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Interactive comment on "Challenges of soil carbon sequestration in NENA Region" *by* Talal Darwish et al.

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First I wish I can correct the Global Soil OC map version 1.0 and not 0.1.

Allow me to add this part added to the manuscript according to your kind suggestion.

Land cover mapping and effect on SOC stock

Land cover map of NENA region shows nearly 80% of the area is covered with bare lands (Figure 4a, b). Grassland, sparse vegetation cover and rainfed agriculture are close by area varying between 4.39% and 5.27%. The irrigated crops do not exceed 0.66% of the total area. Apparently for this reason, The region is becoming increasingly dependent on food imports, because of demographic pressure, rapid urbanization, water scarcity and climate change (FAO, 2015).

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Discussion paper

Comparing our results with the global SOC map produced by Hengl et al., (2014), based on soilGrids1km layers showing the soil organic carbon content in permille in 0-5 cm and the predicted global distribution of the soil organic carbon stock in tonnes per ha for 0–200 cm to be beyond the followed by FAO methodology of SOC stock estimation and presentation. In this paper the standard methodology of the measured SOC stock and density in topsoil (0-30 cm) and subsoil (30-100 cm) was followed. The first Global SOC Map was launched on December 5, 2017. However, a comparison of values of SOC content (%) and SOC stock revealed comparable trends values for the C content and stock (1-2% and 20-204 ton/ha), with higher upper density in Hengel et al approach.

In our study, the combination of SOC stock map with the land cover map showed significant effect of land cover on SOC stocks in NENA region. As can be expected, Shrublands, sparse vegetation and bare lands gave the smallest values, between 14 and 26 ton ha-1 (Figure 5). In a mixture of shrublands and herbaceous vegetation, the SOC increases to 40 ton ha-1. The highest density (30 and 60 ton ha-1) is found under forest stands.

Despite the expected impact of frequent plowing, the soils under mixed trees and irrigated crops have higher density than rainfed crops. The highest SOC stock was observed under evergreen forest land whose area is very limited (3380 km2 corresponding to 0.02% from the total area). Surprisingly, the stock found under urban soils ($\approx$ 30 tons ha-1) was moderate. This could be related to the urban encroachment on prime soils. Between 1995 and 2015, rapid urban growth caused the loss of over 53 Million tons of soils, 16% of which correspond to prime soils (Darwish and Fadel, 2017). The assessment of SOC content in time and space in relation to land cover showed a decline of OC content in topsoil by up to 1% between 2001 and 2009 (Stockmann et al., 2015). Land cover change was considered as the primary agent that influences SOC change overtime, followed by temperature and precipitation.

Please also note the supplement to this comment:
https://www.soil-discuss.net/soil-2017-39/soil-2017-39-AC3-supplement.pdf

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