This manuscript discusses the development and evaluation of high-resolution WRF-Chem modeling approaches to simulate mineral dust emissions from proglacial valleys in the St. Elias Mountains, Canada, across three different time periods and seasons. The land-surface input datasets were updated and the Shao (2004) dust emission scheme was modified to better represent surface erodibility. The model results were evaluated using field data from meteorological stations, Doppler LiDAR, and cameras. The model successfully captured dust emission dynamics, demonstrating seasonal and diurnal variability and dependence on soil type. The model underpredicted surface wind speeds and vertical dust flux, while overpredicting soil moisture. These studies could be used to improve our understanding of high-latitude dust emissions and their response to climate change.

Specific comments:

Figure 9c and d: The contour plot of wind direction is difficult to understand in the way it is presented.

Figure 10: What is causing the high dust concentration in LiDAR data around 1-1.5 km on May 24?