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Catastrophic flood spillway channels in SW Eurasia: Geomorphology and Palaeohydrology

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The formation of an extensive ice sheet during the Late Pleistocene glaciation (˜125-10ka) over the high latitude continental margins of the Eurasian continent induced the damming of drainage basins and this, coupled with meltwater and glacially derived precipitation, led to the formation of large proglacial lakes to the south. These lakes expanded in size until they breached the continental watersheds and overflowed, generally to the south, in catastrophic flood events eroding spillway channels in the process (Grosswald, 1998). The Manych, Uzeboy and Turgay Spillways (all in SE Eurasia) have widely been attributed to having been formed simultaneously by this process, yet limited geomorphic evidence has been put forward to test this hypothesis. Using 3 Arc Second (90m resolution) Shuttle Radar Topography Mission (SRTM) digital elevation models (DEM) we investigate the geomorphology of the Manych Spillway and test whether it was formed by flooding-related overflow events from the Caspian Sea to the Sea of Azov (Black Sea Basin). We observe evidence of an array of landforms associated with high magnitude flooding. Macroscopic features include; a straight U-shaped channel that directly connects the two basins, maintains near constant width (av. ˜40km) over 100's of kilometres and crosses watersheds, numerous V-shaped underfit antecedent fluvial channels, and numerous side truncations visible in transverse section. Mesoscopic features include; eroded streamlined residual hills, terraces and crucially an inner narrow channel which displays high sinuosity and bifurcation, islands. Maximum and minimum possible flow conditions (discharge, bed shear stress, mean flow velocity and stream power) can be estimated for the spillways based on geomorphic measurements (slope and minimum and maximum values for width and depth) over an assumed range of bed grain sizes. Our results have implications for understanding catastrophic flood spillovers from inferred large palaeolakes

on Mars.