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H51L-1451: Using automatic hydrograph decomposition to reveal the origin of change in river runoff regime and flash-flood characteristics since the middle of the 20th century in the European part of Russia

Friday, 14 December 2018
08:00 - 12:20
Walter E Washington Convention Center - Hall A-C (Poster Hall)

One of the core elements in improvement of understanding of the nature of changes in hydrological extremes is a deep analyses of the historical data. When using for analysis only values that can be easily derived from the datasets of daily discharges: annual mean, min., max. value - we use only a small percentage of the information from the 365 daily figures. In order to get more value from the historical river runoff data it is an urgent need to develop big data analysis methods in hydrology. A developed GrWat package allows to perform an automatic decomposition of daily hydrograph into seasonal snowmelt flood, thaw flash-floods, rainfall flash-floods, base flow and get more than 100 characteristics of runoff regime, shape, volume, timing of flash-floods, the values of meteorological parameters that bring about different types of floods. Surface and subsurface runoff is separated by a critical gradient. Flash-floods are separated from the seasonal snowmelt wave by critical values of air temperature and precipitation on the event.

The amount of hydrological extreme events is constantly rising in the European part of Russia since the end of 20th century. It includes sever water shortages in the South, flooding due to vast type of processes, especially in the North Caucasus. The GrWat package was tested on 40 representative watersheds in European Russia covering total area of almost 2 mln km^2 for the period of 1945-2015. The critical gradient value used to separate surface and underground runoff is stable for each watershed through the calculation period and can be classified by climatic zones and river size. In most river basins of the plain territory “flattening” of annual hydrographs is observed. A decrease in the spring runoff is associated with the interception of melt water by thaw floods. Simultaneously an increase in the low-flow period runoff occurs both in winter and summer. The number of flash-floods increases on the plain territory in all seasons. In the mountainous part an increase in variation coefficient of maximum discharges as well as in the duration of floods that can be interpreted as natural prerequisite of rise in flood hazard.

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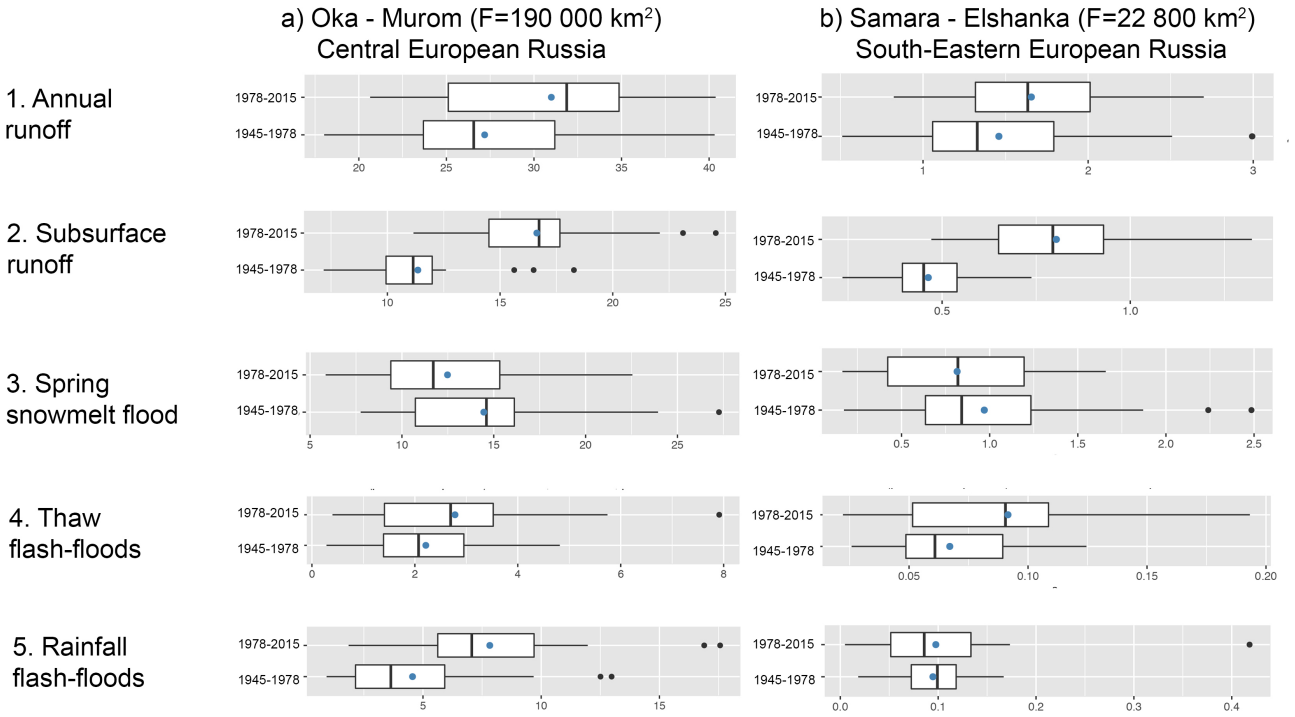

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