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A soil toposequence characterization on evaporites in the semiarid Central Ebro Basin (NE-Spain)

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Central Ebro Basin is a semi-arid region where evapotranspiration exceeds considerably the precipitation, and where Miocene gypsum ($CaSO_4.2H_2O$) is abundant as soil parent material (ITGE, 1995). These are favourable conditions to develop gypseous soils, which cover less tan 1% of the Earth's land surface, being especially scarce in Europe (IUSS, 1998). In order to get a detailed soil description of soils distribution along the landscape, the morphological, physical and chemical properties of five selected soil profiles along a slope were determined. Soils were classified using the Soil Taxonomy System (STS) and the World Reference Base (WRB).

Geomorphic unit	Soil forming processes	Horizons and diagnostic properties	Soil Taxonomy System (SSS, 2006)	World Reference Base (IUSS, 2006)
Head slope	Erosion	Gypsiric material Lithic contact	Lihic Torrirorthent	Haplic Gypsiric Leptosol
Shoulder slope	Gypsification	Hypergypsic Lithic contact	Lithic Haplogypsid	Hypergypsic Leptic Gypsisol
Back slope	Gypsification	Hypergypsic	Xeric Haplogypsid	Hypergypsic Humic Gypsisol
Foot slope	Gypsification	Gypsic	Xeric Haplogypsid	Haplic Humic Gypsisol
Toes slope	Gypsification Salinization	Gypsic & Salic Fluvic properties	Xeric Haplogypsid	Endosalic Skeletic Gypsisol

Table 1. Soil forming processes, horizons and diagnostic properties and classification of the soils studied by the WRB (IUSS, 2006) taxonomy system and Soil Taxonomy System (SSS, 2006).

The surface horizons on the top of the slope have the lowest soil organic matter and soil aggregate stability value, both directly and significantly related (R: 0.89; $P<0.01$). These properties increase water runoff and erosion on higher parts of the slopes (León et al, 2011). Soil water holding capacity (SWHC) is lower on the head and shoulder slope than in the other places, which favour plant cover. Soils are moderately calcareous and strongly gypseous (up to 80%), especially on the upper horizons of the top of hillslope. In the stabilized soils of the back slope the gypsum is translocate to developed gypsic horizons with depth. There is a negative and significant (R: -0.80; $P<0.01$) relation between gypsum and carbonates. Moreover, in the toes slope profile can be found buried and salic horizons. According with these properties, the soils mainly belong to Gypsisol group (Haplogypsid by Soil Taxonomy System) with differences at unit level related to its position along the slope (Table 1).

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