

# Combination between the Caesium-137 technique and soil moisture data to assess the soil erosion status in three watersheds in Northwest Morocco

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As many parts in the Mediterranean basin, water erosion is the main threat of soil resources and water reservoirs in Northwest Morocco. The impact of climate change can even aggravate the situation. Recent studies on vulnerability to climate change in Mediterranean areas in general have shown a trend of increasing aridity leading to a decrease in soil moisture which in turn accelerates soil erosion. The Caesium-137 technique, which has always been an excellent alternative for soil erosion studies in North Morocco, is used in this study.

Based on MBM2, the highest mean erosion rates of about 31.4 t.ha<sup>-1</sup>.yr<sup>-1</sup> (1954-2017) and the lowest mean annual soil moisture of 0.17 cm<sup>3</sup>/cm<sup>3</sup> (obtained by Sentinel 1) were recorded in the fields of El Hachef watershed. In the study site of the Nakhla watershed, the soil loss is 29 t.ha<sup>-1</sup>.yr<sup>-1</sup> for the period 1954-2017 [1] and the mean annual soil moisture is 0.19 cm<sup>3</sup>/cm<sup>3</sup>, whereas the Raouz watershed recorded the lowest mean soil erosion rates of 10.9 t.ha<sup>-1</sup>.yr<sup>-1</sup> (1954-2018) and accordingly the highest soil moisture of 0.24 cm<sup>3</sup>/cm<sup>3</sup>. However, in a field within this watershed, soil erosion rates had slightly increased from 4.5 to 5.7 t.ha<sup>-1</sup>.yr<sup>-1</sup> between 2001 and 2018 due to climate change impact on soil loss in this area [2]. In general, the results show that the soil erosion rates and the data on soil moisture are correlated. The degree of soil moisture has an impact on soil stability. Moreover, a decreasing tendency of soil moisture was recorded in the three watersheds which could be due to the increases in temperature.

[1] Moustakim M, Benmansour M, Zouagui A, Nouira A, Benkdad A, Damnati B (2019): Use of caesium-137 re-sampling and excess lead-210 techniques to assess changes in soil redistribution rates within an agricultural field in Nakhla watershed. *Journal of African Earth Sciences* 156,158–167.

[2] Moustakim M, Benmansour M, Nouira A, Benkdad A, Damnati B (2022): Caesium-137 re sampling approach and excess Lead-210 sediment dating to assess the impacts of climate change and agricultural practices on soil erosion and sedimentation in Northwest Morocco. *Environmental Earth Sciences* 81 (278), 1-17.

