Review of the paper:

Using lagged dependence to identify (de)coupled surface and subsurface soil moisture values by Coleen et al

General comments

The study investigates the (de)coupling between surface and subsurface soil moisture at four in situ stations in Netherland. The authors use residuals from a fitted loess function and a distributed lag non-linear model (DLNM) to demonstrate that decoupled occurrence is not limited to dry conditions.
The paper is of high interest for many applications, especially, those involving the use of surface soil moisture measurements derived from satellites. Indeed, in many applications such observations are assimilated and integrated with models and algorithms to provide improvements of root zone soil moisture estimates, evapotranspiration, runoff etc… Understanding the conditions under which the decoupling between surface and root zone soil moisture shows up (as a function of the soil type, vegetation and wetness) is therefore extremely important and can explain potential detrimental effects of data assimilation of surface observations.

Specific comments

Overall, the paper is well written but can be improved in what concerns the Methods section organization.

I have two main comments:

1) The first is related to the the choice of the value of the parameter β_c. I think it is a key parameter for the study and should deserve further discussion (or results) on its impact on the results.

2) While the authors include different stations characterized by different vegetation cover (grass, corn and forest) its potential effect on the results is not examined in deep, especially for station SM20 which is located in the forested area, this effect could be signifiant. Can the authors provide further discussion on it?

I have some additional and technical comments that I will list below in order of appearance in the manuscript:

1) Section 3.1: It is not clear to which figure the authors are referring to. Please point to a specific figure when describing graphic features or speak more in general. This section should contain method description and choices made for carrying out analysis.

2) Section 3.1: Define what vertical variability exactly means.

3) The cumulative variance is presented in Figure 4. Same as before, here the authors speak about slope but it is not clear at all for the reader to what slope they are referring to. Please define what cumulative residual variance means and clarify better all the related concepts.

4) Section 3.2.2 Distributed lag model: It is not clear enough how the DLNM model is used with soil moisture observations. I suggest to describe the basic concepts here rather than mathematical details (which could be included in an appendix). Please try to simplify and clarify this section so as it can be more easily interpreted.

5) Pag. 6 lines 19-24: here the authors seem to anticipate the results of the paper about the value to be assigned to β_c. However, I suggest to try to organize the paper in a way that the choice of β_c is described in the results section (and supported by analysis).

6) Pag 8 lien 17-19. Clarify this sentence.

7) Pag 8 line 11. Replace 40cm with "40 cm"

8) Pag 9 . Line 25. T is missing.