

# The fireball of 21/09/2017: A study of eyewitness reports

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## Abstract

On September 21, 2017, a large fireball appeared over the Netherlands and vanished over the North Sea. Scores of eyewitness reports with descriptions of the phenomenon arrived through our notification e-mail address [feuerkugel@dlr.de](mailto:feuerkugel@dlr.de). By studying these reports, given with varying level of details, and by comparing them with other trusted sources we may appreciate how reliable and complete the reported data are. This might be helpful for us to improve our notification system in the future. Also, reports sometimes include information not easily obtained by other observing techniques. On the other hand, the reporting system is useful to promote public awareness of Earth in the environment of space.

## 1. Introduction

The Institute of Planetary Research of the German Aerospace Center (DLR) maintains the notification e-mail address [feuerkugel@dlr.de](mailto:feuerkugel@dlr.de) (“Feuerkugel” meaning fireball in German). Eyewitnesses of fireball events are encouraged to send us an e-mail with information on time and place as well as a rough description of the event. The more detailed the report, the easier is the identification of possible double observations of the meteor in the image data from the European Fireball Network (EN) [1]. We receive up to two dozens of reports on sporadic meteors every month. The corresponding guide is in German, therefore reports are almost exclusively from German-speaking countries. Additionally, we often receive requests to identify potential meteorites.

## 2. Fireball of 21/09/2017

In the evening hours of September 21, 2017, a large fireball appeared over the Netherlands and vanished over the North Sea. We received an unusually high

number of 79 witness reports from many parts of Germany. Most reports were sent from observers in the Rhine-Ruhr region close to the border to the Netherlands (Fig. 1). The reports varied greatly in quantity and quality of the given information. Locations from where reports were sent are highly biased by population density in the respective areas (note the reports from the heavily populated Rhine-Ruhr region) and local weather conditions. Also, many people enjoying outdoor activities at a still early night helped to increase the amount of potential eyewitnesses.

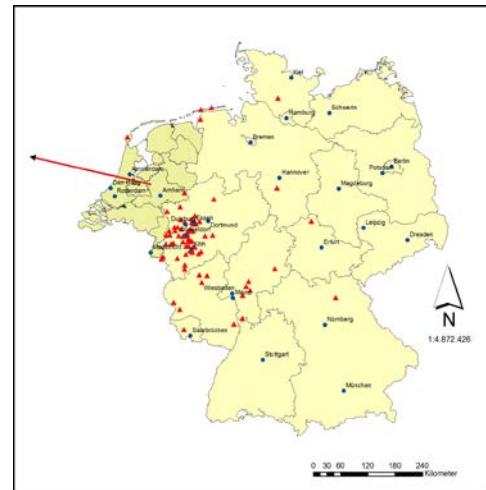


Fig. 1: Map of locations from where eyewitness reports from Germany and the Netherlands were received. The solid red line depicts the presumed location of the meteor given by [2].

## 3. Analysis

We have gathered the information given by the eyewitnesses and have analyzed the data in the following categories: time, duration, brightness, color, and flight direction.

Most reports put the fireball in a timeframe from 20:55 to 21:10 local time (CEST) (Fig. 2). Jörg Strunk's Mintron astro camera in Herford in North Rhine-Westphalia detected the fireball at 21:00:08 which agrees with the reports. EN station 40 in Kalldorf (North Rhine-Westphalia) also imaged the fireball, but due to the long exposure time the exact event time cannot be resolved.

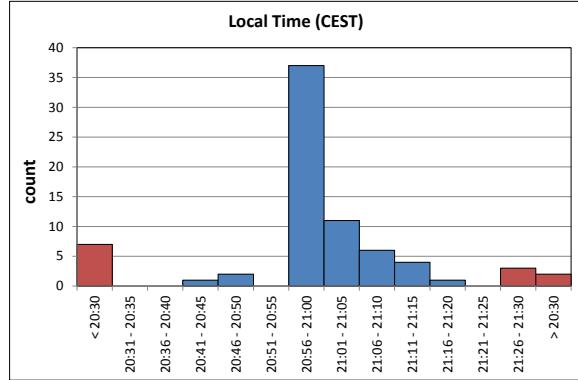


Fig. 2: Reported observation time (outliers in red).

The most mentioned colors were green/blue and white (Fig. 3). But other colors were also reported (red, orange, purple), possibly due to different flight phases of the meteor that had been observed by the individual witnesses.

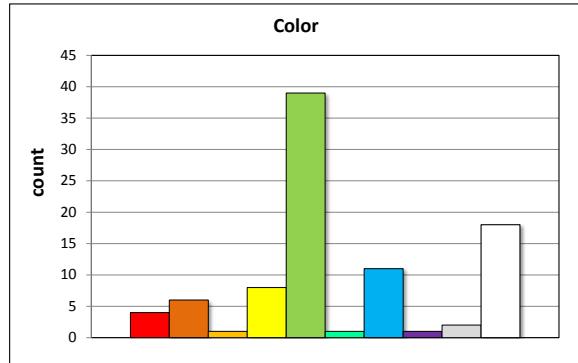


Fig. 3: Color reports.

Duration reports scatter a lot with a mean value of 3-4 seconds. An overwhelming majority reported a westward flight direction of the fireball (Fig. 4), which coincides with the analysis from [2]. The brightness has been described by comparing it to other bright light sources (planets, fireworks, flare guns etc.) or as just being “very bright”.

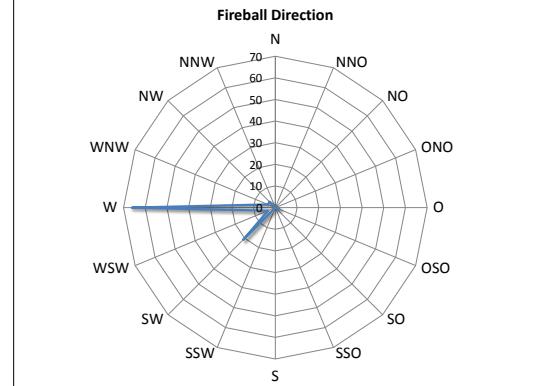


Fig. 4: Flight direction of the fireball.

## 4. Summary and Outlook

We have analyzed 79 eyewitness reports of a prominent fireball, observed on September 21, 2017. While the general flight direction was mainly described correctly, given information on color and duration of the event vary to a certain degree. An estimation of the meteor's magnitude from these reports alone is hardly possible. Also, the exact time of the event can only be determined with relatively low accuracy.

Later in 2017, another large fireball was reported by dozens of witnesses. We will analyze these reports and compare the results with the data from this work. In the future, these findings might help in overhauling the notification form to derive more reliable results from the witness reports.

We make attempts to respond to each observer report to address observers' questions and concerns. Such reporting system is useful to promote public excitement and awareness of Earth in space. We already noticed an increase of reports over the last years, maybe a result of our and our partner's ongoing public outreach work.

## References

- [1] Oberst, J., Molau, S., Heinlein, D., Gritzner, C., Schindler, M., Spurny, P., Ceplecha, Z., Rendtel, J., Betlem, H.: The “European Fireball Network”: Current status and future prospects, Meteoritics and Planetary Science, 33 (1), pp. 49-56, 1998.
- [2] “Fireball Event”, American Meteor Society, Ltd., 2017: [https://www.amsmeteors.org/members/imo\\_view/event/2017/3301](https://www.amsmeteors.org/members/imo_view/event/2017/3301), 2017.