Spatial distribution of annual runoff and its climate factors in the extremal years. Case study for the largest Siberian Rivers: Ob', Yenisey, Lena

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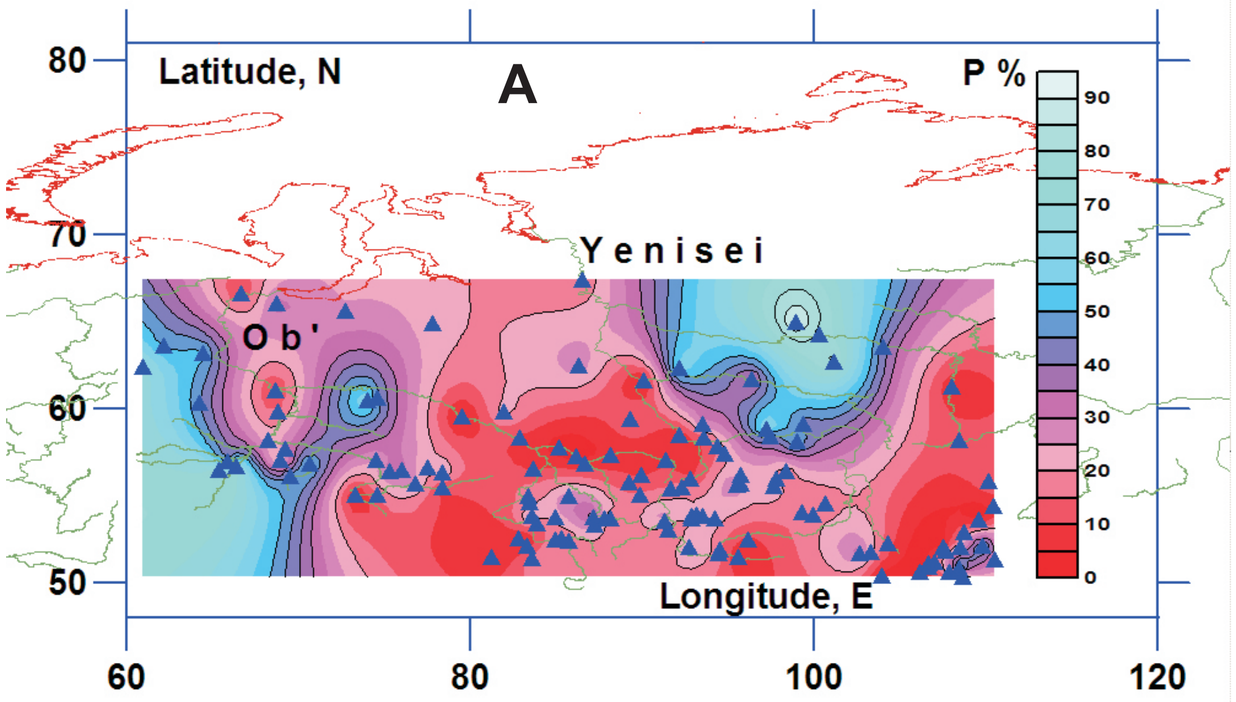
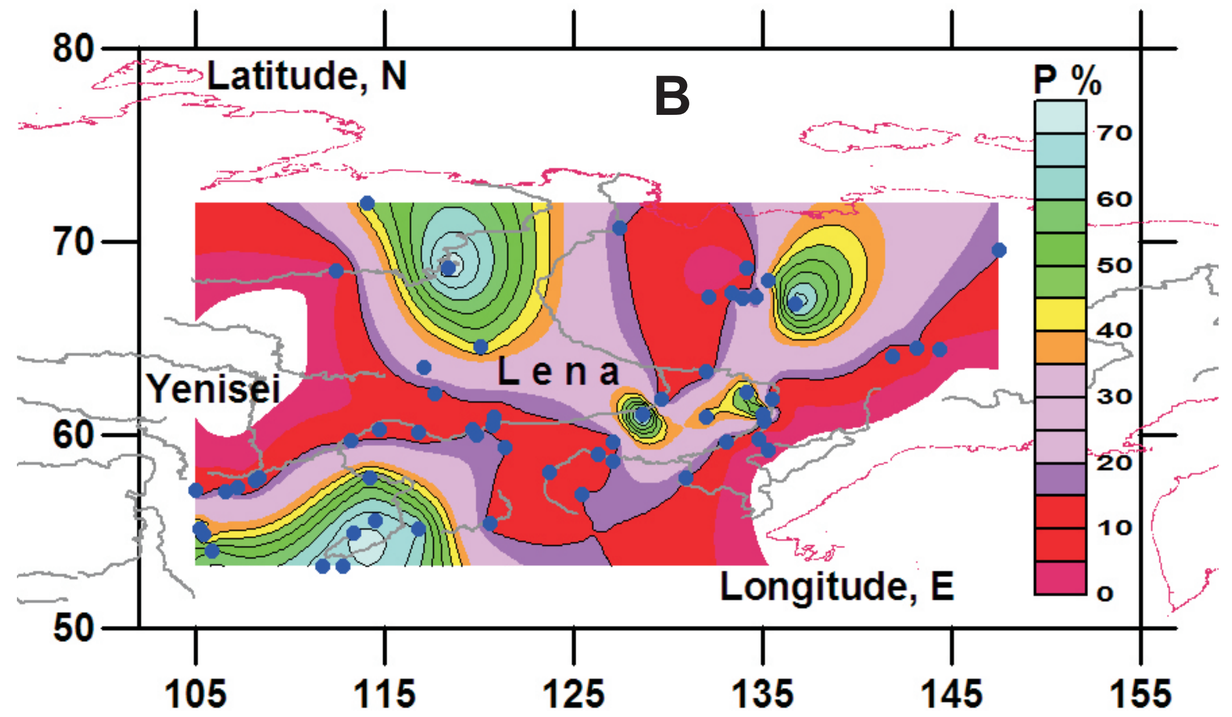
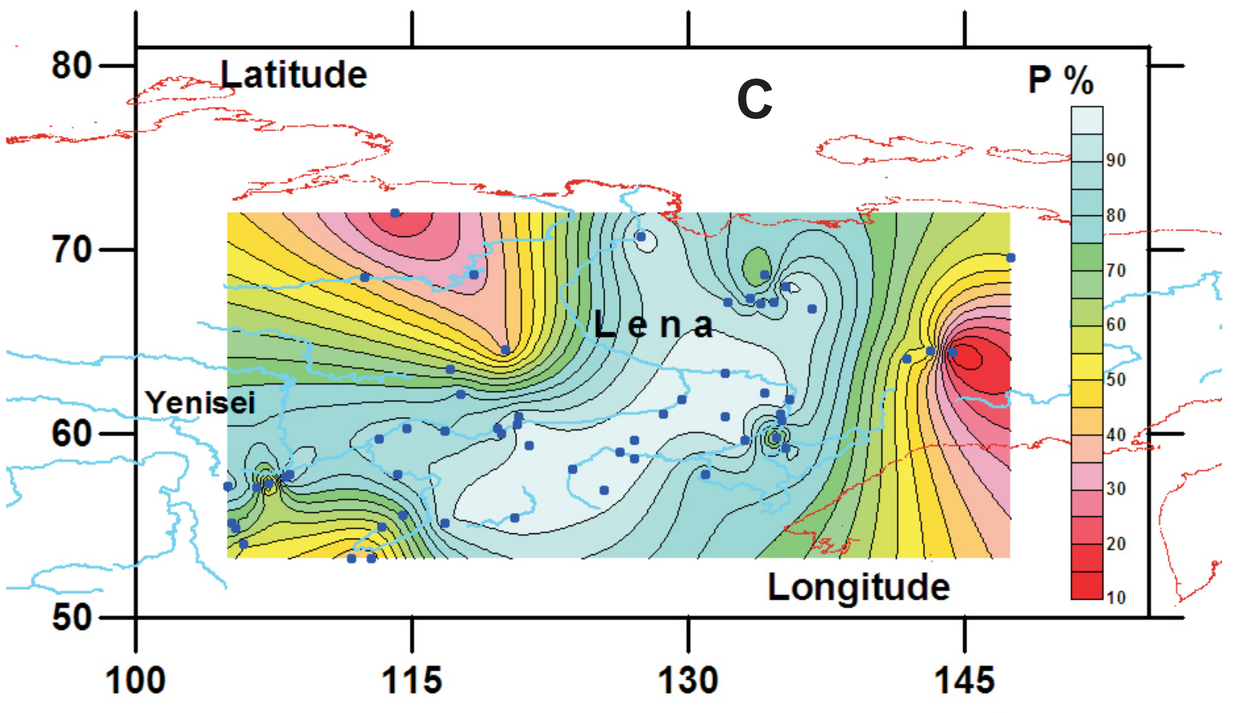
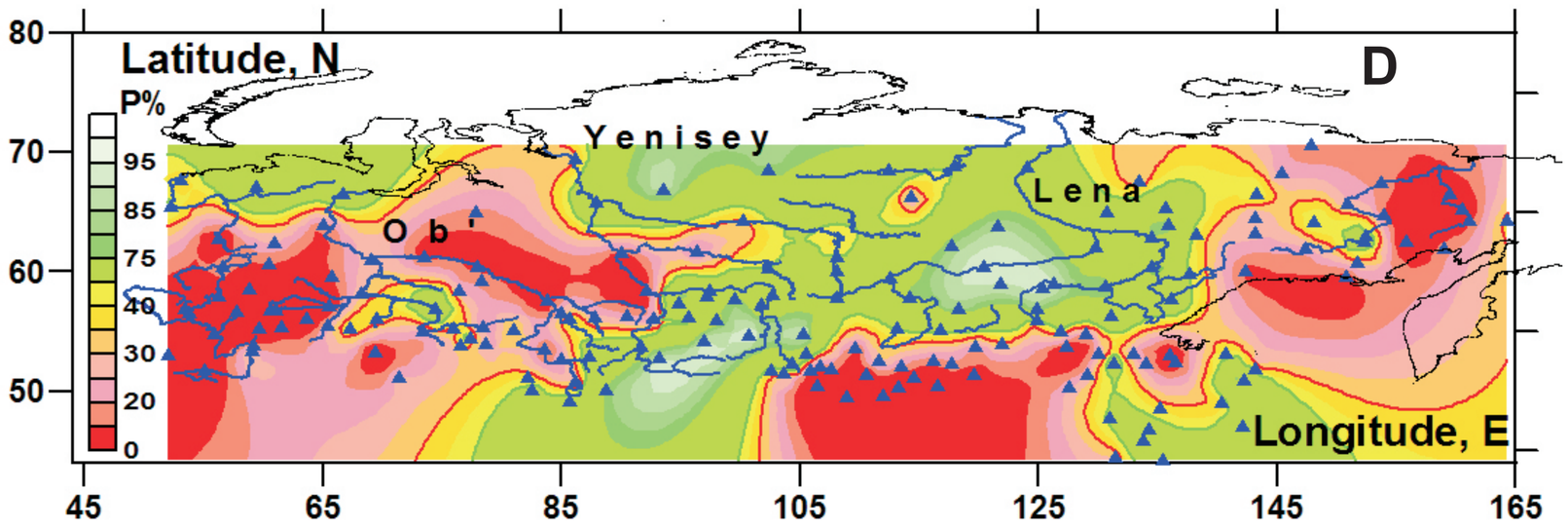
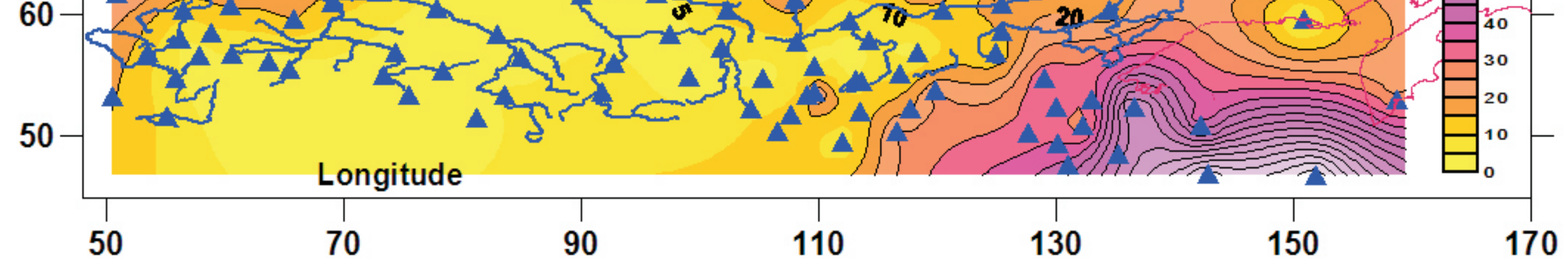


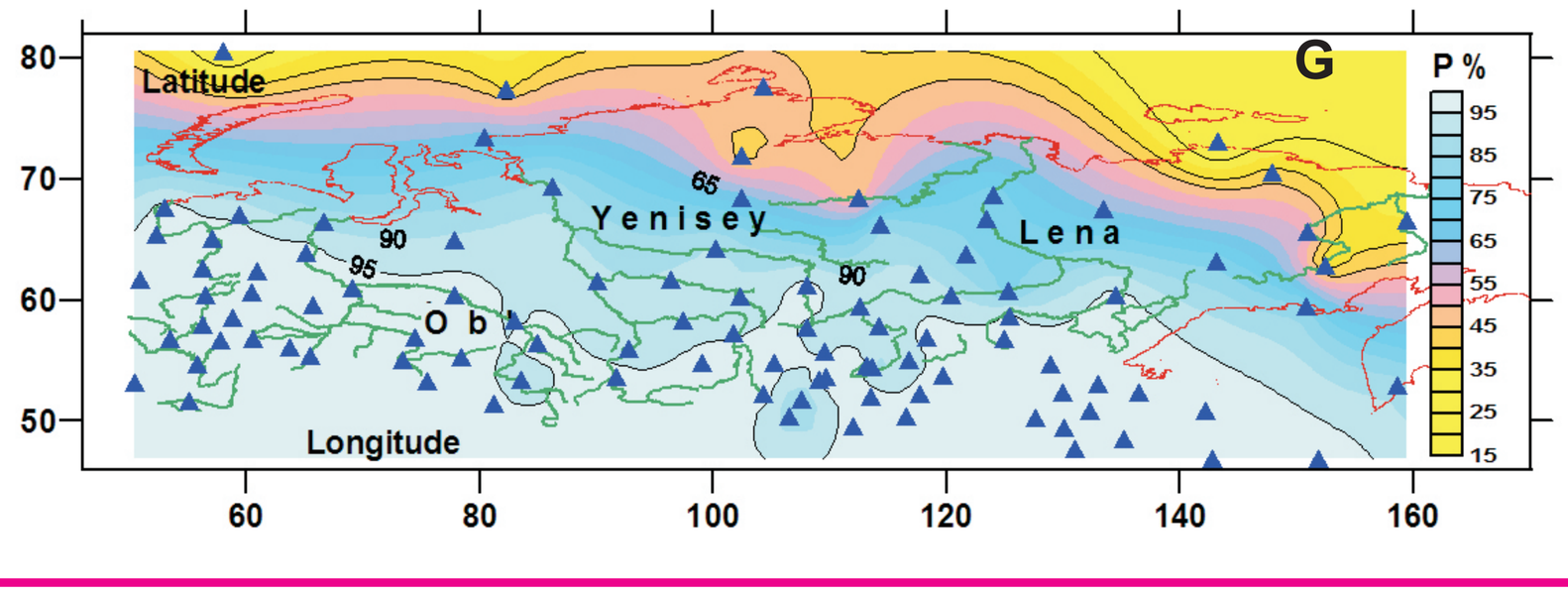




Mapping of spatial distribution in extremal cases for annual values of river runoff (figs A-C) and its climate factors (figs D-G) within the river basins Ob', Yenisey, and Lena is performed in the common system of measurement units. It was done by means of transformation of the considered variables to the ordinates of normal distribution of probabilities P for the corresponding function X, i.e. P(X)=1-F(X>x). For identification extremal and average years on statistical probability were determined at first the values P(X) for each point-element during the basic time interval 1961-1990. Further in the each year we define average value P(X) for all point-elements, located within of certain region. The cases when 7%>=P(X)>=93% were related to the extremal events (years) and when 45%<=P(X)<=55% to the average. The Alexeev's formula used to calculate empirical values of P(X). It is revealed that extremal values of runoff and its climate factors did not coincide in time. The average weighted on area probability of runoff in river basins Ob', Yenisey, and Lena equalled correspondingly: 11.0% (high flow 1971 year) and 92.0% (low flow 1982 year); 14.6% (1988 year) and 82.8% (1976 year); 15.9% (1978 year) и 88.7% (1986 year). Statistical probability of the annual air temperature for the listed years turned out to be: 1971 year – 43.7%, 1976 year – 66.1%, 1978 year – 51.0%, 1982 year – 40.0%, 1986 year – 40.8%, 1988 year – 23.6%. Similarly for the annual sum of precipitation: 1971 year – 47.8%, 1976 year – 65.9%, 1978 year – 49.3%, 1982 year – 45.3%, 1986 year – 60.2%, 1988 year – 54.4%. The annual inflow of water (in cubic km) into the Polar Ocean in the extremal years equals: the river Ob' (gs Salehard) 503.5/304.4, the river Yenisey (gs Igarka) 631.4/519.0, the river Lena (gs Kusur) 605.0/402.6. Coefficient variation of the annual runoff in the extremal years for the same river basins equals: 3.20/3.10, 2.51/2.64, 2.37/2.40. Here in numerator is high flow, denominator - low flow year.





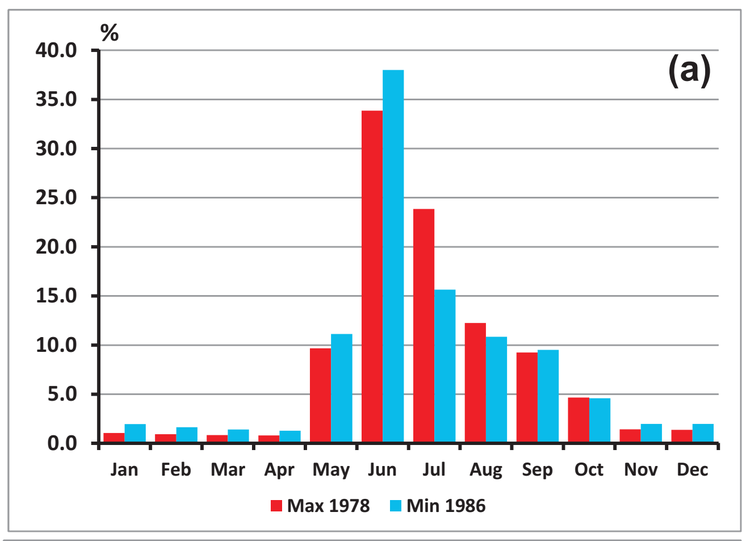


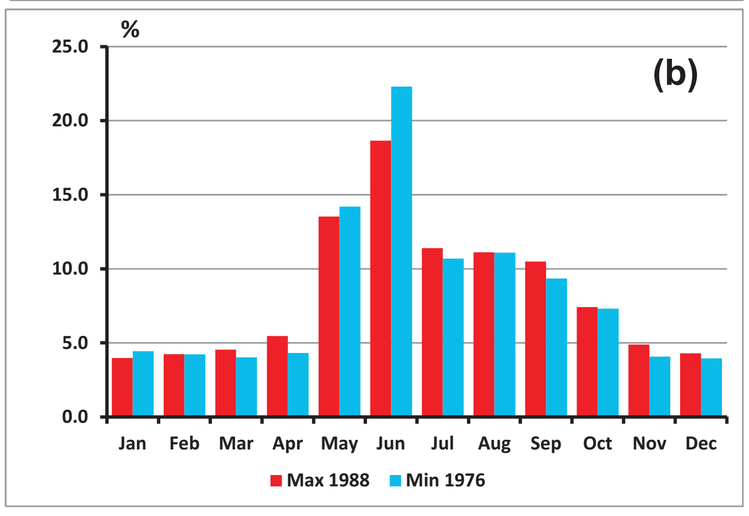
Captions for figs (A-G)

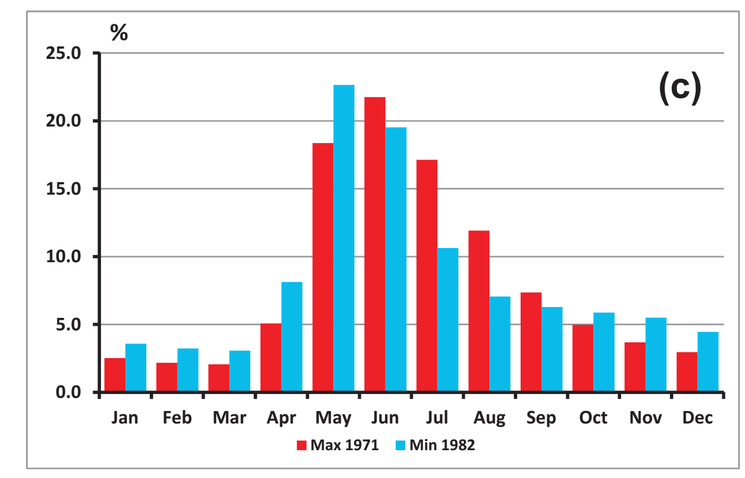
1. (A-C): Spatial distribution of probability (P%) of annual runoff in extremal high flow year (A-B) within the river basins Ob', Yenisey, Lena and (C) in extremal low flow year within the river basin Lena.

2. (D-G): Spatial distribution of probability (P%) of annual precipitation (D-E) and air temperature (F-G) within the river basins Ob', Yenisey, Lena in extremal years. D - 1990 year, average P=37%, E - 1976 year, average P=66%, F - 1983 year, average P=17%, G - 1969 year, average P=88%. Triangles and circles of blue color in figs (A-G) denote points of hydro and meteo measurements.

Mean weighted by area intra-annual distribution of runoff for rivers Lena (a), Yenisey (b), and Ob'(c) in the extremal years







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