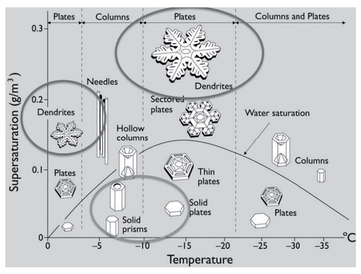
“Dendritic snow production as a means to decrease vulnerability in winter tourism”

Breiling M.[1)], M. Bacher [2)], F. Best [3)], S. Sokratov [4)]

1) TU Wien, Technik.Tourismus.Landschaft
2) BOKU Wien, Institut für Alpine Naturgefahren
3) Energy International Systems LTD, Port Talbot, UK
4) Moscow State University, Faculty of Geography, laboratory of snow avalanches and debris flows



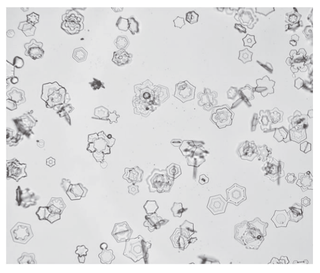


Fig.1

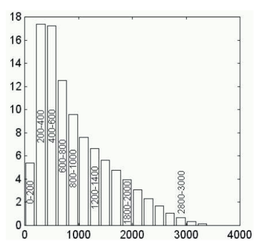


Fig.2

Fig.3

Fig.4

Principle: Recently there is a new way of producing natural like artificial snow. The dendrite generator (DG) simulates processes that take place in a natural cloud inside a container and thereby produces light fluffy snow between 80kg and 200 kg per m³ as compared to 450 kg m³ produced by conventional artificial snow production. The principle difference of the new method to produce snow is explained in Fig.1, the Nakaya diagram from 1954. While conventional manmade snow requires cold and dry conditions, the lower circle in Fig.1, the artificial cloud produces dendritic snow in a more humid environment shown in the two upper circles in Fig.1. We discuss here, why the new quality of manmade snow is needed for the winter tourism industry. We will consider this from three categories, climate, economy and resource use. On the right side of Fig.1 the DG produced snow is shown.

Climate: DG snow is produced in a container, shown in Fig.2, and not in the open environment. Due to this it is possible to produce snow at temperatures closer to 0°C. The possible window for production increases in particular in the lower altitudes of ski resorts. On the right side of Fig.2, the altitude profile of Austria is depicted. We are able to gain more hours for snow production in particular in lower altitudes of ski resorts: the value of hours for snow production increases with about 30% in 2000m and with perhaps 70% in 1000m altitude. The adaptation to the observed warming in winter tourism can last much longer. This is in particular relevant as most of the Austrian population providing tourism services lives in lower elevations and to develop high altitude skiing facilities is not possible.

Economy: DG snow is currently in a phase of industrial development and not yet on the market. The production of nature identical snow could either complement or substitute currently established artificial snow making. Today heavy weight conventionally produced snow is favoured for the preparation of ski runs. DG snow allows a sophisticated use of classified qualities of technically produced snow. New tourist products- like skiing in fluffy snow- become possible. Where the light fluffy snow is acceptable larger areas could be covered with the same amount of water consumption. Funparks like shown in Fig.3 can offer more and saver options by using the light snow. Gradually we expect DG snow to overtake larger shares in the snow making business and the ways of preparing ski runs may be changed in the future. Further inventions in winter tourism infrastructure may be triggered.

Resources: Water is a crucial resource and can be lost by the transportation to the snowmaking device or by forcing a performance at not optimal conditions. In conventional snow production, additionally a considerable amount of water, up to 30%, is lost due to evaporation into the environment. Alternatively when using the DG most of this amount remains in the snow making device. Because the DG snow is less dense, further water savings are possible as it is unlikely that similar densities will be achieved by compressing the DG snow. Water savings reduce the energy requirements to transport the water to the snow making devices. An artificial pond for snow making is shown in Fig.4. Less storing capacity for water is needed when DG technology is used.

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contact:
meinhard.breiling@tuwien.ac.at
www.ttl.tuwien.ac.at