Comment on essd-2021-362
Anonymous Referee #1

The present work describes the application of various machine learning techniques in downscaling soil moisture data at a high resolution over a very large area in Northern China. The methods used and their presentation convince the reader that this work is original, significant and may contribute to science and national environmental legislation and inform effectively the national environmental authorities. All methods/tools are appropriately described with supplementary material related to them being available, while all figures/tables are of good quality and informative. My only concern is related to the uncertainty that such a work has due to the huge area of application (I suppose it is > a million km²) and the relatively coarse in situ observations (SM) for comparison. Therefore, although the statistics show a good performance of all the techniques, the uncertainty due to limited observations can be further addressed. Also, the 131 precipitation stations used for comparison of SM with precipitation are few for such a huge area and this is not addressed in the uncertainty section.

Finally, some technical issues: a) explain DOY in the title of Figure 4 and in all other figures as figures have to stand alone. The word 'still' appears twice in line 353.