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HYDROGEOLOGICAL IMPLICATIONS OF MAN-MADE AGRICULTURAL TRANSFORMATIONS OF THE KARSTIC SOIL TEXTURES OF ALTA MURGIA (PUGLIA, SOUTHERN ITALY)

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The territory of the "Alta Murgia" constitutes the main recharge area of the Murgia karstic aquifer due to the elevation, climatic conditions, surface karstic textures and morphology. The aquifer is bordered to the W as a result of the presence of the impermeable sediments of the Bradanic trough, while to the E is bordered by the Adriatic Sea: it thus acquires the characteristics of a coastal aquifer. The natural morphologic features of the karstic plateau are defined by the density of surface karstic forms: exposed karst, karren fields, layer fronts or outcropping joints with marginal or substantial interposition of "terra rossa", and active or fossil dolines. Karst surface shows natural distribution of modest deposits of "terra rossa" and regolith on the bottom of the morphologic depressions, often outlining a primordial hydrographical network occasionally convergent in dolines or endoreic basins. Up to the end of the 1970's, land use was characterised by pastures or mainly uncultivated soil, while a small amount of cereal growing was only carried out on the morphologic depressions with significant amount of soil. Other no marginal characteristic of the territory was defined by the high degree of its division into parcels, physically delimited by a very developed network of dry stonewalls. These last, made up by two well squared faces and an inner filling of tout venant, and characterised by a high filtering power and capacity for holding the soil, have been built during centuries by using rock pieces obtained by the stone retrieving from fields. In such context, the surface of the recharge area, its high capacity of absorbing rainfall of medium and high intensity (the runoff being

basically activated only during highest intensity events), and the low evapotranspiration, consequent to the negligible outcrop of soils, have been preserved in the time in excellent terms. Recently, the Alta Murgia plateau has undergone a dramatic change due to agricultural activities. In particular, the crushing of surface rock layers to transform it in a cultivable soil has changed large part of the original karst landscape into cornfields. Land transformation involves also the demolition and crushing of the dry stonewalls, and the flattening of large areas, that become suitable to cultivations of intensive type. The above scenario represents one of the most worrying examples of man-made evolution of textural features of the territory, in the light of the significant variations caused to the hydrogeological elements of the water balance, of the speed of the evolution and, finally, of the fact that the Alta Murgia territory should be considered a protected area, to the aims of safeguarding quality and quantity of recharge waters. It is worth to highlight that the concerned aquifer is by now threatened by the consequences of high groundwater exploitation, which triggers, above all in the costal zones, the salinisation of water resources, and of the release of agricultural polluted waters. The joined research of the Laboratory of Applied Hydrogeology of the University of Basilicata and the unit of Bari Technical University is focused both on large scale for the evaluation of the amount and rate of surface transformation of the Alta Murgia territory and on local scale for the study of soil texture parameters The study on the large scale has been carried out through the analysis of multi-temporal aerial photos: it evidenced that, at the end of 2003, the 40% of the analysed territory had been transformed. In selected test areas, either intact or previously subject to the transformation process, a number of elements have been evaluated in order to implement an EPT model: the thickness and the distribution of the soil cover, the micro DEM of the rock surface on a grid with sides of 10 cm, and the grain size and mineralogy of soils. These data allow performing a refined analysis of the saturation process (in situ verified also by tensiometers), of the EPT and of the runoff subsequent the attainment of the ponding time. The consequences of transformations seem to reduce the amount of infiltration, since the textural features of the new surface that replaces in part the original epikarst, and the absence of the dividing dry stonewalls, highly increase the runoff and the evapotranspiration. Such new morphology defines an instable environment: the irreversible loss of soil from the artificial soil covers is the close precursor of the desertification of the area