

**GOODWATER (ALABAMA) SUPERBOLIDE OF 5 DECEMBER 1999.** D. T. King, Jr.<sup>1</sup> and L. W. Petruny<sup>2</sup>,  
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**Introduction:** At approximately 04:18 AM CST (10:18 UT) on 5 December 1999, light from an exceptionally bright bolide (superbolide) was seen across part of the southeastern United States [1]. This superbolide was witnessed, heard, and(or) felt by hundreds of individuals who called local and state police, fire departments, and the Alabama Emergency Management Agency. According to newspaper and television accounts, the superbolide's light was seen within a 300-km radius of its flight path. This area included most of the state of Alabama, and parts of adjacent Tennessee, Georgia, and Florida. This incident was widely reported in regional and local newspapers and on local television news programs. Surveillance camera videos made in two Alabama towns, Weogufka (33.02° N, 86.31° W) and Pell City (33.16° N, 86.28° W), recorded direct light, reflected light, and shadows from this superbolide event.

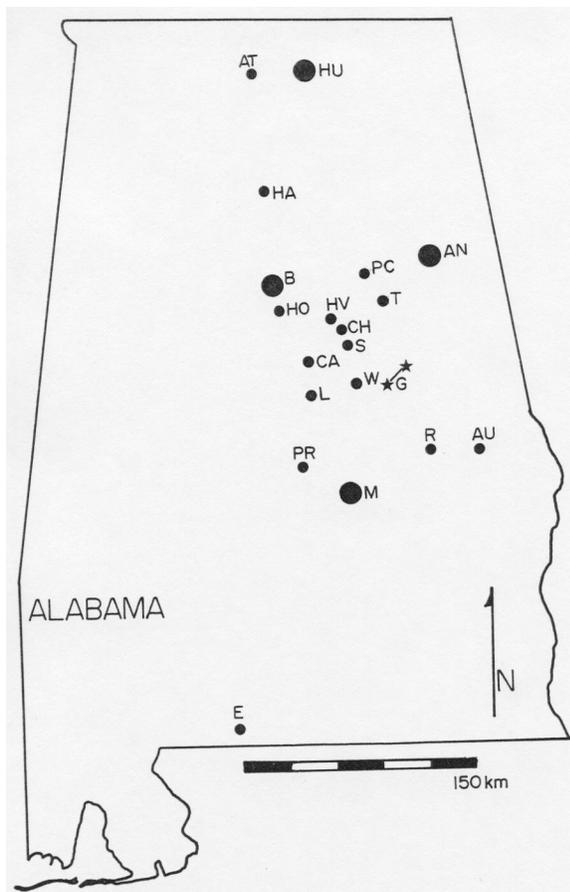


Figure 1. Eyewitness sites (large dots = numerous witnesses). AN=Anniston; AT=Athens; AU=Auburn;

B=Birmingham; CA= Calera; CH=Childersburg; E=East Brewton; HA=Hanceville; HO=Hoover; HU=Huntsville; HV=Harpersville; L=Lay Dam; M=Montgomery; PC=Pell City; PR=Prattville; R=Reeltown; S=Sylacauga; T=Talladega; W=Weogufka. Connected stars = DoD flight path. G=Goodwater (under flight path).

We refer to this event as the Goodwater superbolide event because of the location of its flight path over Goodwater, Alabama (site G, Figure 1). We regard it as a superbolide (versus a bolide or bright fireball) because it was detected by satellite and because shows brightness on video recordings that could be magnitude  $-17$  or brighter [2].

At the same time as the superbolide event, simultaneous fires started within the town of Harpersville, Alabama, which is located about 53 km northwest of Goodwater (Figure 1), as discussed below.

**Flight Path:** U.S. Department of Defense (DoD) Press Release 202 (dated 16 March 2000), stated that this superbolide was first detected at approximately 33.1° N, 85.9° W (altitude = 74 km) and last detected at approximately 33.0° N, 86.1° W (altitude = 23 km). These points are, respectively, approximately 15 km east-northeast and approximately 9.2 km south-southwest of the town of Goodwater, Alabama (site G on Figure 1). The azimuth defined by the points above (stars on Figure 1) is approximately 237°.

Eyewitness accounts of a perceived flight path are limited to three reliable sources. A land surveyor in Auburn, Alabama, reported that he saw the superbolide and estimated the flight path to have been "east by southeast." A geologist driving his automobile a few kilometers south of Athens, Alabama, saw the superbolide and estimated its flight path to have been "east, southeast." Lastly, the general store owner in Weogufka, Alabama, reported that residents who saw the superbolide light in his town told him the object moved "northwest to southeast."

Shadow movement in the Weogufka surveillance video appears to confirm the storeowner's account. From this video, we estimated an easterly flight path with a bearing of 097°. The eyewitness near Athens, Alabama, stated that the superbolide was moving "right at the crescent moon." According to the U.S. Naval Observatory's data-services web page, a waning crescent moon was visible that day from Athens, Alabama,

just above the horizon upon an east-southeasterly bearing of  $104^\circ$ .

It is not clear why there is such a large discrepancy between the DoD-reported flight path and the observer's accounts.

**Brightness and Color:** Eyewitnesses described superbolide brightness as being briefly like mid-day sunshine. Newspaper accounts said that several people were awakened inside their homes by the bright light. In Atlanta, Georgia (170 km northeast of Goodwater), superbolide light caused a resident to report an 'aircraft crashing.' Near Athens, Alabama (210 km north-northwest of Goodwater), an eyewitness was 'completely blinded' while driving. Surveillance video from Weogufka includes a brief segment in which superbolide illumination temporarily overwhelms the camera's capabilities [1].

Eyewitness reports describe mainly a blue coma, and a surveillance video from Pell City shows the concrete floor of a self-service gasoline station reflecting bright, iridescent blue light during superbolide passage. Eyewitness also reported orange and white coma colors, but these reports are associated only with the terminal phase of illumination.

**Sound and Shaking:** Alabama eyewitnesses in an area 100 km to the north and west of Goodwater (encompassing sites B, CA, L, and W on Figure 1) reported associated sounds, mainly 'rumbling sounds' or 'two explosions' occurring 'a few minutes' after superbolide passage. Audio recording accompanying the Weogufka surveillance video sounds initially like a 'distant rifle shot' that occurs 83 seconds after end of superbolide illumination. Then, superbolide-produced sound continues for an additional 91 seconds as an unbroken 'thunder-like noise' that varies in intensity while fading away gradually. A distant eyewitness in East Brewton, Alabama (240 km south of Goodwater) reported hearing 'a bang or a crash' and also seeing 'a trail of smoke' behind the superbolide.

Ground shaking associated with superbolide passage was reported in an area more restricted than the one where sounds were noted. The shaken area formed a narrow corridor that extended from Goodwater toward the northwest, covering a distance of approximately 90 km (encompassing sites B, HO, and W on Figure 1).

**Angle and Velocity:** The DoD Press Release cited earlier says that the superbolide entered the atmosphere at an angle of  $55^\circ$  with respect to horizontal. However, DoD illuminated flight-path data, given in the same press release, plot as a steeper angle of approximately  $66^\circ$ . An eyewitness in Atlanta, Georgia, reported the estimated angle of descent was  $45^\circ$ .

Using duration of Weogufka video illumination (~ 3.4 seconds) and illuminated flight-path length (~ 55.6

km), an average superbolide velocity of ~ 16.4 km/sec is obtained. A second estimate using speed of shadow movement in the Weogufka surveillance video indicated a velocity of ~ 18.3 km/sec.

**Fragmentation and Potential Impact Area:** Eyewitnesses from several viewpoints reported sudden superbolide light extinction, without any illuminated fragmentation. Impact is presumed to have occurred within a few kilometers downrange of the last DoD-detected location. To date, no meteoritic debris or suspect surficial disturbance has been found in this area, which is southwest of the town of Goodwater, Alabama.

**Simultaneous Ground Fires:** Eyewitnesses reported three adjacent, simultaneously occurring ground fires inside a forest of young pine trees, located within the city limits of Harpersville, Alabama ( $33.34^\circ$  N,  $86.43^\circ$  W; site HV on Figure 1). The Harpersville Fire Department received calls about these fires within a few minutes of superbolide passage near the area. Residents who live within 50 m of the fires' location stated that the fires began "when we saw the light" (referring to the superbolide). A televised news story of the event showed several Harpersville residents walking around in a still-smoldering area on the morning of 5 December 1999, apparently intent upon finding parts of the fallen object. Subsequent inspection showed three elliptical burned areas, 200 to 450 m<sup>2</sup>, where grass, shrubs, lower tree limbs, and the outer tree-bark layer (within ~ 0.5 to 2 m of the ground) had been burned. The bearing of major axes of the burned ellipses varied from  $090^\circ$  to  $110^\circ$ .

It is not clear how the burned areas could relate to this superbolide event because these areas are located over 50 km from the potential impact area. Fires said to be associated with superbolide and fireball events are uniformly dismissed. However, there are numerous reports of simultaneous fires like the ones in Harpersville, which defy easy explanation (e.g., the central Pennsylvania daylight superbolide of 23 July 2001, the Bayt Eides, Jordan superbolide of 18 April 2001, and the England, Arkansas superbolide of 9 March 2000). Other alleged meteorite-related fires have been attributed instead to geoelectrical discharges or ignition of erupting gasses [3].

**References:** [1] King, Jr. D. T. et al. (2001) *Meteoritics & Planet. Sci.*, 36(9), A100. [2] Cepelchka Z. et al. (1999) *Astron. Inst. Slovak Acad. Sci., Bratislava*, 37-54. [3] Docobo J. A. et al. (1998) *Meteoritics & Planet. Sci.*, 33, 57-64.