Supplementary materials for article MULCH EFFECTS ON SOC STOCKS IN MEDIRERRENEAN CLIMATE: MODELLING, Pesce et al. 2022

1. **Equations for the calculation of Accumulated TSMD in the modified version of RothC (the changes due to adaptation of the model as in Farina et al. 2013 are not shown here).**

d accTSMD/d t = +TSMD (initial value fixed as MinTSMD, which is calculated from the maximum soil water content measured in the field)

TSMD = IF THEN ELSE(accTSMD+TSMDcalculation>MinTSMD,

    MinTSMD-accTSMD,

   IF THEN ELSE(c advance=0.6,

     IF THEN ELSE(accTSMD+TSMDcalculation<(WTD-DeltaTSMD mulch),

      (WTD-DeltaTSMD mulch)-accTSMD,

      TSMDcalculation),

     IF THEN ELSE(accTSMD<(WTD-DeltaTSMD mulch),

      IF THEN ELSE(TSMDcalculation<MinTSMD,

       MinTSMD-accTSMD,

       TSMDcalculation),

     IF THEN ELSE(accTSMD+TSMDcalculation<(WTD-DeltaTSMD mulch),

      (WTD-DeltaTSMD mulch)-accTSMD,

      TSMDcalculation))))

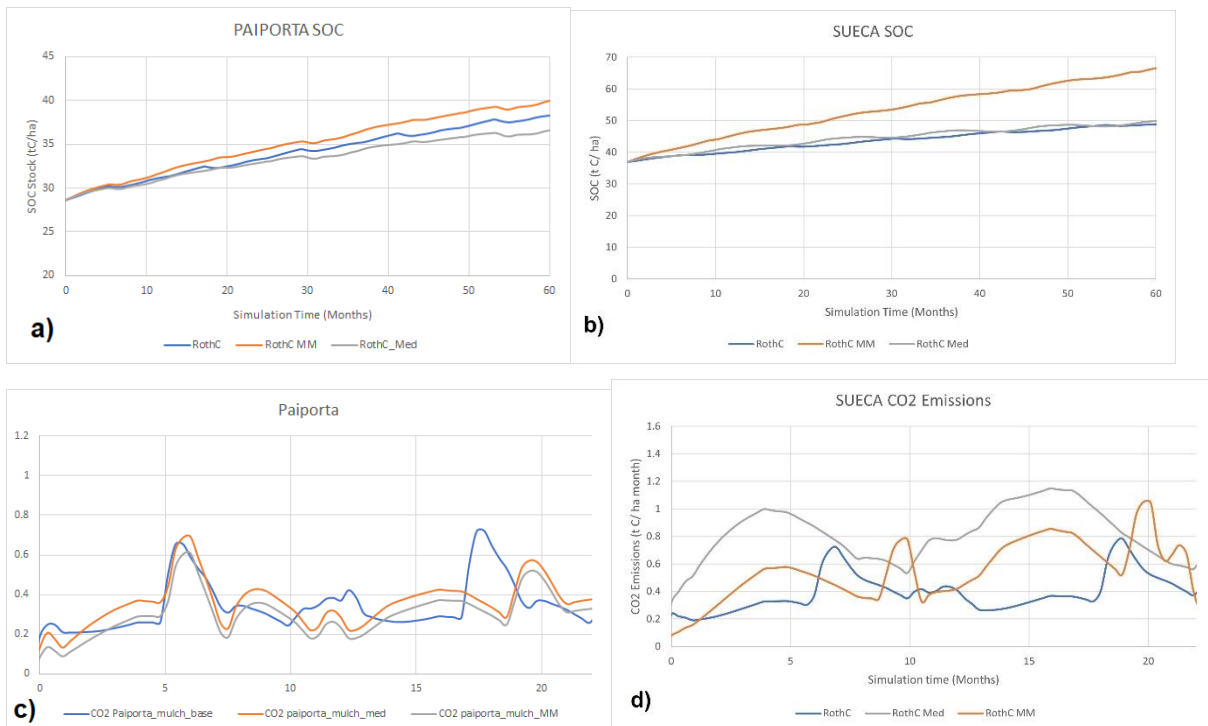Where "c advanced" is the value of RothC parameter *c* (coverage) but for the next time step.

TSMD calculation = (Rainfall+Irrigation)-0.75*Open Pan Evaporation (as in standard RothC)

DeltaTSMD mulch = -5 mm (the effect of mulch in increasing soil moisture, determined directly from field observations of soil moisture, see also accompanying article Visconti et al. 2022)
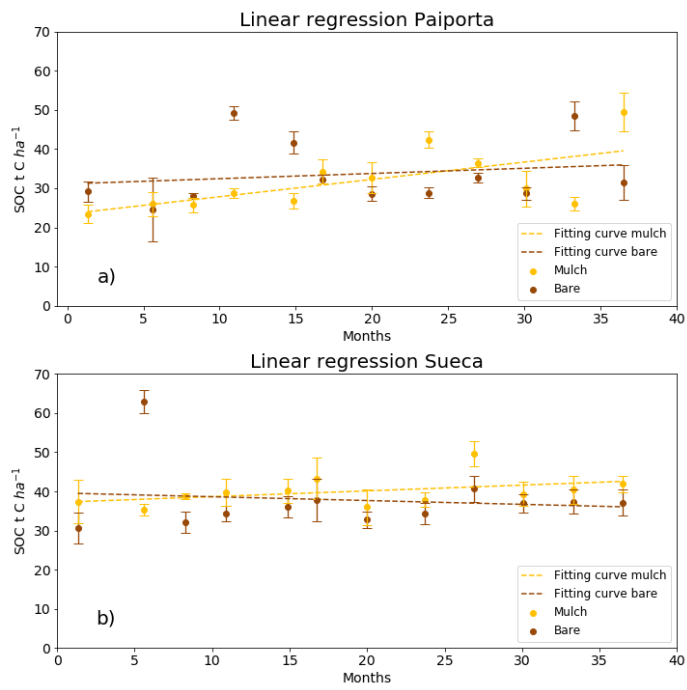
WTD = Drought+Amplitude*SIN((Time+Phase)*3.14/12) (this equation simulates the effect of a yearly fluctuating water table on the soil moisture)

Drought = -70 (determined directly from field observations of soil moisture)

2. Supplementary figures

Figure S1: Comparison between the results obtained from basic RothC, RothC_Med, and RothC_MM, for the mulch treatment: a) SOC stock values predicted in Paiporta; b) SOC stock values predicted in Sueca; c) CO_2 soil emissions predicted in Paiporta; d) CO_2 soil emissions predicted in Sueca. It is hard to distinguish the three different models in Paiporta, and the importance of using the RothC_MM model is not apparent, when looking only at SOC stock. However, when looking at CO_2 soil emissions, basic RothC predicts a trend that is very different with respect to that predicted by RothC_Med and RothC_MM, even though these last two are hardly distinguishable. In Sueca, however, the RothC_MM predicts a much larger SOC stock increase; hence, using basic RothC or RothC_Med would result in an overestimation of the C input to the soil. In Sueca, moreover, the difference between soil CO_2 emissions is clearly visible, and the authors are convinced that, if only more measurements were taken from the field, it would be possible to discriminate the best model using such data.

Figure S2: linear model fitted to SOC measurements (also shown, with the relative error) to estimate the trend in time for a) Paiporta and b) Sueca.