

Mass production of snow crystals under varying ambient conditions

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After finalizing the laboratory trials with artificial production of dendritic snow crystals under regulated environmental conditions, for the first time an outdoor cloud chamber is used in winter 2014/15 to create large numbers of ice crystals of different shape. The cloud chamber consists of a balloon-like structure with a volume of about 20 cubic meters. It is placed in the ski resort of Obergurgl-Hochgurgl (AUT, Tyrol) at an altitude of 2100 m a.s.l. Water is atomized and injected into the cloud chamber by one- or two-phase nozzles. Despite the use of industrial nozzles, the droplet sizes (size distribution) are not fully known. Tests have indicated that smaller droplets are more likely to evaporate faster and therefore allow the formation of purely vapour-grown ice crystals. A short pulse of pressurized air triggers nucleation. Measurements of temperature (along a vertical profile inside the cloud chamber; ambient temperature) and ambient relative humidity as well as air- and water pressure are available for each test. According to the ambient sub-zero conditions the quantity and shape of ice crystals changes. Ice crystals are extracted directly from the cloud chamber and the density of the deposited snow is measured. Tests have produced Graupel-like structures as well as classical dendritic ice crystals. Thus, the field tests shows that a continuous process of fog injection, nucleation and ice crystal growth is possible and can be explored for different industrial application, e.g. the use in wind tunnels or winter sports.