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The performance of state of the art avalanche dynamic models in an arctic environment

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On December 19th, 2015 an avalanche destroyed 12 buildings and killed 2 people in Longyearbyen, a town located in Svalbard, an archipelago in the Arctic Ocean. The following winter in February 2017 another avalanche destroyed 2 additional buildings close to the area where the first avalanche has hit the town. Other than before a vital interest of authorities for the establishment of an avalanche hazard map of the area that fulfills highest international standards has grown. To achieve this task state of the art avalanche dynamic models were used. However, little experience exists about how those dynamic avalanche models perform in an arctic environment. Luckily, high-resolution laser scans could be performed before and after the 2017 avalanche of the area as well as after the 2015 avalanche. Together with other detailed hazard documentation data this provides reliable mass balance data for the definition of 2 design avalanches, which were used for calibrating the models and to be able to choose best fitting friction and snow density data. Dynamic avalanche modeling was then performed using SAMOS and RAMMS. For the SAMOS simulations of the powder snow content we had to use a snow flow density of 200kg/m3 and the friction model SamosAT using parameters: μ=0.155 Rs0=0.222 K=0.43 R=0.05 B=4.13 to achieve fitting results for the design avalanches. Based on an in-depth analysis of climate change induced return periods of snow depths in the avalanche release areas that are heavily influenced by wind, final simulation scenarios were defined. In this presentation we show the results of the simulations and discuss how the models performed and what had to be considered for the final drawing of the avalanche hazard map.