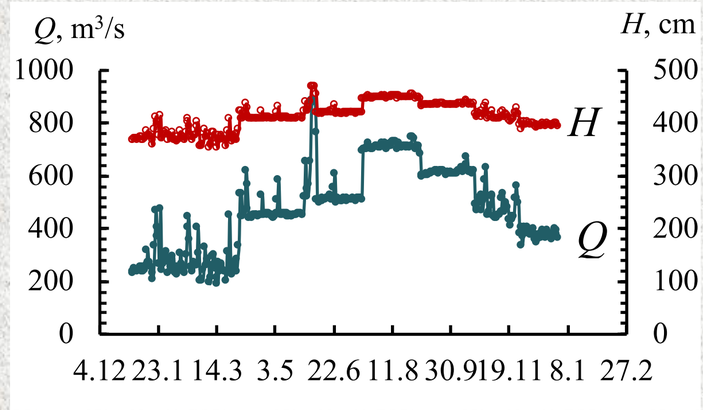
Based on the data of hydrological gauges in the Ili Delta, the distribution of streamflow between the delta branches for different periods of time is analyzed. The impact of the Kapchagai Res. on the Ili R. streamflow and its seasonal variability was revealed. The assessment of the possible direction and intensity of the development of the Ili Delta depending on long-term climate changes and the anthropogenic impact on the delta was made.



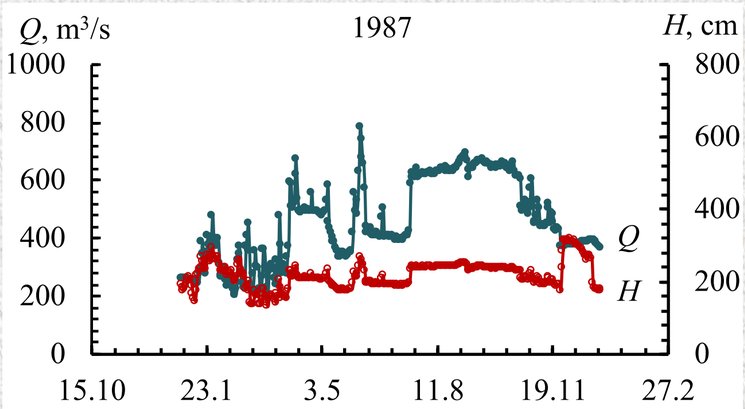


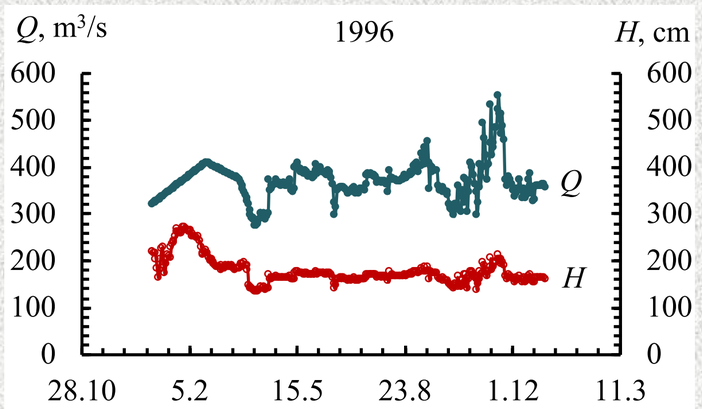
The schematic map of the Ili mouth area ([Isupova, 2019])





Discharge and level hydrograph at g/s '164 km upstream of Kapshagai hydropower plant' and 'Kapchagai natural boundary': 1987, the Ili R.





Discharge and level hydrograph at g/s Ushzharma: 1987 and 1996, Ili R.

The main characteristics of the Ili Delta

Characteristic	Amount
Area of the delta	8200 km^2
Length of the main branch	~120 km
Length of the delta coastline	~200 km
Area of ancient (dry) delta	~10000 km^2
Quantity direct outlets to Balkhash L.	13
Precipitation, P	150 mm
Evaporation, E	500-1550 mm
Potential evaporation, E_0	1100 mm
Budyko aridity index, E_0/P	7.33
Long-term mean water discharge, Q_m 1937-1987 1975-2015	 479 m^3/s (15.1km^3/y) 434 m^3/s (13.7km^3/y)
Water flow into the lake, W_m	10.4-11.8 km^3/y
Losses of water flow in the delta	3.1-4.54 km^3/y

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The Ili delta runoff is concentrated in **three branch systems**. In the **first half of the 20th century**, the runoff was distributed between these systems in the following way: the **Ili** and **Zhideli** br. systems received **42** and **40**% of the runoff in the delta head respectively, while the **Topar** br. system received 18%.

As the branch systems developed in the **second half of the 20th century**, water runoff distribution and re-distribution between the branch systems was changing. Water runoff dropped significantly in the **Ili central br. system** (the oldest), which is currently abandoned. By 1984−1987, its share in the Ili delta head runoff amounted to just **3**%. Q_m of the **Ili br.** downstream of the place where the Zhideli br. off from it was **18.1** m^3/s (**0.57** km^3/year) in 1975−2015, while near Zhideli settlement it was **11.4** m^3/s (**0.36** km^3/year).

The **Topar br. system**, which was formed in the mid-19th century, is abandoned too, but its runoff is artificially maintained. The share of the Topar's runoff dropped to **1**% in 1984−1987.

Today, nearly the entire runoff (up to **96−98**% of the Ili's runoff in the delta head) is concentrated in the **Zhideli br. system**, which is the youngest in the delta and currently gaining momentum.