A halo on Mars (Letter to the Editor)

G. P. Können
Soest, The Netherlands

In a letter to Weather (March, 2007) Mr G. Watt questioned the fact that subsuns belong to the halos and hence my conclusion (Können, 2006) that the appearance of a subsun on pictures taken by the Mars Global Surveyor indicate that halos are present on that planet. Mr Watt suggests that the appearance of subsuns is caused by a reflection of sun-rays from the aircraft's window onto the clouds or, in case of Mars, by a reflection in the direction of the planet from the spacecraft's structure. In line with this argument, he proposed that if one could have viewed the same terrestrial or Martian scene without the presence of a spacecraft or aircraft, there would not have been a subsun.
The subsun explanation of Mr Watt does not fit the observations. In the classical (Meyer, 1929) as well as current (Greenler, 1980; Tape, 1994; Cowley, 2006) literature, the subsun is unequivocally attributed to reflection from horizontally oriented ice crystals, resulting in an uncoloured spot directly under the sun. Subsuns in other positions have never been reported, although in Watt's explanation the subsun could appear at any azimuth, depending on the angle of incidence of the sun's rays with the aircraft's window. Secondly, and in opposition to Watt's conjecture, there exist in the literature numerous reports of subsun sightings from balloons or mountains without any reflecting surface other than perhaps a photocamera. A list of early reports starting with the discovery observation of the subsun in 1850 by Barral and Bixio can be found in Meyer (1929). Nowadays, many pictures of subsuns taken in the open air are available from the Internet, good examples being those by Claudia Hinz (2006) and by Lukas Kosarek (Trncak, 2006). My conclusion is that the arguments presented by Mr Watt do not provide a sufficiently strong basis to dismiss my interpretation of the Mars subsun in terms of halo scattering in the Martian atmosphere.

References

Cowley L. 2006. Atmospheric Optics, website, http://www.atoptics.co.uk/
Greenler R. 1980. Rainbows, Halos and Glories, Cambridge University Press, Cambridge.
Hinz C. 2006. Elliptical halo in diamond dust, http://haloreports.blogspot.com/2006_03_01_archive.html, archive March 2006.
Können GP. 2006. A halo on Mars. Weather **61**: 171–172.
Meyer R. 1929. Die Haloerscheinungen, Probleme der Kosmische Physik Vol 12 (Eds C. Jensen and A. Schwassmann), Verlag Henri Grand, Hamburg, Germany.
Tape W. 1994. Atmospheric halos, Antarctic Research Series Vol 64, American Geophysical Union, Washington DC.
Trncak P. 2006. Parhelion legs in Italy, http://haloreports.blogspot.com/2006_01_01_archive.html, archive January 2006 (picture taken by L. Kosarek).
Watt G. 2007, A halo on Mars – a reply, Weather **62**: 111.