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Fluvial network dynamics during the agricultural period

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It is well-known that start of extensive land-use leads to activation of gully erosion in many agricultural areas. But the dynamics of fluvial forms, including gullies and small valleys, during the period of cultivation is not so well-defined and greatly depends on local topography. Monitoring of individual gully systems evolution, widespread overgrown gullies and small valleys point at the impulsive, undulated development of upper parts of fluvial systems. Our investigation of fluvial network dynamics was conducted for a few key study river basins (Seim, Zusha and upper part of Desna basin) located in different parts of Central Russian Plain with various geomorphic structure. A set of historic topographic maps (from 1860s to 1980s), up-to-date satellite images and field studies were used as a basement for the fluvial patterns comparison and the networks dynamics reconstruction.

The general increase of total length of fluvial forms during the period of cultivation was detected for almost all studied basins. However the relations between morphologic differences of interfluvial areas, depth of relief dissection, duration of agricultural period, and the particular changes of fluvial patterns were found. The general impulsive, undulated character is natural to fluvial network dynamics. There are interchanging periods of dominant erosion or accumulation, and the duration and intensity of these periods are heavily dependent on local geomorphic structure. It was found that in the areas with gentle, long slopes and small elevation difference pre-anthropogenic gullies keep developing and almost no new forms appear due to the land use. But the thickening of fluvial network can be found in the strongly dissected areas with steep slopes and high elevation differences.