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Database of Alluvial Radiocarbon Dates in European Russia and Siberia and its Palaeohydrological Interpretation

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We collected and analyzed published radiocarbon dates from East European Plain (EEP) and Siberia to pick absolute dates on alluvial and associated deposits. After filtering unreliable dates, ∼1000 radiocarbon dates from EEP and ∼500 from Siberia were included into the database. Each date was supplied with information on geographic location and coordinates, catchment area, geomorphological position, characteristics of geological section and dated materials. Also the information about published sources was given. Documented sections refer to fluvial forms in a wide range of catchment sizes.
To extract palaeohydrological signal we used two kinds of proxies: sedimentological and geomorphological. We used the following indicators of low activity: organic horizons (soil, peat) in overbank alluvium, balka bottoms and gully fans, small river palaeochannels; and the following indicators of high activity: active sedimentation on river floodplains (burial of organic horizons), balka bottoms and gully fans, erosion by flood flows on floodplains, in bottoms of balkas and gullies, river incision, big palaeochannels, channel avulsions and chute cutoffs.

Each date that received palaeohydrological interpretation was regarded as the indicator of a particular Local Palaeohydrological Event. Combined probability density functions of high- and low-activity dates were used to detect time intervals of different palaeohydrological status.
For EEP after low fluvial activity during LGM two palaeohydrological epochs were designated: extremely high activity in the end of MIS 2 (ca. 18–11.7 ka b2k), and much lower activity in the Holocene. Within the Holocene two hierarchical levels of hydroclimatic variability were designated according to their duration and magnitude – regional palaeohydrological phases (centuries to few millennia) and regional palaeofluvial episodes (decades to few centuries). Tendency is rather clear of activity lowering in the first half and rise in the second half of the Holocene. In most cases changes of fluvial activity were most likely induced by changing amounts of spring snowmelt runoff. Most distinct correlation of temperature and hydrological regimes was found in the Late Holocene: high fluvial activity corresponded to cold climatic phases (Little Ice Age), low activity, to warm phases (Medieval Climatic Optimum, current climate warming). Correlation of changes in fluvial activity within a west–east transect over Europe revealed relatively poor correlation in the Early and Mid Holocene and much higher synchronism since 3.0 ka b2k, which may indicate increasing role of westerlies in controlling European climates in the Late Holocene. Throughout the whole Holocene, changes of fluvial activity were governed by natural climate forcing until the last few centuries when land use changes induced accelerated hillslope and gully erosion. Comparison of results over Siberia with previously published Holocene flood chronologies in Europe revealed high concordance in the last millennium (the hydrological response to the MWP and LIA climate oscillations) and less similarity in earlier time.