CORVID METEOROIDS AND A GIORDANO BRUNO RAY ARE GENETICALLY RELATED. Jack B. Hartung.
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Summary

Both Corvid meteoroids and the Giordano Bruno (GB) crater are products of recent events. On June 25, or 26, 1178, Corvid meteoroids and a portion of GB ejecta were at the same place in the Solar System and moved in the same direction (right ascension = 12° and declination = $+19^{\circ}$). The ground track of this direction is the same as that of the most prominant GB ray (azimuth = 237°). These "coincidences" could not have occurred by chance and, therefore, support the conclusions that the GB impact occurred on June 26, 1178, and that Corvid meteoroids are high-velocity ejecta fragments from that impact. Finally, those fragments ejected with somewhat lower velocities failed to escape from the Earth-Moon system and produced the prominant ray extending southwest from the GB crater.

Abstract

Between June 25 and July 2, 1937, a Corvid meteor shower was observed (1). The apparent lack of Corvid showers in other years suggests that Corvids are the product of a recent break-up event. The right ascension and declination, corrected for zenith attraction, of 192° and -19° were reported for the radiant of this shower (2). This corresponds to a right ascension and declination of the direction of motion of Corvid meteoroids of 12° and $+19^{\circ}$. In ecliptic coordinates the celestial longitude and latitude of this direction are 18° and $+13^{\circ}$.

In the medieval chronicles of Gervase of Canterbury for June 25 (26), 1178, it is reported that "...there was a bright new moon...and suddenly the upper horn split in two. From the midpoint of this division a flaming torch sprang up, spewing out, over a considerable distance, fire, hot coals, and sparks" (3). This report is interpreted as an eyewitness account of events surrounding the formation of the 20-km-diameter crater, GB (4). In selenographic coordinates the location of GB is given by a lunar longitude and latitude of 103° E and 36° N. On June 25 (26), 1178, the ecliptic longitude of the Sun was 93° (94°) (5), the phase of the Moon was $19^{\circ}.5$ (32°) past new moon, and the geometric libration of the Moon in longitude was $1^{\circ}.5$ ($1^{\circ}.5$). It follows that the ecliptic longitude of the lunar prime meridian was 294° (306°), and the ecliptic longitude of the zenith direction at the GB impact site was 37° (49°). The corresponding latitude was approximately $+36^{\circ}$ ($+36^{\circ}$). The resulting elevation angle of the direction of Corvid motion above the local horizontal plane at the GB impact site was 61° (54°). The values given in parentheses correspond to conditions that prevailed exactly one day after June 25, 1178.

Experimental results show that for ejection velocities near the lunar escape velocity, 2.7 km/sec, the ejection elevation angle ranges up to about 60° (6,7). Therefore, the observed direction of Corvid motion and the direction of motion expected independently for some GB ejecta are essentially the same. In addition, the

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selenographic azimuth of this direction, with the origin of the coordinate system at the GB crater, is 221° (238°). The azimuth of the most prominant, 1000-km-long, ray emanating from the GB crater is 237° (8).

It has been argued recently that on June 25, 1178, the Moon was not visible from the Earth because just after sunset it would have been too near both the Sun and the local horizon (9,10). However, one day later, not only would the crescent Moon have been visible, but the resulting ejection elevation angle would be lower (more in line with expectation), and the ejection azimuth would be essentially the same as that of the most prominant GB ray. This agreement lends support to the idea that June 26, 1178, is more likely the actual date of the GB impact.

Conclusions

1. The GB impact crater was formed on June 26, 1178.

2. Corvid meteoroids are high-velocity (>2.7 km/sec) members of the GB (azimuth = 237°) ejecta family.

3. The GB ray at an azimuth of 237° was formed by lower-velocity (<2.4 km/sec) members of the same ejecta family.

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