Evaluation of classification techniques for snow deposition and erosion patterns in the Antarctic ice sheet using a machine learning method

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In Antarctica, strong winds from the top of the ice sheet along the coast often cause snow deposition and erosion, and once deposited snow is often carried downwind as blowing snow. This results in the formation of snow surface patterns. In the past, there were only visual observation records of the location of snow deposition and erosion. Since the snow surface patterns affect accumulation on the ice sheet surface, we have started to classify the snow surface patterns photographed on the traverse from the Antarctic coast to the top of the ice sheet, and report here.

We evaluated four patterns of the snow surface patterns: small sastrugi (Fig.1a), large sastrugi (Fig.1b), dune/barchan (Fig.1c), and ripple (Fig.1d), using the online image classification model AutoDL. The small sastrugi was 76% correct, the large sastrugi was 95% correct, the dune/barchan was 79% correct, and the ripple was 75% correct. The classification was approximately reasonable. The Linux-based OS Ubuntu was then installed on the PC, and the image classification model AutoDL was implemented on the Ubuntu-based PC. The minimum specifications of the PC were a 2 GHz dual-core processor, 16 GB system memory, 100 GB free hard drive space, and a DVD drive or USB port. A system for image classification using the PC offline was established.

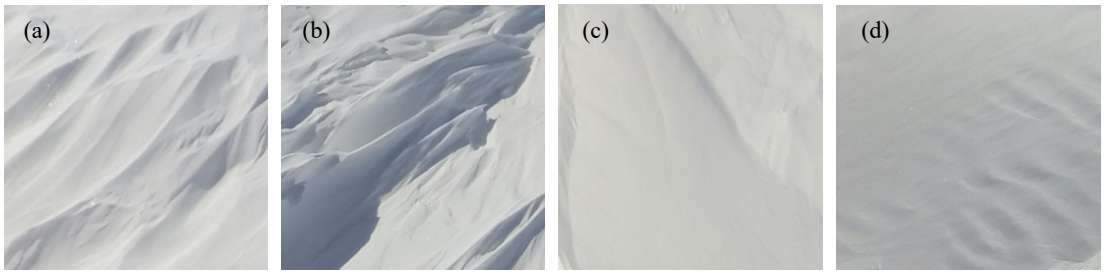

Figure 1. Four patterns of the snow surface obtained on the Antarctic from the coast to the top of the ice sheet. (a) small sastrugi, (b) large sastrugi, (c) dune/barchan, and (d) ripple.