# Meteor showers on the Earth from sungrazers

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**1. C/2012 S1 (ISON) and C/1680 V1 (Newton's comet):** Only very few past works [1,2,3] have looked into the aspects of meteor phenomena from sungrazing comets. Here we study whether feasible meteoroid ejection velocities in ISON and Newton's comet could bring the nodes close to the Earth's orbit so as to cause a visually spectacular meteor shower. Detailed analysis using Lagrange's planetary equations [4] shows that even at very high ejection velocities ($\sim 1$ km/s), the descending nodes of the meteoroids reach only 0.91 au (quite close to the Earth's orbit; which in itself is very rare for sungrazing orbits) in the case of ISON. For Newton's comet, the required ejection velocities are about 800 m/s for the descending node to reach 1 au. Such high ejection velocities are practically rare for big meteoroids ($\sim 1$ mm in diameter) which encounter Earth and hence spectacular visual meteor activity can be ruled out completely [5].

**2. Marsden Group versus other Sungrazing Families:** A similar analysis using Lagrange's equations [6,7] was done on all the known sungrazing families [8]. We find that, only in the Marsden family, it could lead to substantial nodal dispersion in meteoroids so that the descending nodes can encounter Earth at ejection velocities of the order of few 100 m/s. This matches with the earlier significant works [1,2,9] which linked the Daytime Arietids (ARI) to the Marsden group. The fact that only a very small number of sungrazing orbits favour Earth intersection at low ejection velocities (out of the observed families so far) stands as the primary reason for the absence of regular meteor showers from them although sungrazers in itself are very frequent.

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**References:** [1] Ohtsuka K., Nakano S., Yoshikawa M., 2003, PASJ, 55, 321. [2] Sekanina Z., Chodas P. W., 2005, ApJS, 161, 551. [3] Jenniskens P., 2006, Meteor Showers and their Parent Comets. Cambridge Univ. Press, Cambridge. [4] Lagrange J. L. 1811, Mécanique Analytique. [5] Sekhar A., Asher D. J. 2014, MNRAS Letters, 437, L71. [6] Roy A. E. 1978, Orbital Motion, Adam Hilger, Bristol. [7] Murray C. D., Dermott S. F., 1999, Solar System Dynamics. Cambridge Univ. Press, Cambridge. [8] Marsden B. G., Williams G. V., 2008, Catalogue of Cometary Orbits, 17th ed. Minor Planet Center/Central Bureau for Astronomical Telegrams, Cambridge, MA. [9] Jenniskens P., Duckworth H., Grigsby B., 2012, WGN (J.IMO), 40, 98.