Review on “**Repeated electromagnetic induction measurements for mapping soil moisture at the field scale: validation with data from a wireless soil moisture monitoring network**”, written by E. Martini et al.

The paper in context describes a long term field experiment (conducted in the experimental station of Schäfertal, Central Germany) in which different wireless sensors (EM38-DD and SPADE ring oscillator) were utilized for measuring the so-called soil electrical conductivity (EC_a). Changes of EC_a, due to the time-variant soil properties, were monitored in order to capture changing soil conditions and to determine the source of this variability.

The experimental campaign results in an extensive dataset with measurements in time and space. The persistence of spatial patterns was evaluated by calculating the Spearman rank correlation coefficient between the spatial patterns of EC_a and the soil water content (θ).

There is not a lot I can add to improve the quality of the paper. Only one more serious comment I have to make: the results of EMI-based EC_a data analysis are site specific, therefore there is the necessity for a more robust soil characterization, which means the development of a more rigorous sensor calibration methodology to avoid misinterpretation.

I am little bit worried about the poor correlation observed between the EC_a and θ relationships of figure 4. Perhaps intrinsic limitations could exist in the EMI and SPADE sensor calibration which may limit the comparability of EC_a-θ values.

I urge the authors to discuss this issue in the paper prior publication. In the following some general and specific comments for revision:

General comments:

1. The analysis also highlighted all the limits of taking EMI readings only at the soil surface to deduce the EC_a vertical distribution along the soil profile. In fact, the study clearly revealed that this method is too sensitive to the changes over time of the vertical distribution of the local EC_a along the soil profile. In different time frames, a different vertical distribution of the local EC_a may still result in the same EMI measurement but with a different local (SPADE probe) readings. This induces the relative patters of variability of SPADE and EMI to change over time, so that even an effective calibration obtained at a given time frame cannot be extended immediately to other time frames. Accordingly, it is my opinion that of all the approaches now existing for deducing EC_a distributions by EMI sensors, those based on multiple EMI measurements to be made at a succession of heights above the soil surface for each of the monitoring sites remain the best choice, as a sequence of measurements with different depth weightings guarantees more univocal information on the actual depth distribution of local EC_a.

2. To partly explain this site specificity, in the paper the authors must also evaluate the role of the different observation window of EMI sensors and of local scale sensors (SPADE probes) used for measuring local EC_a values to be employed for EMI calibration.
3. Thus, in order to extract the predominant, high-variance signal, the authors must remove the noise of both the EMI and SPADE data series by filtering the original data through a Fourier's analysis. The technique can allow to identify characteristics that a calibration dataset should include to obtain more robust calibration parameters to be used for more effective predictions in other fields and other time frames.

In conclusion, I encourage the application of Fourier's analysis for the characterization of the presented time series of EC_a and θ measurements, in order to better interpret and speculate on their variability in space and time.

Specific comments:

1. The introduction is too long, I believe that this paragraph can be improved by making it shorter and more concise.

2. Figures 3 and 4 are not readable in the form presented (especially figure 4). I believe that the dimensions of the figures in context should be increased.