

Interactive comment on “Estimating Sahelian and East African soil moisture using the Normalized Difference Vegetation Index” by A. McNally et al.

Anonymous Referee #4

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Authors propose a statistical approach to estimate soil moisture using NDVI satellite products. In spite of the importance of this parameter for drought quantification, the proposed simple approach show different limitations. Authors consider one statistical relationship between moisture and NDVI index for different sites with different vegetation covers. The relationship between moisture and vegetation dynamic could not be the same for all vegetation covers during rainfall season. The use of a limited number of local moisture ground measurements could not be sufficient for the analysis of relationships at regional scale. Satellite moisture products could be more efficient for the proposed analysis.

1. Authors could use different existed Satellite moisture products over western
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Africa, particularly using passive and active microwaves, for discussion of statistical relationship between moisture and NDVI (Wagner et al., 2000, ...). In this context, (Zribi et al., WRR, 2010) have discussed the relationship between satellite NDVI index and satellite soil moisture for a North Africa site.

2. What about effect of scales for analysis between local ground moisture measurements and satellite NDVI or precipitation products. We know that for these Sahel sites, there is a high heterogeneity in precipitation.
3. Authors propose one relationship between moisture and vegetation for all the sites. Or we know that the vegetation cover changes from one site to another. Also, relationship could be different from one month to another function of vegetation growth and precipitation cycle.
4. Ground soil moisture measurements: it is not enough clear what are the exact depths of measurements for the different studied sites?
5. Authors consider moisture values between 40 and 70cm. The reason is not evident, particularly in Mali area with low vegetation cover and then limited root zone area?
6. Models are calibrated for Niger sites and tested for other sites in Mali or Kenya. Or vegetation cover and its effect in root zone soil moisture could not be the same. Is it possible to retrieve the same statistical model for all studied areas?
7. In introduction, authors write: “For regional estimates, microwave remote sensing data can detect wetness in the upper five centimeters of soil, but are compromised if thick vegetation is present.”. Different algorithms using ASCAT or SMOS show a precision close to 5% in volumetric moisture, which is a good precision. For high vegetation density, precision is certainly lower, but this is also the case of NDVI because of the index saturation.

8. Figure 4 illustrates difficulties of using a general estimated soil moisture from NDVI index, with limitations for extreme years, dry and wet, for which, a global statistical analysis could be not sufficient (NDVI saturation etc. . . .). This difficulty could be probably improved if we consider monthly relationships.
9. Application of equation (1) retrieved from sites in Niger to all the subsaharian area (figure 5) seems not clearly justified. In fact, we have to consider variations in soil texture, rainfall seasons, and vegetation cover.

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