

The end of weather shooting

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Several times I got in the past two years inquiries on the progress and results of weather shooting. Because recently these were repeated, I will answer them below. I will begin from the state of the art at the time of the international conference of experts on weather shooting at Graz in 1902. On this I have reported at length in the Appendix of the report on this conference (see Annual Report over 1902 of the Royal Central Meteorological Institute in Vienna) and have stated the main result of this conference as follows: "The first result of the expert conference in Graz is that in the opinion of the experts the effectivity of weather shooting is not only dubious -- as voiced by a serious majority of expert opinions -- but, when all conditions and reservations of the opinions are considered, looks very dubious, even improbable." After this decisive important conference of experts in July 1902, further proof has been looked for by execution of orderly correct shooting, as in particular is done at official shooting locations. There were just two of these shooting locations -- one in Austria, in the home of weather shooting in Styria, in Windisch-Feistritz, and the other one in Italy, at the beginning in Conegliano, then from 1902 onwards in Castel-franco Veneto. Now I will tell the results of these two trial shooting locations, exemplary both in setup and in shooting organization.

The degree of success of the Austrian shooting location was subject to precise and intensive control by our Styrian thunderstorm researcher Prof. Prohaska, whose outstanding scientific reputation guarantees the reliability of his results. In his report ⁽¹⁾ to the Ministry of Agriculture on the effect of shooting in Styria and Krain in 1904 prof. Prohaska says :

"The year 1904 has tested the weather shooting in Styria severely with much hail, and it can not be said that this test has come out in favor of shooting. Primarily this applies to the shooting location Windisch-Feistritz, where grave hail damages were recorded. If we pass over 23 April, on which day the shooting may not yet have worked perfectly, then still the failures of shooting on 23 May and 3 July cannot be ignored. On the first one of these days the thunderstorm extended itself over the shooting area from SW to NE, and it was seen that the hailfall, which at the outset was light, gained intensity while passing over the grid of shooting stations, and had the largest effect in the NE third which was reached last. If the Tainach area at the SE corner, where the thunderstorm began, had been hit harder and if the Oberpulgau had been hit less, then this case had led to a less negative judgement on the effectivity of shooting. Moreover reference to the fact, that mainly the periphery and not the center of the region has suffered, cannot diminish the failure when considering the direction of the thunderstorm path.

While on 23 May the shooting region had lain under a hailswath, on 3 July just a local hailfall occurred, which showed no clear expansion. Again the NE part of the shooting grid, next to the Oberpulgau, was struck; hailstones fell in sizes of hazelnuts and of chicken eggs, about two-thirds of the hoped-for harvest was lost."

It is certain that shooting has been executed timely and according to the instructions in the entire shooting area of Windisch-Feistritz. With reference to the mentioned part of Oberpulgau this has been confirmed emphatically by the local thunderstorm observer, the teacher J. Sabati ⁽²⁾.

But not only the occurrences in the official Austrian shooting location decide against weather shooting, also in the Italian governmental shooting areas the facts testified against weather shooting.

The Italian shooting location in Castel-franco is probably the most authoritative, first, while it is about one-and-a-half the size of the Austrian one in Windisch-Feistritz and cannons are placed at twice the Austrian density, and second, because it is led and controlled by a scientific professional, dr. Pochettino. He wrote me about this at the end of 1904:

"So this was the last year of weather shooting experiments in Castel-franco. For we have two convincing decisive cases. On 23 May, in spite of correct shooting, hail struck the southerly part of the defended area; no usefulness of shooting was shown. On the contrary, on 12 July hail fell at the border of our area, while the defended area remained hailfree, though on this particular day no shot was fired. Because of such results the government has stopped further experiments with hail cannons, and only some experiments with rocket and bombs are still planned."

Because also the Austrian government has ended the support of the Windisch-Feistritz shooting grid after getting the report of Prof. Prohaska (3), the weather shooting which Stiger had started in 1897 was really in 1904 officially at its end, both in Italy and in Austria.

In France, to which weather shooting in the way of Stiger had been extended, it lasted a bit longer. There no strict methods of control and scientific experiments were installed, and therefore the trials there are of little value, and publications of French results are such, that they offer no decision and can well be read in a negative way. Because Windisch-Feistritz and Castel-franco gave undoubtable proofs against the usefulness of weather shooting, the vagueness showing in the French reports supports the Austrian and Italian results.

However, in France a different method to fight hail was extensively practised: firing rockets which explode at great height. Shortly after Stiger's method began, this way of defense against hail has shown up up almost everywhere, so that it would be difficult to link it to any particular name. By Vidal in particular this method was spread in France. Soon about the effect of rockets the same marvellous things were "seen" and told, which so far had been attributed to Stiger's cannons. That raised caution, and because individual trials did not work out satisfactorily, the method of shooting rockets against hail (bombs were added) attained no widespread application. Still a serious investigation of the effect of this shooting on hail was missing, and we can be grateful to the Italian government that they also instigated such experiments in the same exact and deciding manner.

According to the reporting by Senator and Roman Professor of Physics P. Blaserna -- who had been trusted by the government with organizing the whole program of weather shooting with Stiger's cannons and with rockets and bombs and also with leading and controlling the experiments -- the last experiments (with exploding rockets) also did not show any effectivity against hail, and therefore modern weather shooting is shown to be useless and worthless -- a pity ! Blaserna has made public in a communication of the Royal Accademia dei Lincei in Rome (Italian Academy of Science), session 7 December 1906, this unfortunately entirely negative result of shooting at hail, be it with hail cannons of any type, or with rockets and bomb systems. This communication of the scientist, who led and controlled the largest research projects on the matter of weather shooting in a solid scientific way, seems to me by far the most important item which was published on weather shooting, and I think that I should present it here in its entirety, because without any doubt it signifies the end of weather shooting. It reads as follows:

"In the year 1902 I was made President of the Commission, to which was charged with the study of the effect of weather shooting. A region had to be chosen which was struck often by the scourge of hail, and to find out if and to what extent it could be hoped to find help against the destructive effects of hail.

Various offers were made to the government by regions which were plagued by hail; the Commission chose Castel-franco Veneto, which in the two past years had suffered much from hail. This concerned a region of more than 6000 hectare, which could be extensively armored and cared for with the means allowed by the government and offered by the local consortium.

The program of the Commission was very simple: choose a region, which probably will be struck by hail, and arm it with the best weather cannons produced by industry; place the cannons at half the interspace required by the defenders of weather shooting, and apply the shooting with the largest possible generosity. If in spite of this massive application of all resources one will not be able to allay the disastrous danger, then it can no longer be conceded to assume that weather shooting works.

According to this program 200 weather cannons were installed of the best existing type, made by the company Carl Greinitz Neffen, with a 4 m high funnel and loaded with 180 g gunpowder. Later, when the cannons loaded with acetylene became fashionable, also 22 cannons of that type were installed, made by the company Maggiore in Padua; among these was a giant one with a 14 m funnel.

This entire arrangement and the organisation of the experiment by the Commission was highly praised by the International Conference of Experts on Weather Shooting in Graz. But the experiments, led by Prof. Pochettino and executed by selected numerous staff, produced no particularly favourable result for weather shooting. As I already had to state at the Conference in Graz, the areas most struck by hail were those armed with the best cannons; less damage was suffered by those which were provided with small cannons, and the undefended areas remained free of hail. This was quite the opposite from what could be expected. Obviously one did not want to end the matter with a single case, and therefore the experiments were continued in 1903 and 1904, but with the same negative results.

Meanwhile the great enthusiasm, with which our country had accepted the idea of weather shooting, had quickly disappeared and had even changed into enmity. At the end of 1904 I could say without exaggeration that I was the only one still active in weather shooting, though I was about the only one who had stated to have no confidence in weather shooting. The parliament became more and more opposed to the continuation of weather shooting, but I thank the Ministry for the statement that scientific experiments should be finished calmly, seriously and in an exhaustive manner, so that one would not have to revisit the same problem after some years.

However, it would have been really an exaggeration if I had insisted to go on in the same way after 1904; the country did not support it any more, and only France still stuck to weather shooting. At the end, the issue of weather shooting looks like a large wave, generated in Styria in Austria, flooding all Italy and flowing out into France, where it still exists but already with clear indications of petering out. For us it can already be seen as a solved problem.

But apart from the so-called weather cannons also other related forms of fighting hailfall came into being and deserved careful research. Especially in France the effectivity of rockets was much praised. Our Commission undertook the task to investigate those, wherever they came from. Nearly all appeared to be ineffective right from the outset, like firework. They did not mount higher than 200 to 300 m and obviously could not influence the hail clouds. However, the company Aulagne at Montreux provided us with rockets of better construction, which reached heights of 900 to 1200 m; therefore they could be exploded inside hail clouds. But here too the effect was zero.

With respect to the ineffectivity of this rocket the objection could be raised that it could be due to the small mass of explosive material. Therefore I addressed the Minister of War with the request if he could have investigated the manufacture of a paper bomb weighing 5 to 10 kg, which

could be hurtled into the clouds up to a height of 1000 m. The Minister thought he should not support my proposal. However, he made for the Commission a smooth-bore cannon available, for which the outstanding pyrotechnician Mr. Marazzi in Rome made bombs weighing 8 kg, which easily could be propelled upwards to 800 m and higher.

In 1906 a noisy campaign was started to investigate also this last hope. They fired 250 rockets of the Aulagne type and 60 Marazzi bombs upward; again the effectivity was zero.

Clouds, and hail clouds too, are nothing else but fog, and are not influenced even by the explosion of an 8 kg bomb. In this way we reached the final conclusion, that this last remedy to fight the scourge of hail is ineffective too, and with a sober mind and full conviction I could propose to the Minister to decide that this period of experiments should be finished.

I do not want to miss the opportunity to thank in public my assistant dr. Pochettino who, with support of dr. Pacini, has executed the experiments with great tenacity and insight in a conclusive manner. Detailed reports will be published by the Ministry of Agriculture. Simultaneously I take the opportunity to thank effusely the Ministry that it has placed the means for these experiments at my disposal.

The final result of the entire campaign against hail, which has lasted five years, is fully negative. It would have been more pleasant if we had reached the point that we could place at the disposal of Italian agriculture an effective remedy against one of its huge enemies. But though this result is negative, at least it gives the consolation that we are now in the situation to inform people that this road we have taken is hopeless, and that one should ward off the effects of this scourge by quite different means."

So far Blaserna. Maybe never before a popular and widespread practice was investigated by science so thoroughly and exactly, so unbiasedly and tenaciously as modern weather shooting, born in our province of Styria and there also investigated seriously initially. In St. Katharina a.d. Lamming the company Carl Greinitz Neffen ⁽⁴⁾ began the first experimental research in 1899, and there too the first scientifically exact and critically correct experiments were made on the distance reached by the vortex rings and their effect. Austria also has organized the large international Expert Conference in Graz, and its proceedings have made the questions clear. In Windisch-Feistritz the first large governmentally supported experimental location for weather shooting, equipped in an optimal manner, was put into operation and correctly managed until the end of 1904. In Italy the size of the experimental areas, available means and duration of research was even larger than in Austria. Both countries could state in 1904, based on exact research, that the modern weather cannons are ineffective. Italy also has investigated the newest method to fight hail, use of rockets and bombs, in a rigorous manner to the end, and this too must now be declared ineffective.

By this now this matter is finished for the scientific sphere, but also for all objectively thinking persons in agriculture. Based on the failures in Windisch-Feistritz and Castel-franco, and also on the unsuccessfulness of rockets and bombs shown by the experiments in Italy, we are justified to say: with this the end of weather shooting has been sealed ⁽⁵⁾.

Notes:

(1) These reports have been published under the authority of the Royal Ministry of Agriculture, based on the information from 600 thunderstorm- and hail-observing stations in Styria, Kärnten and Krain. Here I only mention those from the weather shooting area of Windisch-Feistritz, which was set up and organized according to the stiff rules of the Expert Conference in Graz, because only hail damages which happened there are useful for proving matters.

(2) In a letter to me of 23 April 1905, on the occasion of sending his official report on the shooting period of 1904 to the Ministry of Agriculture, Prof. Prohaska says: "Of the fact that also in the official shooting region

Windisch-Feistritz two extensive cases of hail damage occurred I only became aware from the hail lists of Oberpulsgau; I then corresponded with the reporter, and without doubt we have here an effectivity failure of the shooting. Such matter of course is never published in the newspaper !" Also the official chief of the shooting there, lieutenant Konschek, mentions interesting details on these hailfalls in Windisch-Feistritz, and on the difficulties made for him because he objected to concealment.

(3) Because the decision of the Austrian Ministry of Agriculture was published in June 1906, actually the end of this shooting was shifted to the fall of 1906.

(4) The merits and cooperation of the chief of the large Greinitz company, Hans Dettelbach, and the devotion, perseverance and hability of the company's deputy, Gustav Suschnig, cannot sufficiently be lauded here, while by these our investigations became possible.

(5) Certainly there will in future still be people who in spite of everything will seek salvation in weather shooting. Science is entitled to leave them to their illusions; for us the matter is closed.

Prof. Pernter was organizer of the conference at Graz, Austria, in July 1902.

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