EGU21-14718
https://doi.org/10.5194/egusphere-egu21-14718
EGU General Assembly 2021

Formation and infill of the Late Glacial incised valley of Concordia Sagittaria (Tagliamento River, NE Italy)

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At the end of LGM the alluvial plains extending along the southern side of the Alps experienced a strong phase of fluvial entrenchment because of the impressive decrease of sedimentary input, related to the withdrawn of the Alpine glaciers within their valleys. Since 19 ka cal BP and up to Early Holocene, few incised valleys formed from the apex of the alluvial megafans to their distal sector but, along the northern Adriatic, the mid and late Holocene fluvial and coastal depositions have largely buried these landforms. During the Late Glacial the incised valleys were the only fluvial corridors where transport and deposition of sediments could occur in the whole plain.

We investigated the distal sector of the alluvial megafan of Tagliamento River through the analysis of a dataset consisting of ca. 2300 mechanical and hand-made cores. These data, compared with LIDAR-derived DEM, radiocarbon and paleoenvironmental analyses, allowed a detailed reconstruction of the formation and evolution of the buried incised valley characterizing the area of Portogruaro and Concordia Sagittaria. The valley has been traced for over 25 km, is up to 1.2 km wide and with a depth of 20 m below the top of LGM surface.

The erosive valley has been mainly formed between 19 and 14 ka cal BP, leading also to its partial infill with about 10 m of gravels, that arrived up to the present coast. The fluvial activity has been after limited to the deposition of fine sediment almost until the end of Late Glacial and, according to paleobotanical information, for the first time in the Venetian–Friulian Plain, these deposits recorded the vegetation of the Younger Dryas period.

After the disconnection from active Tagliamento, swampy environments occupied the valley bottom and the Holocene marine transgression started to indirectly affect the valley around 9.5 ka cal BP, contrasting the drainage and favouring the formation of widespread lacustrine environments. Since 8 ka cal BP lagoon entered in the valley and, following the sea-level rise, led to the deposition of a ca. 15 m thick unit of lagoon muds up to historical time. The infill of the valley documents the evidence of anthropogenic activity since 6-5 ka cal BP, probably in relation to wood clearance and soil degradation. Anyhow, significant human impact occurred during Iron and Roman Age, when Concordia became an important city. In 6th century AD high-magnitude floods

deposited up to 5 m of sediments and largely obliterated the valley.

The detailed 3D reconstruction of the valley of Concordia allowed also to highlight the importance of the groundwater-fed streams in affecting the formation of this and other large incised valleys of Tagliamento. In particular, we produced evidence that river piracy by minor rivers triggered the creation of other incised valleys in the distal sector of Tagliamento megafan.

The buried incised valley of Concordia can represent a reference model also for describing the fluvial evolution of the other main Alpine rivers in the coastal sector of the whole Venetian-Friulian Plain during Late Glacial and Early Holocene.