Identification of paleochannels and floodplains by GIS analysis around the ancient city Tegea, Greece.

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In the area of the ancient city Tegea, Peloponnese, paleochannels and floodplains have been reconstructed by using terrain data and GIS analysis. The main data are field observations and vectorized contour data from detailed topographic maps with contour levels of 0.5 m, vectorized lines of present day rivers and channels and vectorized well points. The ancient Greek city was located at the Tegea plain. No river is running through the ancient city area today. The terrain is characterized by three landforms: Hill slopes, the river plain, and bedrock obstacles. The basis for the analysis is a terrain model made from the contour data. The river plain was identified by a query of slope less than 1 on a grid with no sinks. The remaining areas have been categorized as hill slopes and bedrock obstacles. There are numerous wells distributed over the plain and bedrock obstacles have also been identified by areas of no well points. Hydrological models have been made from the filled grid producing flow direction, flow accumulation, and watershed. Field surveys and map analysis of the present day river Sarantapotamos tell that the river is running on the top edge of its floodplain. The model for this river plain is a channel with bedload sediments of stone, gravel and sand, fine sand at the levees, and silt covering the floodplain. There is a level gradient from the levees over the floodplain. This model from the present day river has been applied to the ancient floodplains. The boundaries between the watersheds on the plain will then be the paleo channels and the main draining rivers from the flow accumulation will be the boundaries between the paleo floodplains. This is illustrated by the flow direction running in a cute angle from the paleo channel. The location of paleochannels is verified by field observations from cross sections in two sand pits and one construction pit showing fluvial sedimentary structures of sand and gravel. A few GPR profiles with drillings crossing one of identified paleochannels also show channel cross sections filled with sand and gravel.

It is to be discussed whether the convex shape of the floodplain is a product of floods of different ages or that a few late floods have made their imprints on the landscape. In one part of the Tegea plain a three meters thick package of sterile silt is covering the area. Findings on this surface are only from medieval or modern time. On other floodplains the findings are also of older ages. The city area has been identified on a river plain with findings of prehistoric age indicating that the city was founded on a river plain of prehistoric age with left but maybe still open channels. There are two river plain layers. The upper one is 5 – 7 m thick and of relatively loose packing. The lower layer is of the same thickness with a hard packing probably due to calcium precipitation. The small thickness of the upper layer indicates that the different floodplains are of different ages and together with the distribution of findings this indicates that the reconstruction of the paleochannels and floodplains by GIS methods gives a picture of the development of the Tegea river plain in a proper way.