

Winter and summer-autumn flash floods as “drivers” of drought and seasonal flood characteristics (case study of European Russia)

Maria Kireeva (1), Natalia Frolova (1), Ekaterina Rets (2), and Natalia Ezerova (1)

(1) Lomonosov Moscow State University, (2) Water Problem Institute, Russian Academy of Science

The presence of occasional flood periods on rivers is a typical feature of the hydrological regime of European Russia. Despite the fact that the main high-water phase of a hydrological year here is related to spring, flash floods in other seasons play an equally important role. For example, increased water content during autumn determines soil moisture content that determines the loss of runoff during spring flood. Winter floods caused by thaws result in a significant drawdown of a snow pack. And when it is followed by a return of cold weather an ice crust is formed on the surface of snowpack that significantly reduces rates of melt water filtration process. In recent decades, most of the rivers in the European part of Russia have experienced a significant increase of occasional flood flow share in total annual runoff. For example, in the Don basin this parameter has increased by almost 2 times, in the basin of Oka by 1.5. Though less intense, these trends can be traced in the eastern part of the region - in the basins of Kama and Vyatka. The increase here can be approximately 15-20%. In the north of the Eastern Plain (North Dvina, etc.) this tendency isn't observed. The number of flood waves has several times increased. Until 1970s 1-3 occasional floods a year were generally observed on the rivers of Central and Southern Russia. In the past three decades almost every year there are from 4 to 8 or more periods of high water. They are superimposed on each other, as well as the phase of the spring flood and low flow period. The ratio of the maximum discharge of occasional flood to maximum discharge of seasonal flood has increased several times. Now some outstanding floods can be compared with the spring flood wave or even exceed it. Thus, through winter floods an "interception" of spring flood runoff occurs. Spring floods have a lower height and volume and as a result they don't fully recharge a basin. Dry period in this case begins much earlier and though the moisture deficit may not be as deep the long duration of a relatively low water period leads to a "cumulative effect" in various sectors of the economy. In such cases damage can be significant. Higher water levels during the low flow period are associated with frequent flash floods at the same time creates the preconditions of flooding. This is especially acute for the regions where huge amount of precipitation in a short period of time is typical, for example, the Black Sea coast of the Caucasus. On the north of European Russia, the winter thaws causes break-up of the rivers. In this case the risk of ice jams during spring increases.