

A STATISTICAL STUDY OF BALL LIGHTNING EVENTS OBSERVED IN FRANCE BETWEEN 1994 AND 2011

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Abstract. *In this study we present data from 282 observations of ball lightning reported in Metropolitan France between February 1994 and September 2010. In order to present a coherent and homogeneous picture, witnesses from each of the sightings were interviewed and answered a standardized set of questions relating to the detailed physical characteristics of the observed phenomena. While there were some 350 sightings of ball lightning during that period, 68 of these were eliminated due to inconsistent or conflicting reports. Of the remaining 282 cases, 181 were observed from indoors; 94 from out in the open; there were 4 sightings reported from aircraft and 3 sightings from ships.*

1. Introduction

Ball lightning is perhaps the most mysterious of the naturally occurring electrical phenomena in the Earth's atmosphere. Even though the most recent experiments suggest a strong similarity to artificially generated electrical plasmas, and much will likely be learned during the coming years, it is difficult to understand the physical nature of ball lightning and its interaction with its surroundings, and one must guard against jumping to hasty conclusions.

This study, which focuses on observations of the behavior of ball lightning over a seventeen-year period, is one of the most comprehensive to-date, both in the number of episodes and the detail collected for each of them. In order to extract as accurate and complete a description as possible of each episode, a detailed questionnaire was developed with the aim of producing a quantitative summary of each of the sightings. In the majority of cases, witness statements were either recorded directly during interviews with laboratory personnel, or indirectly via written testimony. One thing is clear from all of the statements – every observer was deeply affected by having witnessed ball lightning first hand.

2. Survey data

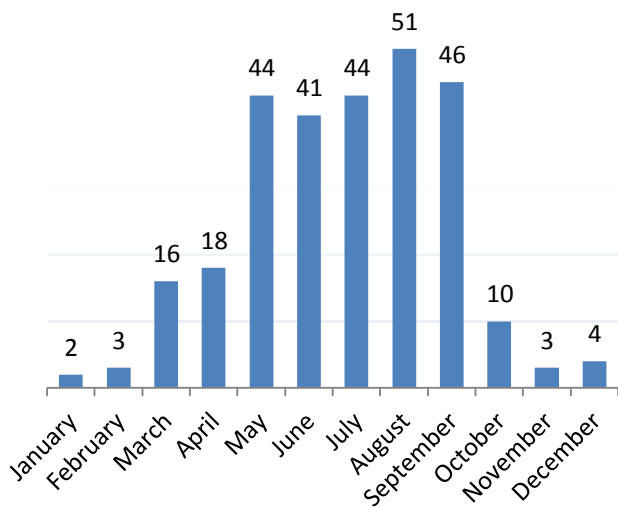
In order to more easily understand the data, we have divided them into several broad categories which help put the observations into context: time of year, time of day, weather, geographic location, and the location and number of observers of each event. We have also classified the physical characteristics of each of the sightings: dimensions, color, noise, smell, duration, distance traveled, height above ground, and the distance away from observer. We further divided each of these categories into those events that took place indoors, and those that occurred outside.

3. Conclusions

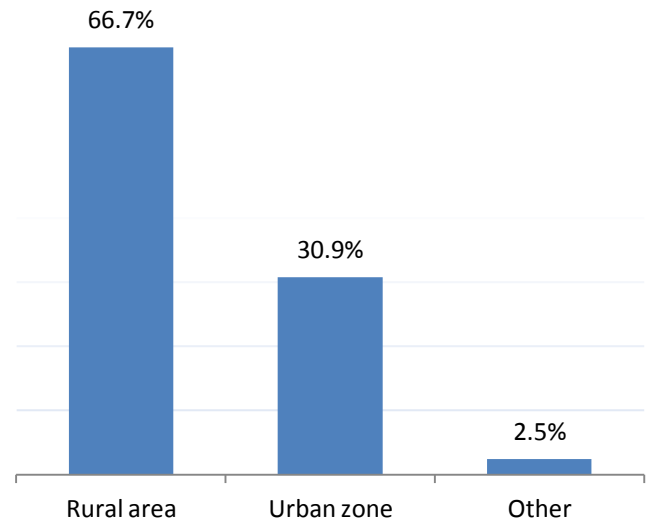
The results of this study underscore the large discrepancy between ball lightning events occurring indoors and those that take place in the open air. Data from this study will be included in the ©ORATLAS database. The files relating to each observation of ball lightning contain numerous details not reported here. We have included only those generalities to affect a reasonable comparison between events.

I – General statistics of ball lightning episodes

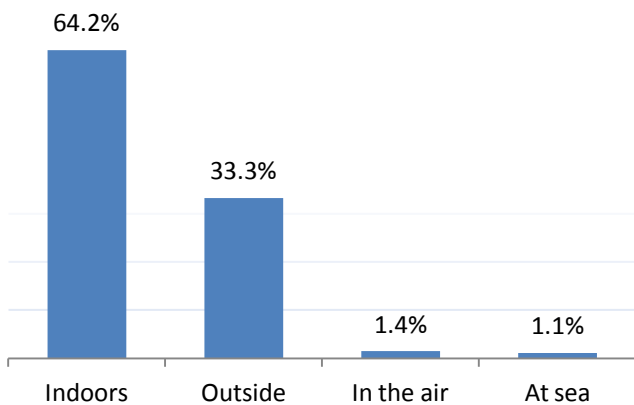
Distribution of ball lightning appearances throughout the year



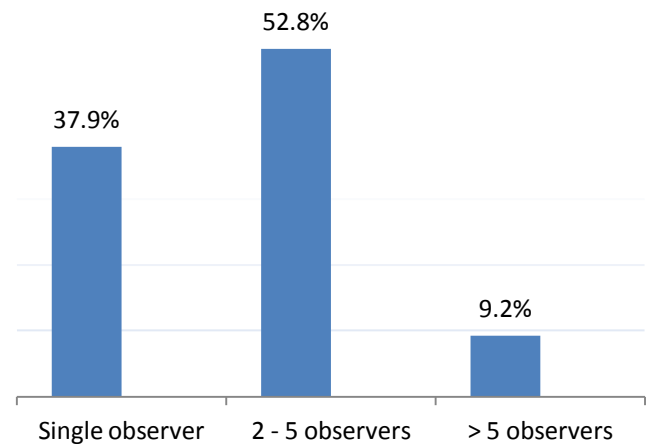
Geographical distribution of observations



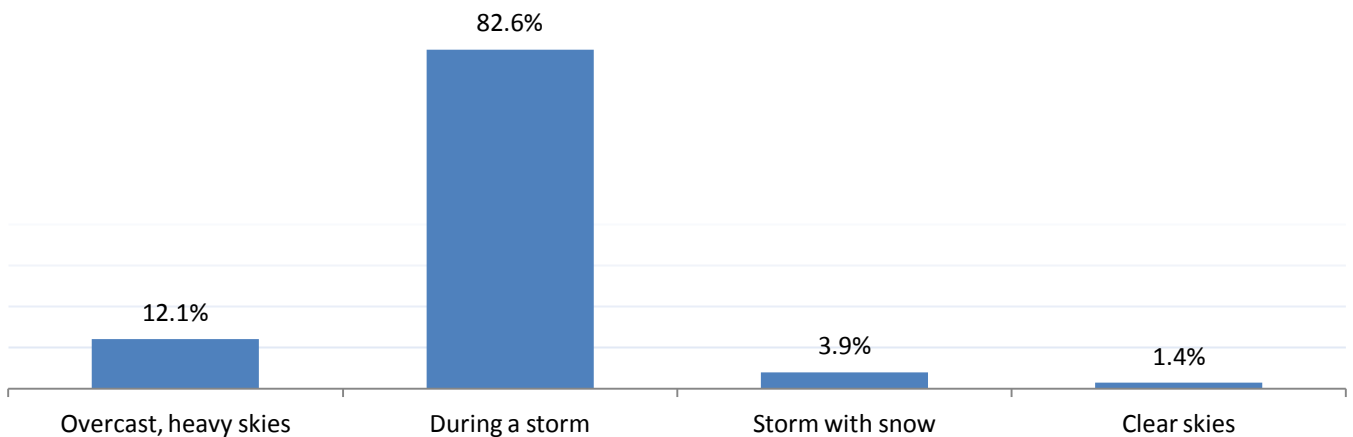
Observer location at time ball lightning appeared



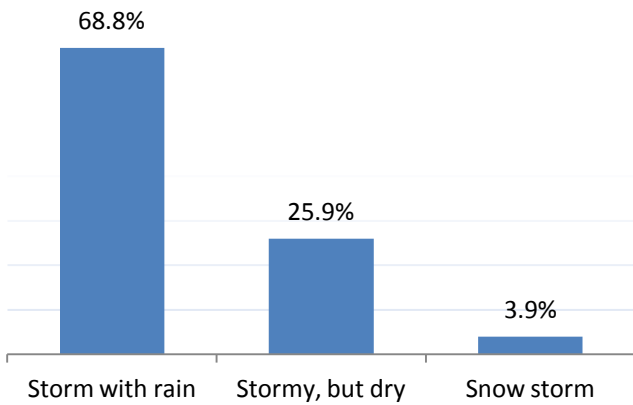
Number of witnesses per episode



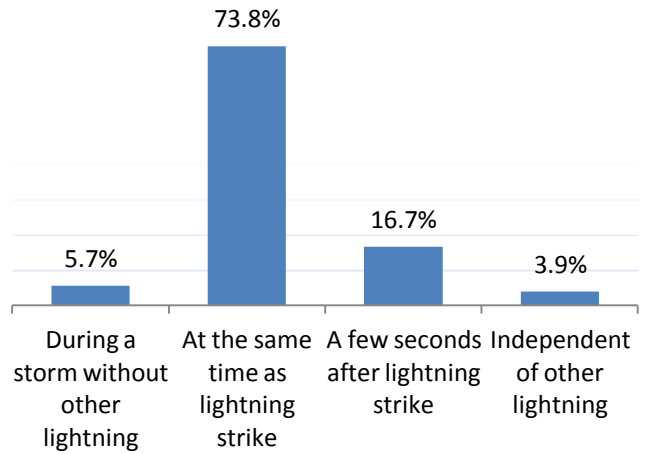
Meteorological conditions during ball lightning episode



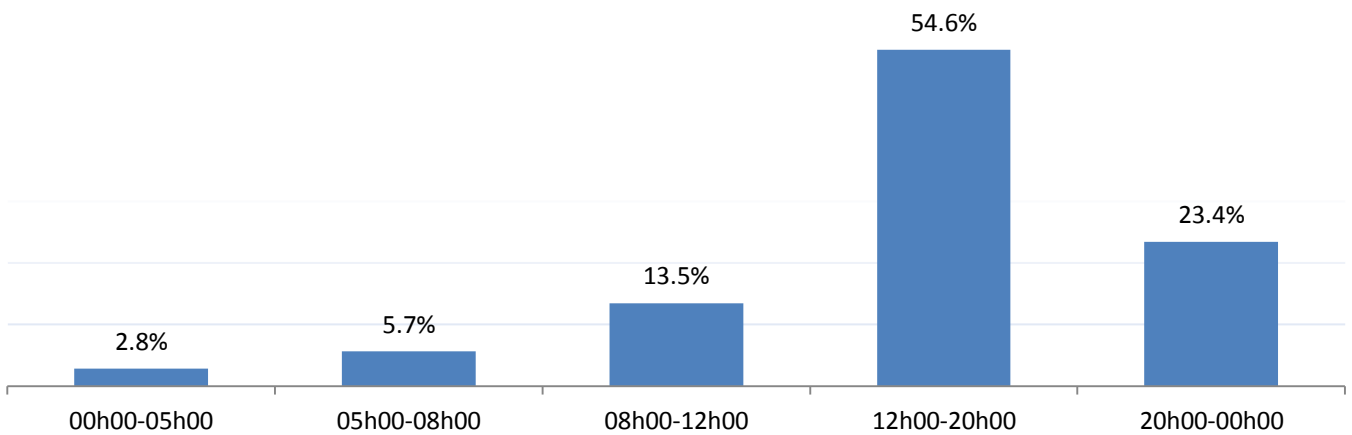
Characteristics of the storm during ball lightning episode



Time ball lightning appeared

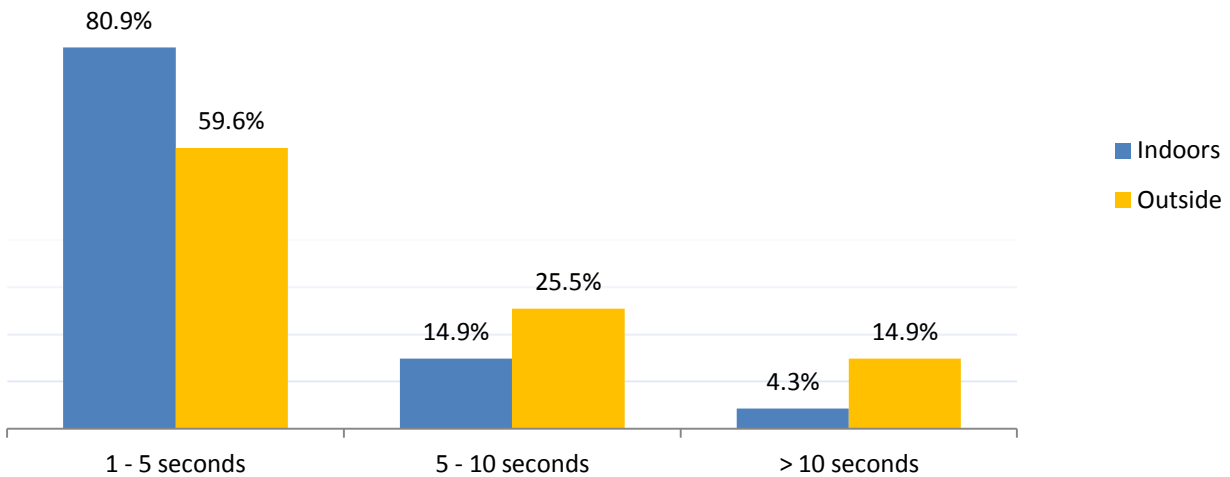


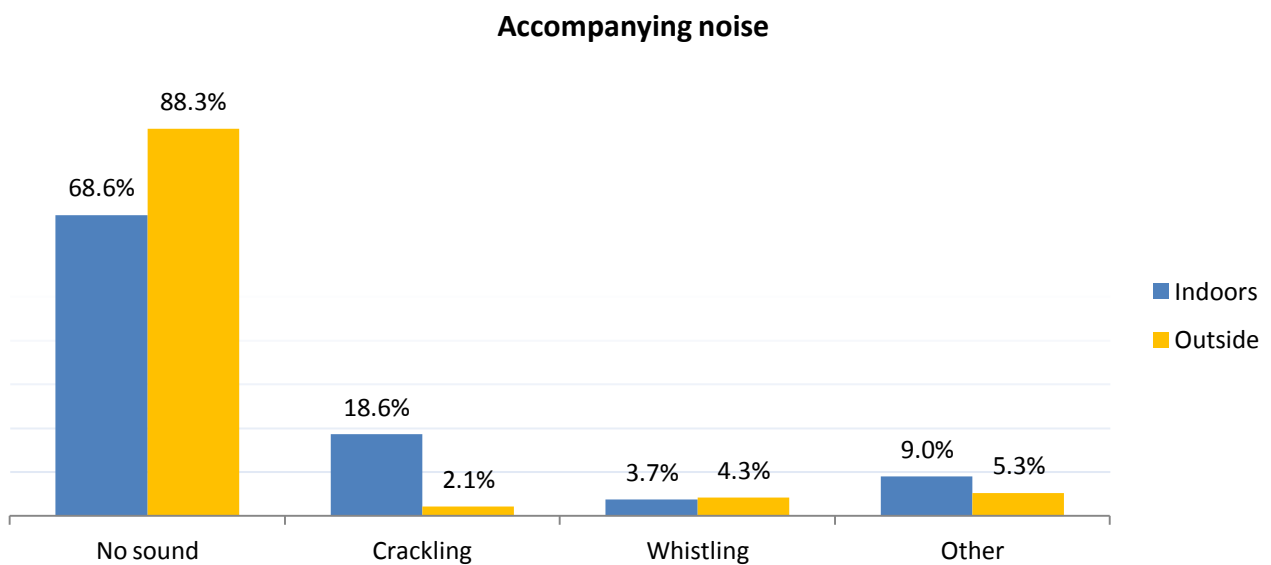
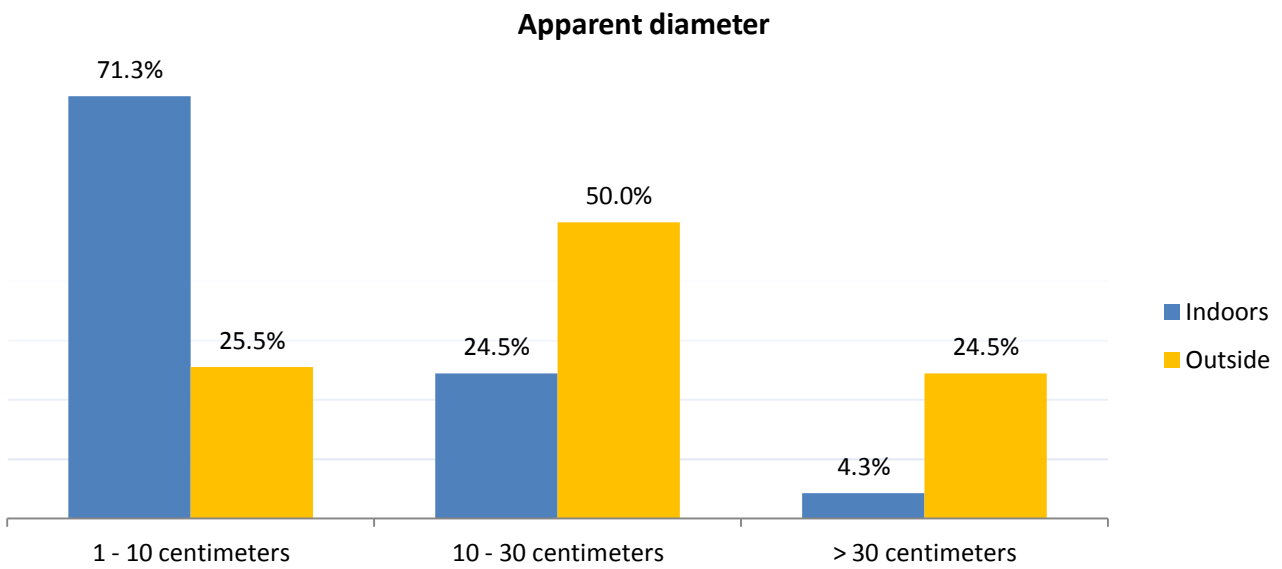
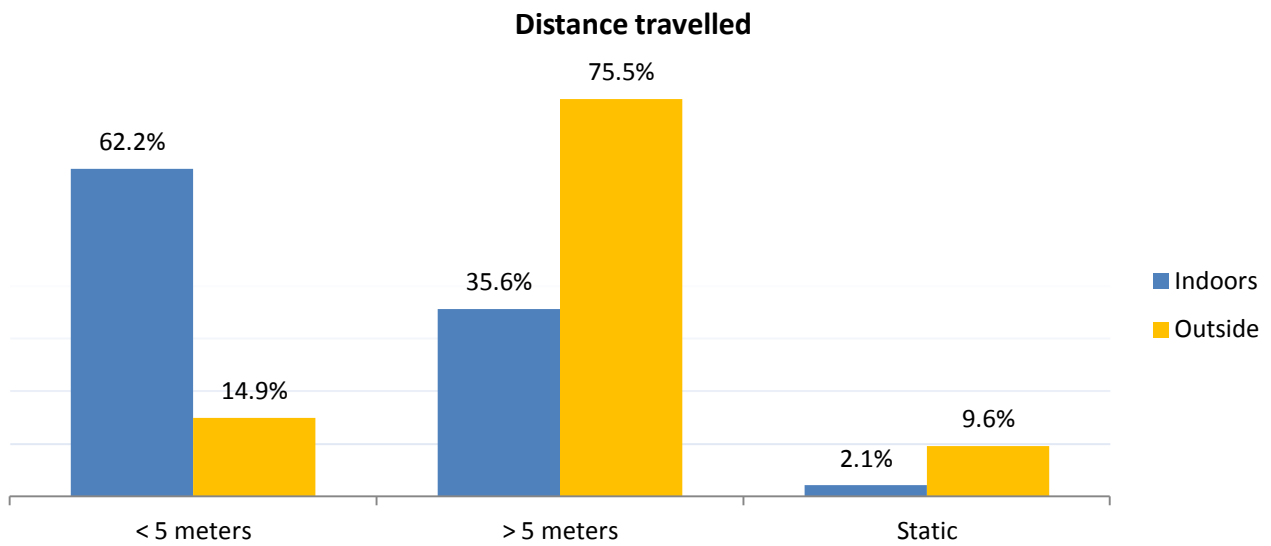
Time of day ball lightning occurred



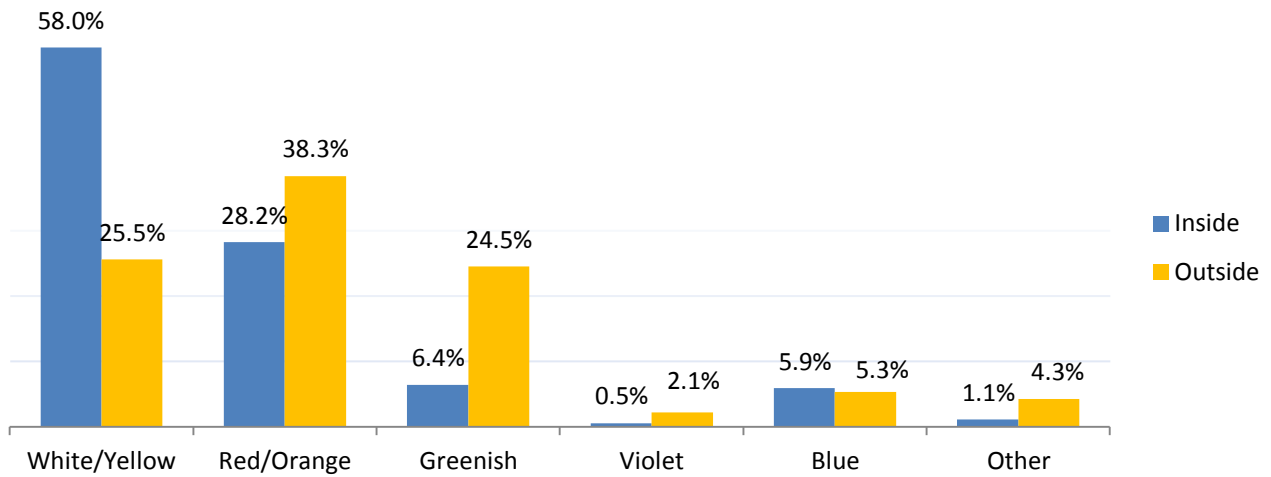
II – Physical characteristics of the ball lightning

Duration

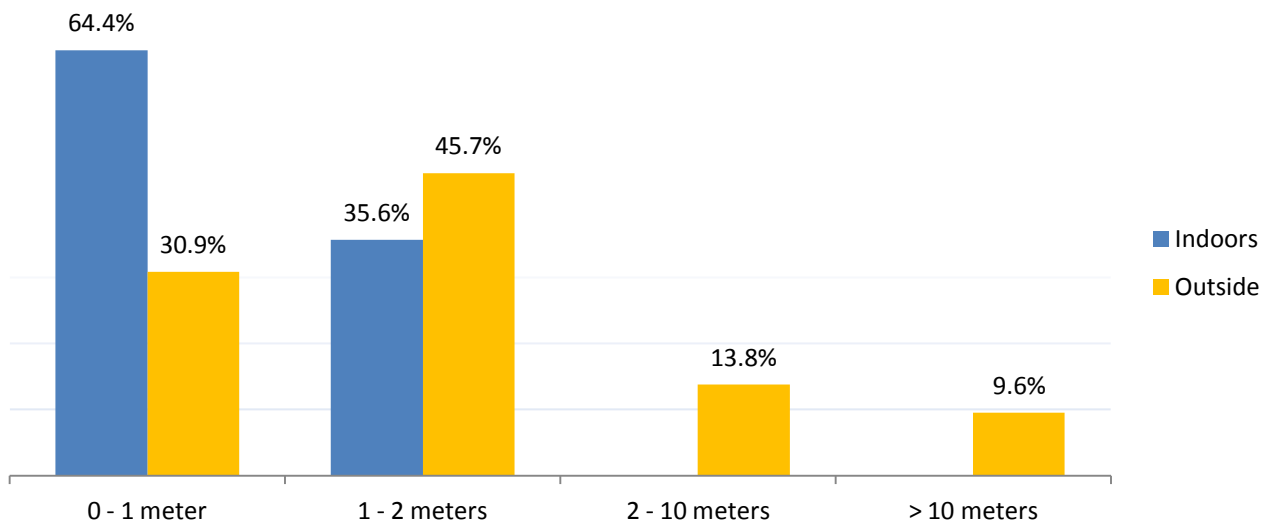




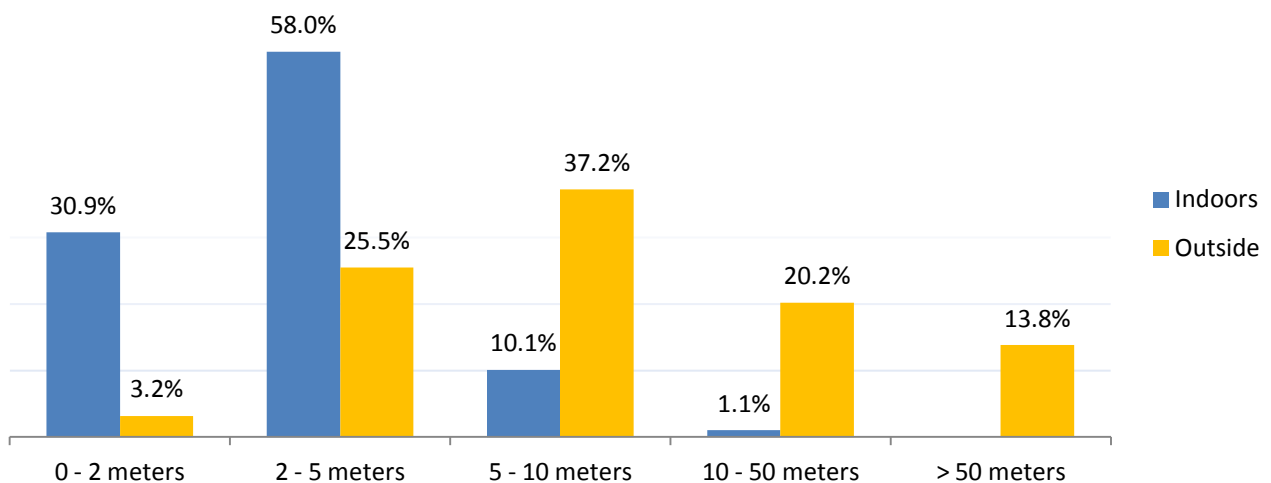
Color



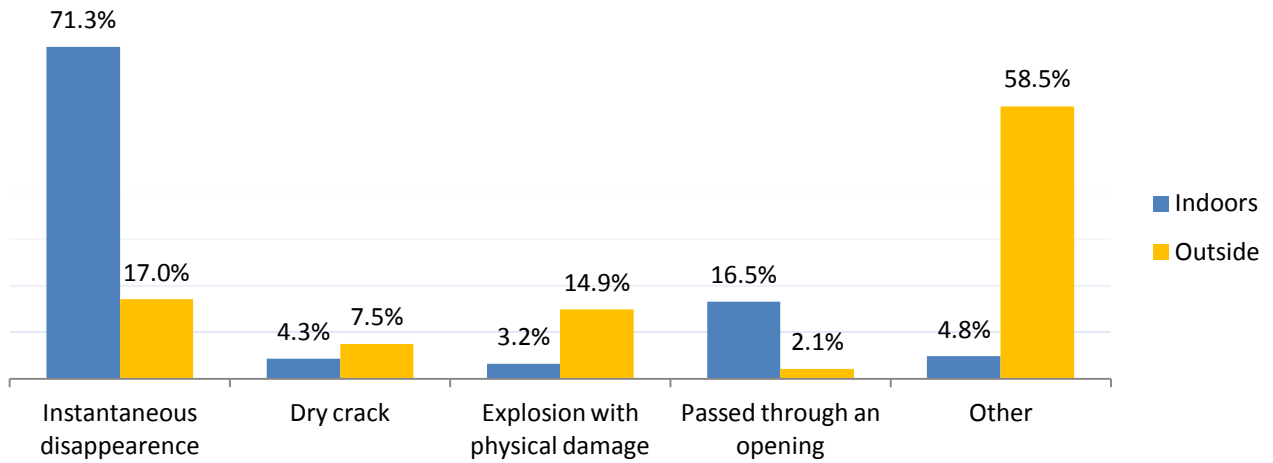
Height above ground level



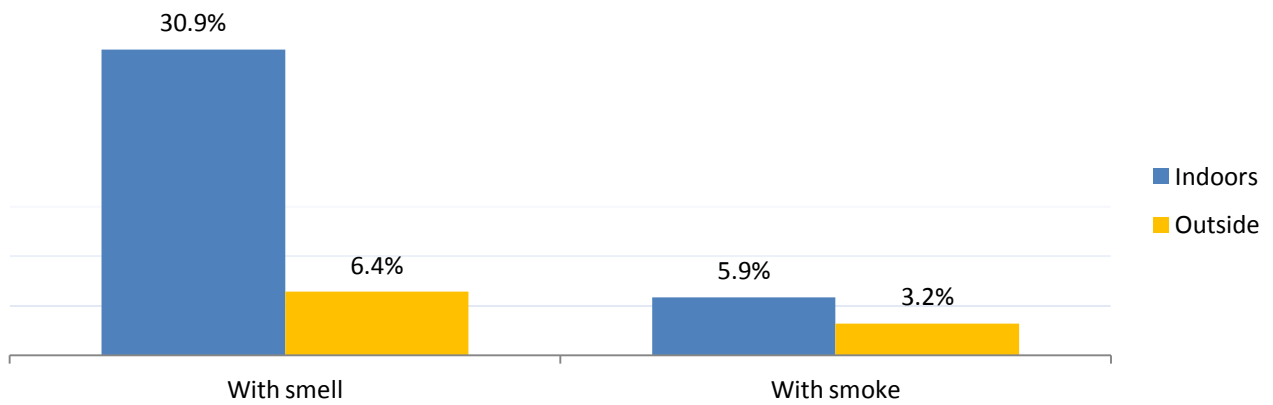
Separation between observer and ball lightning



How the ball lightning episode ended



With or without smoke or smell



Effect on observers

