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# Recent geometric evolution of a cold crest-type miniature ice cap at Murtèl/Corvatsch, Upper Engadin, Swiss Alps

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Since the detection of the Oetztal Ice Man and a few rather preliminary studies on perennial ice patches and ice ridges at different sites of the northern hemisphere (Canada, Japan, European Alps), cold cornice-, crest- and plateau-type miniature ice caps are known to contain old (Holocene to even Pleistocene) ice layers. Such small but interesting paleoglaciological archives, however, are still largely unexplored. Especially the information contained in their ice and the future destiny of the small and vulnerable ice bodies with rapid atmospheric warming remain to be investigated. Systematic studies have been performed for several years on the roughly north-south-oriented ice ridge Murtèl/Cortvatsch, Upper Engadin, Swiss Alps. In 2007, ice core drilling was performed and borehole temperatures measured down to bedrock. In July 2007, recent geometric evolution of the ice ridge was determined by repetition of an earlier GPS survey from the year 2000. In order to establish a new digital elevation model (DEM) of the ice crest, the altitude of the ice surface was measured at exactly the same points as in 2000. First results of this resurvey are presented here.

During the seven years from 2000 to 2007, surface subsidence clearly predominated with an overall average of about 5 meters and a highest observed lowering of more than 15 meters. The spatial distribution of the elevation changes is characterized by enhanced subsidence in the eastern part, where the glacier is less steep and more exposed to direct solar radiation. In the uppermost western part, increased surface el-

evations are observed at a few points. In addition to the general surface lowering, a displacement or even distortion of the crest is observed. In the middle part, the ridge is shifted 5 to 15 meters towards east, whereas in the upper part - where the crest is less pronounced - a westward shift by about 15 meters is measured. Such geometric changes may be caused by changes in the aerodynamic flow pattern, which most likely governs the overall shape of the crest- to cornice type ice ridge. In the lowest part, cover sheets protecting tourist installations influence melting rates and lead to artificial geometric changes.

The average thinning rate of 0.7 meters ice or 0.65 meters water equivalent per year is roughly comparable to the average mass balance regularly measured on nine glaciers in the Alps according to the data collected by the World Glacier Monitoring Service (WGMS). Based on information from drilling and radio-echo sounding (GPR), mean thickness of the ice ridge is estimated at a few tens of meters. Continuation of the measured thinning rates would lead to vanishing of the ice ridge within several coming decades. Further atmospheric warming and related acceleration of melting rates could even lead to its disappearance well before the middle of the century.