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Influence of climate and land use changes on recent trend of soil erosion within the Russian Plain

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The Russian Plain is one of the largest plains with an area of 460 × 106 ha. Soil erosion during snow-melting and rainstorms occurs mostly on arable lands at the Russian Plain. The relative contribution of different types of soil erosion changes from the central part of the Russian Plain to the south. Sheet and rill soil erosion during snow-melting and rainfall are practically equal in the forest zone, while rainfall erosion prevails in the forest-steppe zone and the northern part of the steppe zone. Mostly rainfall erosion is observed in the southern part of the steppe zone. Mean annual soil losses from cultivated lands change in the range from 1 to 3 t ha-1 within lowlands to 6 to 8 t ha-1 at uplands with the maximum (10 t ha-1) observed near the Caucasus Mountains in the Stavropolskiy Krai. The intensity of gully erosion is relatively low during the last two decades. The collapse of the Soviet Union in 1991 caused a serious crisis in the agriculture because of financial problems and structural reorganization. As a result, the area of arable lands decreased in the southern half of the Russian Plain in 1991 - 2003. To a greater extent it was observed in the south of the forest zone because of the low productivity of its soils compared with chernozem. More than one third of the arable lands were abandoned in the dry steppe – semi-desert zones because these lands were irrigated during the Soviet period. The reduction of the arable land occurred in the forest-steppe and steppe zones mostly because of funding limitations during the 1990s. Recently the area of arable lands in the steppe zone was practically restored to its pre-1991 size. Simultaneously the last 25 years are characterized by unusual warm winters - in particular, in the southern half of the Russian Plain because of the global warming. As a result, the coefficient of surface snow-melting runoff considerably decreased for both cultivated fields and compacted fields after harvesting. Accordingly, spring flood levels decreased considerably - in particular, in small rivers. This is confirmed by a serious decrease of floodplain sedimentation rates since 1986 compared with the period from 1964 to 1986. As a result of both positive trend of extreme rainfall and negative trend of surface snow melting runoff, the proportion of sediments eroded from cultivated slopes and delivered by surface runoff to river channels decreased considerably during the last few decades in the southern part of the Russian Plain. Complex assessment of different erosion factors changes is undertaken for the different landscape zones of the Russian Plain. Given analysis allows evaluating of recent trend in erosion rates from cultivated lands. The other indicators of sediment redistribution dynamic (gully head retreat rate, floodplain sedimentation) are also used for assessment of soil erosion rate dynamic under land use and climate changes during last 25-30 years.