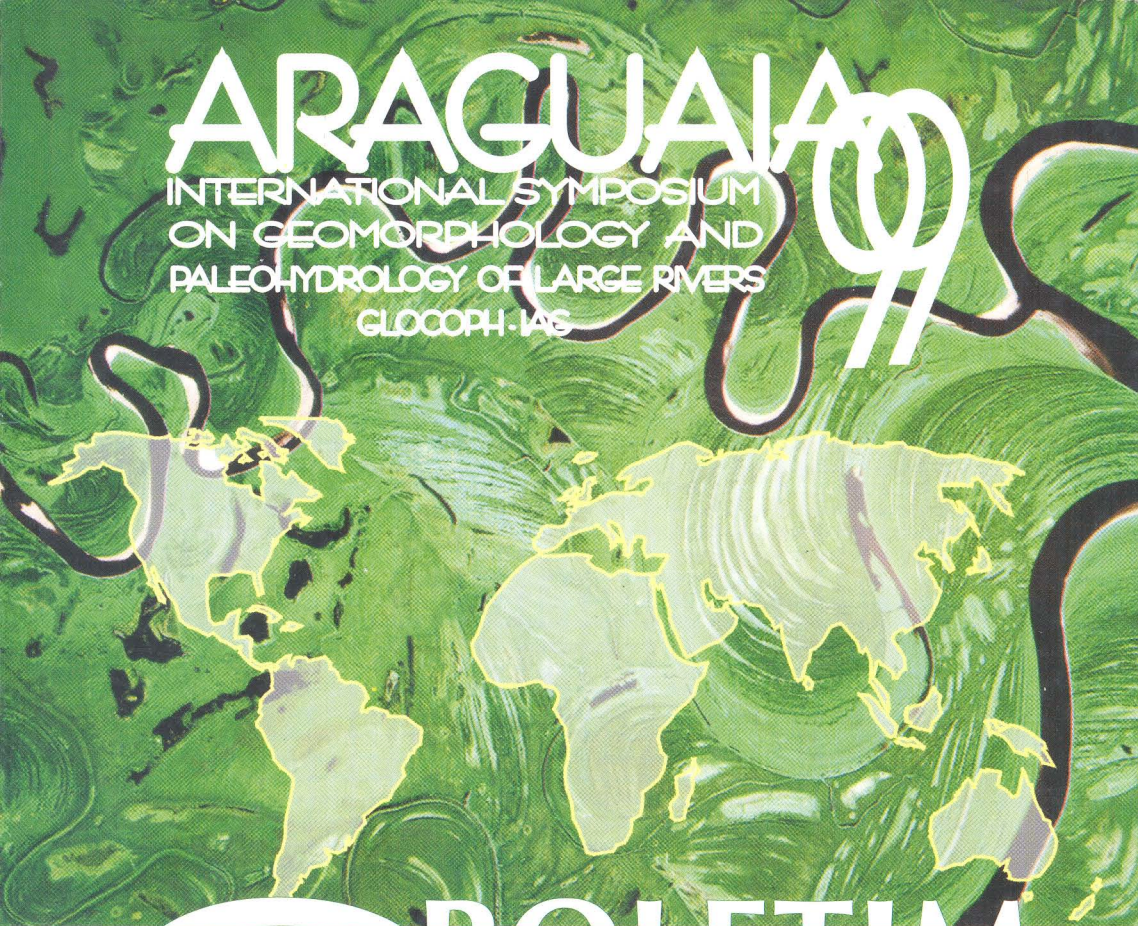


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RUN-OFF OF AMUDARIA AND SYRDARIA RIVERS IN LATE PLEISTOCENE AND HOLOCENE

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Amudaria and Syrdria are two main rivers feeding the Aral Sea.

Their run-off is formed in the high mountain regions of Pamirs and Tien Shan. Then they flow on Kyzylkum and Karakum more than thousand kilometers. History of these rivers constantly attracts the attention of researchers, as already first palaeogeographical reconstructions shown discrepancy between extensive alluvium spreading and comparatively small run-off of modern rivers in the region.

One of the ways for the evaluation of water run-off of ancient rivers is calculation using hydraulic formulas. Input data are parameters of ancient channels. Well known Chezy's equation is most often used.

Usually the most important and most complex as well is determination of particular water levels, stream gradients, and bed roughness.

Best visible traces of ancient water level correspond to flood maximal run-off. Usually they are either natural bank levee or top of flood plain bank. Evaluated run-off is usually rather overstated if first value is used, and it is underestimated if the second value is used.

Roughness of river' beds in Central Asia is poorly studied. Using available fragmentary data it may be accepted as equal to 0.020-0.025, in some cases - up to 0.040.

The conversion from maximal discharge to mean annual one correlation of the present day values was used. Data were collected during hydrological measurement on approximately the same cross-sections of the rivers.

Information on ancient river run-off is also encoded in a shape of their channels, in parameters of meanders. Many geometric and hydraulic relations were offered for different types of meanders.

The relations are based on two suggestions: - the most distinctive factors of the meander are its wavelength (L, m), its radius of curvature (R, m) and a width of riverbed (B, m); - characteristics of the meander depend basically on water bankfull discharge ($Q, m^3/s$). Following dependencies were received for the rivers in Central Asia:

$$L = 44.0 \cdot Q^{0.48}, \quad R = 0.66 \cdot Q^{0.99} \quad \text{and} \quad B = 0.44 \cdot Q^{0.84}$$

Time of operations of the ancient rivers was defined mainly on basis of multiple archaeological discoveries of camps of primitive population in this region.

It was found as a result of investigation that run-off of the rivers was changed many times during last 18-20 thousand years. The total annual run-off of two rivers did not exceed 15-20 cubic km in late Pleistocene and old Holocene. It exceeded modern one as much as 4-5 times and was equal to 180-260 cubic km a year in early Holocene 5-7 thousand years ago. It was a period of maximal moistening of the territory in Holocene. Some smaller values were received for middle Holocene: run-off was more then modern one as much as 1.5-4.5 times.

Two phases can be stood out in late Holocene: first of them is from last half of second millennium BC up to V century AD, and the second one from XIII to XIX century AD, during so named little glacial epoch. The run-off exceeded modern one no more than 1.2-1.5 times.

It has to be noted that the evaluation of ancient rivers run-off on deserts of Central Asia was checked using palaeoglaciological data from mountain area of the region where feeding of the rivers take place. Calculation of precipitation amount, made using independent method, shown similar result.