

## ***Interactive comment on “Time domain reflectometry (TDR) for dielectric characterization of olive mill wastewater (OMW) contaminated soils” by Alessandro Comegna et al.***

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Dear Referee #1,

With reference to the paper: hess 2020-69, by A. Comegna et al., please find below the replies to your review. Overall, the authors beg to disagree on a number of major points.

In particular, the Referee claims that the model adopted is “. . .very trivial. . .”, a consideration which we found hard to fathom. We would like to point out that the model in question is the well-known exponential model based on Birchak’s mixture equation

(Birchak et al., 1974), which was reformulated for our purposes. The model has been widely used, in the last 40 years, in soil physics (Dobson et al., 1985; Alharthi et al., 1986; Roth et al., 1990; Knight, R. and Endres, A., 1990; Heimovaara, T. J, 1994; Redman and DeRyck, 1994; Hilhorst, 1998; Knight, 2001; Chenaf and Amara, 2001; Persson and Berndtsson, 2002; Regalado et al., 2003; Huisman et al., 2003; Haridy et al., 2004; Mohamed and Said, 2005; Rinaldi and Francisca, 2006; Moroizumi and Sasaki, 2008; Francisca and Montoro, 2012; Zhan et al., 2013; Comegna et al., 2013a; Comegna et al., 2013b; Comegna et al., 2016, Comegna et al., 2017; Comegna et al., 2019; etc. . .).

Furthermore, the Referee states that: “. . .the literature overview does not include the works available at the state of the art”. We agree that the literature in question is extensive. It was precisely for this reason that we included in the paper more than 30 references, which were selected from others for their affinity with our research.

Besides, according to the Referee the “. . .scientific approach is far to be robust. . .”, which, objectively speaking, does not seem true to the facts. From an experimental point of view: i) two soils, pedologically different, were selected, ii) 160 measurements, for a full factorial analysis, were carried out only for model calibration and validation, iii) three different statistical indices (mean absolute percentage error: MAE, model efficiency: EF, and maximum absolute percentage error: ME) were calculated to assess model performance. Finally, the methodology developed in this study required statistical analysis of the relationship between the relative volume of OMW in water ( $\beta$ ) and EC<sub>b</sub>, to determine the coefficients  $a_c$ ,  $b_1$ ,  $b_2$ ,  $b_3$  of equation (7). The analysis was performed using analysis of covariance (ANCOVA, at a significance level of 0.05), which is a statistical tool used to test the main and interaction effects of categorical variables on a continuous dependent variable, controlling for the effects of selected other continuous variables that co-vary with the dependent variable. Thus, the ANCOVA analysis combines regression analysis and analysis of variance, providing for each soil investigated a way of statistically controlling, in our case, the parallelism of the empirical

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linear relationships  $\beta$ -ECb (figures 3a, b) observed at different levels of soil saturation  $\theta_f$ . The results of the ANCOVA test, coupled with the other statistical indices computed are enough to validate, in our opinion, the methodology developed, whose results are indisputably encouraging (see figure 5).

Finally the Referee says: “More importantly, the experiments conducted only on two soil samples are definitely poor and trivial”. It should be stressed that the soils selected belong to two typical pedological units of southern Italy which account for approximately 90% of the Italian olive plantations and the highest concentration of the olive oil industry in Italy. In these districts, despite European and Italian laws, there is the controversial propensity to spread olive mill wastewater (OMW) on soils, causing critical environmental problems.

The current database should of course be extended, selecting for example other pedological contexts in other Mediterranean countries sharing the same environmental problems. This aspect goes beyond the scope of the present research.

Sincerely

The authors

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