

COMMISSION F1 / WG Meteor Shower Nomenclature (MSN-WG)

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1. Introduction

In the past International Astronomical Union (IAU) General Assemblies (GA) in Hawaii, 2015, the commission F1 proposal to continue the activities of the Working Group (WG) on Meteor Shower Nomenclature (MSN) was accepted. The MSN-WG has the objective to formulate a descriptive list of newly established meteor showers that can receive official names during the next IAU GA. As technology advances and more networks and surveys are performed and results reported in the literature, the *pro-tempore* designated shower list grows significantly during the years in between the GA. As pointed out recently by (Koseki 2016, Koseki (2016)) and (Koukal 2018, Koukal (2018)), this rapid grow results in many duplicates and inaccuracies that need to be reviewed before giving the shower the *established* designation. The MSN-WG has the task to uniquely identify all existing and newly discovered meteor showers and formulate unique names that keep the literature transparent. To achieve that objective, the Working Group mediates when nomenclature issues arise and oversees the work of the IAU Meteor Data Center (MDC) in Poznan, which updates and maintains the List of Established Showers, the Working List of Meteor Showers, and the List of Removed Showers. An example of the value of such a definitive catalogue would be to facilitate the establishment of associations between meteor showers and parent bodies among the many Near-Earth Objects that are being discovered.

Because of measurement uncertainty, low number statistics, or gaps in temporal coverage, newly discovered meteor showers can be named for different nearby stars, which in the past resulted in the same shower carrying multiple names. Over time, this had resulted in an opaque literature, where authors would not be able to compare new detections to earlier discoveries. Since the formal establishment of the MSN-WG in 2006, an official list, naming and numbering system has been maintained that has made it possible for authors to recognize when a meteor shower is established, was previously detected, or is new. This list also maintains formal parameters of the meteoroid stream that identify the stream, can be used to validate parent body-stream associations, and probe dynamical models of parent body evolution.

Contributions to the Working List are made from photographic-based meteoroid orbit surveys, video-based surveys, as well as omnidirectional and narrow-beam radar-based surveys in many countries in the world. Meteor showers are an excellent tool to study the history, development and origins of the Solar System because they are the direct result of cometary mass loss through their approach to the inner solar system. All particles of

a particular shower share the same parent, enabling to study the parent, being known or not, through proxy orbital observations of the dust and meteoroids it produced sometime in the past. This characteristic of meteor showers is an advantage over the sporadic meteors orbital properties, which have evolved significantly over the time due to the effect of planetary perturbations and a number of non-gravitational factors. A good understanding of meteor showers is also important to satellite operators, to human space travel endeavors, and to those studying planetary atmospheres and airless bodies.

2. Developments within the past triennium

The task of the Working Group on Meteor Shower Nomenclature is to construct a short list of meteor showers that are ready to be called *established*, so that they can receive their official name by the IAU. Once a new shower is proposed, it is entered in a Working List of Meteor Showers and assigned a unique number, 3-letter code, and name by the IAU Meteor Data Center. The working list is posted at the website of the IAU MDC: <http://www.ta3.sk/IAUC22DB/MDC2007/>. When additional evidence is obtained that the shower is real, the MSN-WG evaluates that data and presents to Commission F1 a list of showers that deserve to be called *established*. That list will be the final product of the WG. It will be then formally accepted, in total or modified form, during a vote at the IAU General Assembly in 2018.

According to the latest official report published in the special issue resulting from the Meteoroids 2016 conference in Noordwijk, the Netherlands, by (Jopek & Kánuchová 2017, Jopek & Kánuchová (2017)), the MDC currently lists 112 *established* showers, 563 in the working list, among them 36 have the *pro tempore* status. The list of shower complexes contains 25 groups, 3 have *established* status and 1 has the *pro tempore* status. Specifically, in the past triennium, new meteor showers submitted to the MDC database were detected amongst the meteors observed by CAMS stations (Cameras for Allsky Meteor Surveillance; (Jenniskens *et al.* 2016, Jenniskens *et al.* (2016))), those included in the EDMOND (European viDeo MeteOr Network Database; <http://www.daa.fmph.uniba.sk/edmond>; (Kornoš *et al.* 2014, Kornoš *et al.* (2014))), those collected by the Japanese SonotaCo Network, recorded in the IMO (International Meteor Organization; <http://sonotaco.jp/doc/SNM/>) database, observed by the Croatian Meteor Network (CMN; (Šegon *et al.* 2016, Šegon *et al.* (2016))).

Efforts to survey the largely unexplored Southern Hemisphere ecliptic sky have also become critical. Until very recently, only 10% of surveys were performed at southern latitudes ((Brown *et al.* 2008, Brown *et al.* (2008))). In the past three years radar and optical surveys in at southern ecliptic latitudes were reported by (? , Pokorný *et al.* (2017)) using the Southern Argentine Agile MEteor Radar (SAAMER), and by (Jenniskens *et al.* 2018, Jenniskens *et al.* (2018)) using CAMS. Many new showers were reported and their future status in the list currently are being considered.

3. Closing remarks

The activities of the MSN-WG is a continuous effort. As technology evolves becoming both, technologically and financially more accessible, the development and deployment of observing network is no longer limited to large observatories or professional research groups. In fact, one of the great successes of the Commission F1 is the large contribution by amateur astronomers and observers. This rapid grow and the initial “unfiltered” report of potentially new showers by these groups make the activities of this WG more critical than ever. For example, (Koseki 2016, Koseki (2016)) reported some inaccuracies in the

identification of meteor showers in the IAU MDC attempting to detect and remove some of these by recalculating the orbits based on the radiant data and the radiants from the orbits. More importantly, the authors found a mixture of the definition of showers. During the second half of 2017, there was an “explosion” of shower reports by the new Brazilian Meteors Observations Network (BRAMOM; <http://www.bramonmeteor.org/bramon/>), increasing the list of all shower to over 900. No doubt many of these are duplicates, and so the WG will address this challenging task during the next triennium.

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