

## Fireball and Bolide Observations; 2009-2010

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Southern African Fireball Observations 2009-2010, including accounts of the 21 November 2009 bolide.

### Catalogue of Recent Sightings

This article continues the sequential numbering of reported fireball sightings from southern Africa, and covers fireballs observed during 2009 and 2010. By definition, a fireball is any meteor event with brightness equal to or greater than visual magnitude -3. The following events were reported to the author and details are reproduced as given by the observer. All times were converted to UT, and all coordinates are for epoch J2000.0.

#### Event 218 – 2009 January 20 – Brackenfell, Western Cape

Observed by Auke Slotegraaf at 20h57, who reported  $m_v = -5$ . Duration was about 1.5 seconds. The path started at RA 01h00, Dec  $-39^\circ$  and ended at RA 00h20,  $-65^\circ$ . Colour definitely not white, and it appeared to have a slight orange cast.

#### Event 219 – 2009 March 30 – Pretoria, Gauteng

Observed by Michael Poll at 20h35.  $m_v = -5$ . Colour white. Fell straight down from about  $2^\circ$  to the west (right) of Crux. No disintegration, just “went out”.

#### Event 220 – 2009 April 26 – Makhado, Limpopo

Observed by Kos Coronaios around 16h00.  $m_v = -3.5$ . Duration 2 seconds, path length  $30-40^\circ$  from  $20^\circ$  above the southern horizon moving towards the southeast where it disappeared about  $5^\circ$  above the horizon. Colours were yellowish-white with a definite orange/red centre or slightly in front of the meteor.

#### Event 221 – 2009 August 3 – Cape Town, Western Cape

Reported by Juanita Daniel. ‘I live in Southern Suburbs, Cape Town and early Monday morning around 23h40 I spotted the biggest and brightest shooting star I have ever seen. It had a huge long tail that burned for quite a few seconds after it passed over the Silvermine Mountains’. No further details.

#### Event 222 – 2009 August 24 – Western Cape

Four independent sightings from Cape Town to Sutherland, where 39 individuals witnessed the event. Time between 17h40-17h45. Duration 3-4 seconds. The object was observed by Auke Slotegraaf, from whose report I deduce start and end alt/az roughly  $268^\circ, +26^\circ$  to  $190^\circ, +20^\circ$  as seen from Sutherland. That is looking SW, from right to left, west to south, path length  $68^\circ$  and descending  $6^\circ$ . A screen print

from Google earth submitted by Andre du Preez as seen from Woodstock yields very approximately  $330^\circ$ ,  $+30^\circ$  to  $020^\circ$ ,  $+25^\circ$ , that is looking N from left to right, NNW to NNE, path length 40 and descending  $5^\circ$ . The best path I can deduce from these observations has the meteor crossing roughly from Vredenburg - Ceres- Mossel Bay. The following individual reports were received of this object:

From Auke Slotegraaf: 'On Monday evening, 2009 August 24, there were 39 members of the public outside under the stars, gazing at constellations and deep sky objects. At one point, I was standing facing south and my half of the group was mostly looking northward. A flash of light in the west caught my attention and I turned to see, near the moon, a pretty neat meteor, heading south. I watched for the briefest moment and then saw that it was growing brighter. The meteor reached maximum brightness and then abruptly faded. Its colour at maximum was orange-yellow, not unlike Arcturus. After the sudden fade, from the leading edge of the fireball, a train of four fragments continued for a brief moment before disappearing. The time may be out by a minute or so, which I recorded as 17h41. The duration of the event was at least three seconds. I first noticed it out of the corner of my eye at roughly near the moon (very uncertain; RA 13h50m Dec  $-15^\circ 40'$ ) and the maximum brightness abruptly vanished at about (RA 09h15m, Dec  $-75^\circ$ )'.

From Andre du Preez: 'I live in Woodstock and have a balcony facing the harbour. The meteor appeared over the harbour and came at an angle of about 15 deg from Lions Head side towards the Hex Mountains. The Meteor entered the sky in the centre between the Signal Hill and the right side of bay.

From Mark Alderman: 'I saw a meteor this evening at about 17h40 that lasted about 3 or 4 seconds. It had a distinct tail and glowed red and yellow before disappearing. I was in Hout Bay just below Constantia Neck. It started to the North East of me and moved in a South Easterly direction'.

From Handa Zeller via Auke Slotegraaf: 'saw the fireball from Somerset West at 17h45. She described a similar colour to what we saw'.

**Event 223 – 2009 October 17 – Western Cape**

Reported by Tony Jones.  $m_v = -7.0$  to  $-8.0$  at 18h13. Path was from alpha Ophiuchi, passed 109 Herculis and toward alpha Lyrae ( $15^\circ$  to  $20^\circ$ ). Two second train and broke up at end of travel into a shower of pieces. Colour was white.

**Event 224 – 2009 November 11 – Henley on Klip, Gauteng**

Observed by Brian Fraser at 21h29. Path roughly from Taurus at altitude  $30-40^\circ$  towards the west. The colour was distinctly green. Duration 2-3 seconds

and estimated it to be maybe 20-30 times brighter than Sirius (i.e. about  $m_v = -4$  to  $-5$ ).

### **Event 225 – 2009 November 21 – 56 separate reports**

The event that occurred late in the evening of November 21 was clearly one of the most energetic meteoric events for many years, and certainly since the Thuathe fireball and meteorite fall in July 2002. However, unlike the latter event there is no evidence that the most recent event produced any meteorite fall, and so the event is classified here as a very bright bolide. The author has catalogued 56 separate eye witness accounts of visual sightings of the bolide. The following summary is gleaned from the most useful accounts received.

#### **Visibility, time and duration:**

The geographical spread in visibility ranged from as far south as Ladysmith KZN (latitude 28.5 S) to Gweru in Zimbabwe (19.5 S), and from near Rustenburg in the west to Ezulwini in Swaziland in the east. The greatest concentration of sightings was in Gauteng (also the most populous area of South Africa) and Limpopo, from Polokwane to the border between South Africa and Botswana. The separation in latitude between the southernmost and northernmost sightings is 9°, corresponding to approximately 1000 km on the earth's surface. There is a wide range of times reported for the event. Most of these

times were reported by members of the public and can therefore only be regarded as approximate. In general the time was reported as about 23h00 SAST, with the earliest as 22h45 and the latest as 23h30. From the 56 reports I considered the following as the most accurate times. Anton Minnaar was travelling in his car and noted the time as 22h54 from Johannesburg. Visiting amateur astronomer Greg Campbell noted the time as 22h55 from Mabelingwe. Magda Streicher obtained the time of brightest illumination from the surveillance camera at Polokwane radio station as 22h49m42s. As the state of calibration of these times could not be ascertained, the best estimate of the appearance time is somewhere between 22h50 and 22h55 SAST. Seven reports quoted the duration of the flight in seconds. These range from 2-5 seconds, with a mean duration of 3.6 seconds.

#### **Visual Reports:**

The most valuable reports which may be of further scientific value were from Andrew Morgan and Greg Campbell. Andrew Morgan is a game ranger at Lions Valley Game Lodge, Nambiti Conservancy, just north of Ladysmith, Kwa-Zulu Natal. His location was 28°28.5' S, 30°00.1' E. Andrew is conversant with the stars and often presents star talks to guests at the Lodge. He provided details which enabled me to determine the altitude and azimuth of the start and end points of his sighting. Greg Campbell, a visiting Australian amateur astronomer,

witnessed the event from Mabelingwe, Limpopo Province. His location was 24°50.8' S, 28°02.8' E. From his description of the path relative to bright stars I was similarly able to determine the start and end points of his path. This data will hopefully allow a tentative assignment of a pre-atmospheric orbit to the object.

The perception of colours in meteors is highly subjective and depends, amongst other things, on the observer and the brightness of the event. There were no consistent reports of colours seen as the bolide moved north, descending all the while and decreasing in velocity and temperature. So from Gauteng the range in colours was red, orange, green and blue, with one report of white turning to red. From the more northerly sites the colours were reported as red, white, blue and purple. From colour video recordings taken from Gauteng the colour change from white to red as the object descended towards the horizon is apparent.

#### **Sounds heard:**

Sounds from meteors are generally of three types; sharp cracks and rumbling like thunder, which are heard after the visible passage and electrophonic hissing heard simultaneously with the visible passage. No sounds were heard south of latitude 23.5 S, or if they were they were not associated with the bolide. The first definite reported sound was a dull boom, like a tremor,

by Peter Straughn at Leshiba Wilderness Area, latitude 22 47' S. From this point northwards, nearly all sites reported noise of some sort, described variously as explosions, tremors and rumbling, ranging from 1-10 minutes after the passage. The airburst was detected by two seismic recorders outside South Africa, and allowed a tentative location of the airburst over Botswana. Attempts to obtain records from South African stations were frustrated by most of these being in a state of disrepair or inoperative.

#### **Event 226 – 2010 May 31 – Hermanus Golf Club, Cape**

Observed by Danie van der Spuy and Paul Richards at 15h55 (it was still light). Danie was inside and saw the object through an east-facing window. He reported 'a bright object suddenly appeared, heading towards the ground at approx 50°, right to left. I could only see it for say 2 seconds. It was still light outside, and yet it was very bright. Paul was outside at the time and reported the main body being followed by a long tail and many smaller fragments. Duration given as 3 seconds. Colour was distinctly red. Brightness estimated as 10 times brighter than Venus or about the brightness of the full moon (ie between  $m_v = -7$  to  $-13$ ).

#### **Event 227 – 2010 July 26 – Cape Town, Western Cape**

Probable fireball, observed by several individuals, just after 20h00 UT.

From Lise Sloan: ‘huge object slowly descending in the night sky. It had a long tail of what looked like fire and seemed to disappear directly behind the Sir Lowrys pass mountains’.

From Nicole Shea: ‘driving along the R310 from Muizenburg direction to Somerset West when we witnessed a large, streaking light in the sky. It lasted about 10 seconds and was most definitely larger than the light of a planet in the sky’.

From Justine Ward: I saw the most amazing fireball with a tail in the sky just after 22h00 SAST. The meteor was moving from Cape Town towards Plattekloof area where it disintegrated’.

From Avril Michelle White: ‘seen at 22h25 SAST when I was leaving Canal Walk – I was on the main road that bends towards the Shell garage towards the N1 and the meteor was about 1 o’ clock in front of me, pretty low down on the horizon. It had green and red colours with sparks’.

From Mark Runtzler: ‘seen at approximately 22h15 in the direction 170-180°, at an elevation of around 40-50°, the trajectory was from left to right at an angle around 15° down from horizontal. The object was burning a very bright orange/red, leaving a long burning orange/yellow tail. It lasted about 4 to 5 seconds from the time I saw it until it appeared to disintegrate into sparks of smaller pieces’.

From Vivian van der Merwe: ‘Last night at about 10h20 SAST, while standing on my stoep in Jamestown, Stellenbosch, I observed an unusually bright and large fireball plummeting out of the eastern night-sky. Unfortunately I only glimpsed the last part of its trajectory, from about 30° above the horizon. It’s path was at angle of about 15° to the right of vertical. It disappeared over Haelkop Peak, that is about 20-30° south of due east. The centre was bright white-yellow in colour and the peripheral outer layer (about 5-10% of the visible area) consisted of very clear turquoise and indigo-blue flames. The section between the outer and inner areas burned an orange-yellow colour. What struck me as unusual were the very distinctive “flames” emanating from the “ball”. In relation to the overall size of the ball they were not very long or large but nevertheless very visible. The immediate tail was conspicuous but not long. I listened carefully for about 40 minutes after the sighting and heard no sound of any kind’.

Also Steve Kleyn collected the following reports from the Hermanus area:

From George Lombardi, Wortelgat Nature Reserve, Stanford. ‘He was working on his computer and a bright light overhead made him look up (bearing in mind that the moon was very bright that night). It seems that it appeared more or less directly overhead or perhaps a little south of the zenith until dropping below horizon due E of

observation point over Stanford. Duration was about 5 seconds. Colour red in front changing to yellow behind at first then going bright white all over just before falling below horizon. It had the appearance of pieces breaking off and sparking. No smoke trail noticed and no sounds were heard.'

From Denis Grace who was walking his dog, Westcliff, Hermanus. 'The object appeared directly overhead, dropping below horizon over Stanford. Colour was red, leading to yellow trailing becoming all white just before disappearance. Had the appearance of bright sparks and pieces breaking off before burning out. No smoke trail noticed, and no sound was heard'.

**Event 228 – 2010 August 5 – Howick, KZN**

Observed by Carol MacDougall at 18h38, facing north north east towards the Karkloof Nature Reserve from the centre of Howick, saw a pinkish/red ball with orange tail. It seemed to explode in a reddish ball with a lime greenish edge and disappeared from sight straight after the explosion. Duration was very short, perhaps 1-2 seconds.

**Event 229 – 2010 October 21 – Bredell, Gauteng**

Observed by Tim Cooper at 00h40,  $m_v = -3$ , a sporadic fireball observed during an Orionid watch, colour white, speed fast, path from approximately 04h15,  $-10$  to 01h20,  $+04$ .

**Event 230 – 2010 October 22 – Bredell, Gauteng**

Observed by Tim Cooper at 02h23, an Orionid fireball,  $m_v = -4$ , colour white, speed fast and left a persistent train.

**Event 231 – 2010 December 30 – Hopefield, W Cape**

Observed by Mary Fanner at 23h23 UT. Path was from approximately 11h40,  $-14^\circ$  to 13h00,  $+10^\circ$ , or from the open end of Crater towards the eastern horizon for a path of  $25^\circ$ .  $m_v = -5$ , brighter than Venus, duration about 2.5 seconds giving an angular velocity of  $10^\circ/\text{second}$ . Colour white, but reddish tint as meteor separated into two balls (red colour could have been due to low altitude above horizon). Mary reported 'first seen as a very bright pinpoint, widening as it descended before splitting out into two balls, one small bright reddish ball wider than the train, and, almost immediately below it, on the same path as the train, one larger ball, the same colour as the first but about twice its diameter. The two balls appeared joined in the middle with a very thin wire like train. After the second ball appeared the whole apparition abruptly disappeared. I got the impression of a long dangling silver earring with two reddish beads hanging from the end. There was no persistent trail and no sounds heard'. ☆