



Falling Ice Blocks from Sky – A Case Study

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Abstract- There are a large number of reports and documented proof from all around the world that huge blocks of ice are falling from the sky. These are called as megacryometeor. The burning question is from where do these come? Under what conditions are these formed? These questions have been addressed by many researchers. The historical record of ice falls indicates that these cases were very rare in the pre-aircraft invention era. The frequency of megacryometeor hitting the earth suddenly increased in the post aircrafts invention era. These environmental problems may be either natural or due to direct/indirect interference of technological problems. An in-depth analysis of these events as a whole indicates that different types of ice falls correspond to different extra-terrestrial/ terrestrial formation scenarios. These can also be attributed to aircraft icing which occurs when super-cooled water droplets strike an aircraft whose temperature is colder than 0°C. Consequently, it is necessary to investigate case specific differentiation criteria which include compositional characterization of the ice. Practically such cases have been reported from Australia, Canada, India, Italy, Japan, Mexico, New Zealand, South Africa, Netherlands, UK and USA.

A similar incident of blue green colored ice fall was reported in the National Capital Territory of Delhi, India (28°31'02"N Latitude and 77°27'11"E Longitude). The sample of the same were collected and analyzed. The results show that it has been formed by wastewater from aircraft lavatories. Further the site where the ice blocks have fallen is located below the air route also categorizes the present case as an aviation problem.

Keywords: Blue ice, aircraft icing, megacryometeor, landing path etc.

Introduction

There are a large number of reports and documented proof from all around the world that huge blocks of ice “the megacryometeors” (MCM) are falling from the sky. Some observers believe these to be extraterrestrial, some classify them as meteorological ice while some other speculates these ice chunks to be falling from aircraft. The process that creates MCM is not fully understood, mainly in relation with the atmospheric dynamics necessary to produce them.

Review

The records indicate that the phenomenon of falling of MCM was observed even prior to the invention of aircraft^[3] but its frequency was less. These may have a similar mechanism of formation to that produces hailstones^[1]. In addition, MCM display textural variations of the ice and hydro-chemical and isotopic heterogeneity, which evidence a complex formation process in the atmosphere^{[6] [7] [8]}. Studies indicate that fluctuations in troposphere associated

with hydration of the lower stratosphere and stratospheric cooling, can be related with their formation^[6]. Detailed micro-Raman spectroscopic study made it possible to place the formation of the MCM within a particular range of temperatures (–10 to –20 °C)^[2].

Analysis of the Problem

If the origin of these MCM is extraterrestrial, the ice would evaporate quickly from the heat of entry into the upper atmosphere at the very high speeds that are attained by an object falling to the earth.

There is no possible way for a large block of ice to form in a clear atmosphere. Large hailstones can only form in intense thunderstorms that contain supersaturated air. It should have high uplift speeds which can keep the hail suspended long enough to collect a large amount of frozen water on its surface.

The frequency of MCM hitting the earth suddenly increased in the post aircrafts invention era. Further

geographical investigations of the sites of such events indicate that most of these cases have occurred in the vicinity of the travel path of the aircrafts which clearly categorizes it as an aviation problem. These MCM are sometimes contaminated from waste water from the toilet. Distinct blue color which matches the color of liquid toilet disinfectant indicates the aircrafts as their source. These MCM could have been built up on the outside of planes that were not protected by deicing equipment.

The aircraft being the possible reason for these MCM was generally denied because at the time these hit the earth no aircraft was observed in the sky. For a large irregular block of ice, a terminal fall speed of about 200 km/hr can be assumed. For an assumed altitude of 10 km the MCM will fall for three minutes before reaching the surface. An aircraft traveling at an average speed of 900 km/hr would have covered about 4.5 km distance during this time. This is the reason why aircraft are not observed after an ice fall as the aircraft has already traveled outside of the viewer's range of sight.

Monitoring these MCM events is important as these can not only be a potential natural hazard but also signals of more serious environmental problems. Recently a similar incident of blue green colored ice fall was reported in the National Capital Territory of Delhi, India (28°31'02"N Latitude and 77°27'11"E Longitude). The samples of the same were collected for assessing its chemical characteristics.

Laboratory Analysis of Blue Green Ice sample

The blue green ice sample was analyzed for color, odour, density, boiling point, conductivity in $\mu\text{mhos/cm}$, pH value, suspended solids, organic matter, inorganic matter, calcium, magnesium, sodium, potassium, chloride, sulphate and trace metals like Cu, Ni, Cr, Mn, Zn. The analysis was carried out as per the standard analytical procedure laid down in IS: 3025-1986 "Methods of Sampling and Test (Physical and Chemical) for Water used in the Industry" [5]. Wherever necessary, reference was also made to the procedure laid down in Standard Methods for the Examination of Water and Waste Water" published by American Public Health Association and Water Pollution Control Federation, USA, 1985[4]. The results of these tests are presented in Table 1.

Results

Physical examination

The value of boiling point, conductivity and total soluble salts are found to be 82 °C, 1937 $\mu\text{mhos/cm}$ and 775 mg/lit respectively. Low boiling point, lower value of total soluble salts and higher value of conductivity indicate the presence of volatile matter in the sample. The sample has a typical odour of commonly used blue colored lavatory disinfectant.

Chemical analysis

The sample solution is slightly alkaline in nature (pH 8.66). It is seen that the chloride ion is predominant ion in the sample (360 ppm). Trace elements except copper and zinc, that too in negligible amount is absent.

Discussion

Blue ice is formed by leaks in commercial aircraft lavatory waste tanks that freezes into ice at high altitude. It is the frozen bio-waste material and commonly used blue colored liquid disinfectant. During the descent of the aircraft at the time of landing the mass warms sufficiently to detach from the plane. There are several documented incidents of blue ice fall in the United States in the recent past. A number of such cases have also been reported in India. Some of these which happened since January 2010 are listed as News Report^[10] in Table 2.

Conclusion

The leakage of bio-wastes and blue colored liquid disinfectant from the waste tanks of a commercial aircraft freezes into lumps of blue ice when the aircraft is at high altitude. During landing due to increase in temperature of aircraft body these lumps get detached and fall on air route/landing path of aircraft. Based on physical and chemical examination of the sample of blue ice sample, it appears to be frozen bio-waste mixed with commonly used blue colored liquid disinfectant material.

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Table 1: Results of Physical and Chemical Tests on the Ice Pieces^[9]

S. No.	Name of parameters	Value
1	Colour	Bluish Green
2	Odour	Typical Blue coloured Lavatory Disinfectant like.
3	Boiling point, °C	82
4	Density, gm/cc	1.01
5	Conductivity in μ mhos/cm	1937
6	pH	8.662
7	Suspended Solids, mg/lit	489
8	Total Soluble Salts, mg/lit	775
9	Organic Solids, mg/lit	272.4
10	Inorganic Solids, mg/lit	502.6
11	Calcium, mg/lit	40
12	Magnesium, mg/lit	12
13	Sodium, mg/lit	67
14	Potassium, mg/lit	59.5
15	Chloride, mg/lit	360
16	Sulphate, mg/lit	0
17	Copper, mg/lit	0.04
18	Manganese, mg/lit	0
19	Nickel, mg/lit	0
20	Chromium, mg/lit	0
21	Zinc, mg/lit	0.148

Table 2: Details of a few cases of Ice Fall in India since January 2010 ^[10]

S. No	Date & Time	Place Details	Latitude	Longitude	Colour & Description of Ice	Location of the site with possible link to nearby Air-Routes
1	31.01.2010 at around 1415 Hrs.	Mongshangei Maning Leika area in Imphal	24°46'06"N	93°55'23"E.	A block of ice Blue in colour weighing about 5 Kgs On melting it turned into bluish liquid with strange smell.	The place is located just 1.5 Km away from Imphal Airport..
2	15.08.2010 (Sunday) 0830 Hrs	Near Village Padampur Kharsanwan Jharkhand	22°45'56"N	85°48'03"E	Huge block of Ice weighing about 30 Kgs.	Place is located on the approach path on Air Route at a distance of 272 Kms from Kolkata
3	20-08- 2010	Jashpur	2°50'33"N	83°49'30"E	A Huge block of Ice weighing about 100 Kgs.	Place is located below Air Route at a distance of 215 Kms from Kolkata
4	01-10- 2010	Village Khudia ka Bas, Village Haripura, Distt. Pilani Rajasthan	28°20'19"N	75°36'06"E	3 lumps of ice weighing 5 to 25 Kgs. Colour White and taste salty.	Place lies at 249 Kms from Delhi Airport close to Air route, where International Flights are operating.
5	03.10.2010	Village Tetvali, Ratnagiri, Maharashtra	17°43'41"N	73°17'27"E	lump of ice weighing about 50 Kgs. Colour was dirty.	Place lies on Mumbai-Goa Route at 265 Kms from Goa Airport
6	08.10.2010	Village. Borana, Surendranagar Gujarat	22°30'29"N	71°50'21"E	Lumps of Ice bluish in colour fell on the house of one of the residents.	Place lies at 145 Kms from Ahmedabad Airport on Air route. International Flights operate on this route.
7	10.10.2010	Village Rampur, Lakhanpur Dist. Surguja	23°13'30"N	83°6'19"E	4 lumps of ice fell in different fields. One was reported as about 150 Kgs.	Place lies close to Air Route where International Flights operate. Possibility of fall during cruise.
8	11.11.2010	Near Village Sultana Ka Bas, Jhunjhnu, Rajasthan	28°07'48"N	75°36'47"E	2 lumps of ice weighing 5 to 25 Kgs..	Place lies close to Air route, where International Flights are operating.
9	19.12.2010	In Village Dandu about 20 Kms from Churu Rajasthan	28°18'30"N	75°08'26"E	2 lumps of ice weighing about 5 Kgs fell in two nearby fields. Colour not white but yellowish & dirty.	Place close to Air route where International Flights are operating.
10	06.01.2011	Village. Dariyabad, Morna Mujaffarnagar, UP	29°27'30"N	77°57'43"E	A lump of Ice 10-Kgs in weight	Place lies on Delhi-Dehradun Route at 130 Kms from Dehradun Airport
11	19.02.2011	Greater Noida, Suthyana	28°31'02"N	77°27'11"E	Green Colour, Smelly, a lump of about 6 Kgs.	In the approach Funnel about 40 Kms from IGI Airport
12	16.03.2011	Village Lohat, Badali Haryana	28°31'41"N	76°52'45"E	A huge lump of Ice about 50 Kgs in weight fell in a field.	Place lies at a distance of 21 Kms from IGI Airport (Delhi)