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Loess-Palaeosol Successions, southern and central Russian Plain: Progressively drier, generally cooler Interglacials

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Loess-palaeosol successions investigated along a transect between Taganrog Bay, Sea of Azov, and the Oka River valley, reveal a complex succession of palaeoenvironments throughout the middle and late Quaternary. In exposures along Taganrog Bay, four palaeosol complexes are identified within the sedimentary succession. Soils in the Vorona palaeosol complex, correlated with the late Muchkap Interglacial, resemble modern semi-humid subtropical Mediterranean region soils. Some successions have characteristics indicating development from soils resembling modern kastenozems. Muchkap Interglacial palaeosols further north exhibit characteristics typical of prairie chernozems, to luvisolic soils in the central part of the Don River Basin.

The successive Likhvin Interglacial (Inzhavino Pedocomplex) palaeosols show a transition from units with strongly preserved chernozemic characteristics in the south, progressively northward through drier, cooler prairie chernozems to luvisols. Morphological features associated with seasonal frost activity are present. The spacing and depth of the cracking noted in palaeosol successions is similar to observed modern seasonal frost cracking. Kamenka Interglacial (MIS 7) successions derived from luvisols, dark grey chernozems, and gleysols are present in the Sea of Azov area. Northward, the interglacial pedocomplexes show a transition indicative of cooler, drier conditions.

Along the Sea of Azov, the Mikulino Interglacial (MIS 5; Mezin complex) is represented by chernozems similar to the presently-developing soils of the region, although the modern soils are marked by seasonal frost features. In the Don Basin and further northward, the Mikulino soils show similar features to the modern chernozems and luvisols present, although gleying, carbonate nodules, and microstructural analysis suggest development under somewhat moister environments, with higher groundwater tables.

The environmental succession recognized in the Sea of Azov region shows a transition from semi-humid subtropical conditions in MIS 11, to temperate and boreal conditions during MIS 9 and 7, and finally towards landscapes with typical steppe soils in MIS 5 and 1. The sequence indicates that moisture supply and temperatures during successive interglacials shifted progressively towards cooler, increasingly drier climates.

The transitions over time in the southern successions can also be recognized spatially across the Russian Plain from the Sea of Azov to the Oka River Basin. Although local conditions at each investigated site exert significant influences, a similar general pattern of increasingly drier, generally cooler interglacials can be recognized. The palaeosol-loess successions from MIS 11 to MIS 1 show a progressive shift from Mediterranean dominated climate patterns, with warm, dry southwesterly winds, to colder northwesterly and Atlantic-influenced winds.

These successions parallel results obtain in the Altaisk region of Siberia, where a progressive shift from southerly winds during MIS 5.5 and MIS 4 to westerly winds during MIS 2 and MIS 1 has been observed. The substantial changes marked by increasing dominance of westerly winds in the Central and Southern Russian Plain since MIS 11 are mirrored, although to a lesser degree, in changes within assemblages correlative to the Trubchevsk soil (MIS 2) and early MIS 1.