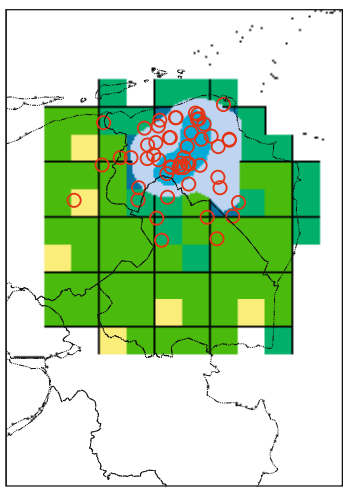
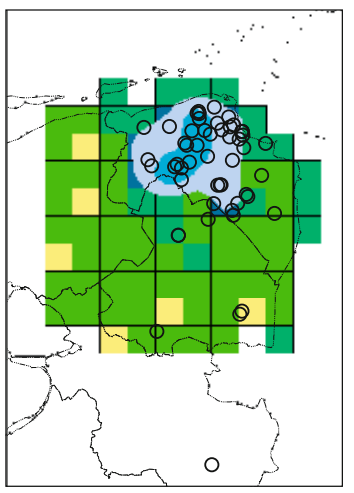
Impact and attempted recovery of fireball over Groningen (Netherlands) [2009 october 13, 16:58 UT]

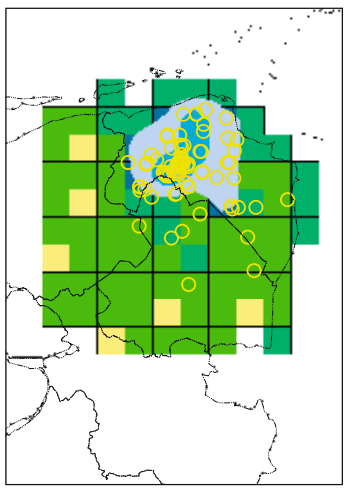
A



B



C



Trajectory

First sketch for trajectory of the bright fireball over the northern parts of the Netherlands and Germany (calculations & plot by Peter van Leuteren).

This plot is based upon:

- accurate visual plot by Koen Miskotte at Ermelo, a visual meteor observer in the Netherlands
- photo of the train from Kiel (Germany)
- photo from Ralph Adolph in Hannover (Germany)
- additional visual recordings from northern parts of the Netherlands (red dots)

Visual observations

Visual observations (blue dots) and photographic observation (red dot) of the fireball in the Netherlands
(recorded by Theo Jurriens , Groningen, Netherlands)

A Sounds like a plane breaking the sound barrier

B Sounds like thunder rolling

C Sounds like a bomb exploding

Groningen

Photographer: Robert Mikaelyan
Place: Groningen (53 13’ 26” N / 06 32’ 26” E)
Country: Netherlands
Kamera: Canon EOS 450D with 200mm F6.3 (1/200s)

Hannover

Photographer: Ralf Adolph
Place: Hannover (52 26’ 28” N / 09 44’ 08” E)
Country: Germany
Kamera: Canon EOS 20D with 70mm F4 (1/250s)

Bremerhaven

Photographer: Maciej Libert
Place: Bremerhaven (53 33’ 48” N / 08 35’ 24” E)
Country: Germany
Kamera: Canon EOS 450D with zoom 35 – 70mm F5.6 (1/50s)

Ermelo

Observer: Koen Miskotte
Place: Ermelo (52 17’ 19” N / 05 36’ 47” E)
Country: Netherlands

091369 Carl

Dutch Meteor Society

Carl Johannink
c.johannink@t-online.de

Fireball observations from the Netherlands

By visual and photographic observations

1a: Visual observations

Observers call:
- National Weather Institute
- Nearby police stations
- Fire brigades

Observers spread the news via:
- Radio
- TV
- Newspaper
- The internet: chat, mailinglist, websites...

What do we do? Try to centralize observations in one or more steps.

Note: big fireballs are visible over a large area so observers in many countries are involved. See poster Luc Bastiaens.

Visual observers of the Delphinus group at Biddinghuizen, the Netherlands. Photographic equipment is in front.

2a: Observations: what do we want to know?

Data of observer:
- Name of observer
- Location of observer (place and coordinates)
- Phonenumber, e-mail address of observer

Most important details of event:
- Date and local time of event
- Brightness compared to Venus, moon...
- Direction and elevation of beginning point
- Direction and elevation of endpoint
- Duration of event in seconds
- Velocity
- Angle of trajectory

Secondary details of event
- Persistent trail
- Colours
- Fragmentation
- Sounds

Part of the fireball report form of the International meteor organization (IMO): http://www.imo.net/fireball/report

3a: Rough trajectory from visual observation

- First search for reliable observations
- Compare these, they should correspond with each other
- Secondly: search for observations perpendicular to the trail
- Then determine the crosspoint of begin and endpoint
- Find a rough trajectory providing a first impression
- Accuracy is mediocre most of the times

Note: we are facing all kind of observers from layman to experienced and it is important to distinguish between them.

Trajectory of the fireball on 18 july 2006. All-Sky photo from Klaas Jobse at Oostkapelle and visual observation by Maurice Gavin in London.

1b: Photographic observations: different kinds of camera's

- All-sky stations
- Surveillance camera (video)
- Photo from normal camera, mobile phone
- Note: photography of persistent trails

Important: direction of view, known points on the image

Note: accuracy of images can be from mediocre to excellent

All-Sky camera equipment at station Wilderen, Belgium operated by Jean-Marie Biets. Note the 2-blade rotating shutter in front of the lens.

2b: Photographic observations: what do we want to know?

- Observer details, name, location, phone, e-mail, date and time
- Technical details: camera, name, type, optics, exposure time,...
- Accuracy of image
- Direction of view
- Reference points like stars or details in landscape
- Use of a rotating shutter to obtain velocity

Fireball at 22:54 UT, 18 july 2006 by EN-97, Klaas Jobse, Oostkapelle, the Netherlands. EN = European Network of All-Sky stations.

3b: Multi station: measuring star trails and meteor trail

- Combining two (or more) images from different locations
- Meteor trails on these images should have a large convergence angle
- Combining three or more images yield information on accuracy
- To obtains high quality measurements at least 20 stars should be visible on the image
- The meteor trails should have at least 10 shutter breaks to obtain velocity details
- Measuring software can be by hand (Astrorecord) or automatic

Measuring position of stars and shutterbreaks of the meteortrail using the Astrorecord software developed by Marc de Lignie.

4: Further analysis

- Infrasound measurements at different stations to obtain a trajectory
- Atmospheric and heliocentric trajectory ultimately yields the origin in space of the meteorite
- Length and width of straw field depends highly on endpoint and drift by winds in the atmosphere
- Search for debris: like Asteroid 2008 TC3
- Analysis of the meteorites

Infrasound measurements by the Royal Dutch Meteorological Institute (Läslo Evers, KNMI) of a bright daylight fireball on 31 may 2003 at 18:45 UT.

Flight of a meteorite through the atmosphere of the earth ending up with a terminal burst. Thereafter the debris of the meteorite falls to the surface and is called 'dark flight' trajectory.

5: References:

- Centralized gathering of fireball information from the general public in an international context (poster Luc Bastiaens)
- Impact and attempted recovery of the October 13, 2009, fireball over Groningen (poster Carl Johannink)
- The January 17, 2009, fireball and meteorite recovery in Lolland, Denmark (poster Klaas Jobse)
- Fireball report form of the International Meteor Organisation (IMO): http://www.imo.net/fireball/report
- All-Sky – Dutch fireball patrols: http://www.all-sky.nl
- The Mbale meteorite shower in Meteoritics (ISSN 0026-1114), vol. 29, no. 2, p. 246-254
- Glanerbrug meteorite fall in Astronomy and Astrophysics. 255, 373-376 (1992)

091369 Casper

Dutch Meteor Society

Casper ter Kuile
casper.ter.kuile@xs4all.nl