Referee comment on "A random forest model to assess snow instability from simulated snow stratigraphy" by Stephanie Mayer et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2022-34-RC3, 2022

The authors developed a Random Forest (RF) model to evaluate snow instability from snow stratigraphy simulated in SNOWPACK. They manually compared 742 observed snow profiles with SNOWPACK simulations and selected the weak layers in the simulations that corresponded to the observed rutile block failure layers. They used the observed stability test result and an estimate of the local avalanche danger to construct a binary target variable (stable vs. unstable) and finally selected six features as potential explanatory variables. Their model could reproduce an independent validation data set with high reliability (accuracy: 88%, precision: 96%, recall: 85%) using manually predefined weak layers. They also compared their model to observed avalanche activity in the region of Davos for five winter seasons. Their model showed high performance, namely, in 73% of the days, their model correctly discriminated between avalanche days and non-avalanche days.

Although it has been difficult to systematically link between simulation results and decisions about avalanche forecasting in the field, they have done so through machine learning using a very large amount of data. The quality control of the data used was adequate and no doubt a lot of time was devoted to this. The paper itself is well organized including the explanation of the model, analysis of the results though the paper seems a bit long for a TC paper. The conclusions are also very clear and will contribute to improving the accuracy of avalanche forecasting in the future. In my opinion, both the scientific finding and the quality of the paper are enough level to be accepted for publication in the TC without revision.