In this paper, authors presented a new method for producing long-term surface soil moisture data in China, and the data is well-validated. However, I am a bit confused about the interannual trend of soil moisture in this study. According to this dataset, surface soil moisture declined in most parts of China during 2002-2018, especially in eastern China (Figure 6 and Figure 7). However, we noticed that GPM IMERG precipitation increased in China, especially in eastern China (please see the figure we attached below) where your data however, indicated a sharp decline in surface soil moisture. Considering the strong positive impact of precipitation on surface soil moisture, this conflict seems quite strange. In addition, we also noticed a recently published global long-term microwave-based surface soil moisture dataset called RSSSM (https://doi.org/10.5194/essd-13-1-2021). That dataset seems to suggest an increase in surface soil moisture in China over the same period, while the eastern China showed an obvious increasing trend, which generally agrees with the spatial pattern of the trend of precipitation. So, I may doubt which dataset is more reliable in terms of the interannual trend. Theoretically, the “linear regression matching technique” applied in your study can harmonize the absolute values, or the spatial patterns of different soil moisture products, but may be less capable of calibrating and harmonizing the interannual variations of different products retrieved from different sensors. The interannual trends of different microwave soil moisture products may differ a lot, probably because the disturbances of major influence factors (e.g., vegetation, open water) on different soil moisture retrievals are quite different, in fact.

Response: Thank you very much for your good comments and suggestions. We did a comprehensive analysis, and improved data quality. We have tried to modify our manuscript and improve the quality of paper.

Our work in this manuscript is mainly to do downscaling research and provide a set of higher resolution (0.05°) soil moisture products based on the soil moisture products of Japan Aerospace Exploration Agency (JAXA) which has been verified. Because the resolution of passive microwave scale is too low, the theoretical model for large scale (mixed pixels) is not very mature. Although

there are many soil moisture algorithms and products, and different algorithms have their own advantages and disadvantages, and their accuracy performance is inconsistent in different regions. As you mentioned, especially in areas with a lot of vegetation and rainfall, the accuracy performance is inconsistent.

Usually in vegetation coverage areas, single albedo and optical thickness coefficient values are obtained differently for different retrieval algorithms, which result in a relatively large difference in soil moisture retrieval.

Another difference is the treatment of heavy rainfall. When there is heavy rainfall, the retrieval error of microwave soil moisture is very large. Some retrieval algorithms determine that when there is heavy rainfall, the retrieval soil moisture is an invalid value (usually set to a null value), but some algorithms directly set the soil moisture saturation value as the soil moisture value.

Due to the above two reasons, especially the second reason, there will be deviations in the calculation of the monthly average and the annual average, because invalid values are not included in the calculation for algorithm. In other words, when there is a heavy rainfall, the invalid value in the soil moisture product is not included in the calculation.

We have made an analysis. The soil moisture products you mentioned (RSSSM https://doi.org/10.5194/essd-13-1-2021) has some advantages in the monthly and annual calculation of soil moisture in the eastern rainfall area of China, and it is more reasonable to handle during heavy rainfall. The resolution of this data set is 0.1°. We optimize the value of the high-precision area of this data set to our previous data set, and then further downscaling. In this way, we can have a set of soil moisture data sets with higher accuracy and resolution. Thank you very much.