

Definitions of terms in meteor astronomy

Commission F1 of the International Astronomical Union (IAU), recognizing that

- there is persisting confusion about the correct usage of terms related to meteor astronomy in scientific literature and among the general public and that*
- the “basic definitions in meteoric astronomy” adopted at the IAU General Assembly in 1961 do not correspond to the current state of knowledge,*

approved the following definitions, explanatory remarks, and comments concerning the terms to be used in meteor astronomy:

The definitions of fundamental terms

Meteor is the light and associated physical phenomena (heat, shock, ionization), which result from the high speed entry of a solid object from space into a gaseous atmosphere.

Meteoroid is a solid natural object of a size roughly between 30 micrometers and 1 meter moving in, or coming from, interplanetary space.

Dust (interplanetary) is finely divided solid matter, with particle sizes in general smaller than meteoroids, moving in, or coming from, interplanetary space.

Meteorite is any natural solid object that survived the meteor phase in a gaseous atmosphere without being completely vaporized.

Meteoric smoke is solid matter that has condensed in a gaseous atmosphere from material vaporized during the meteor phase.

The explanatory remarks, comments and secondary definitions (in bold)

Remarks to *meteor*

- The meteor phenomenon can be caused by a meteoroid, an asteroid, a comet or any solid matter with the appropriate combination of velocity, mass and mean-free-path in a planetary atmosphere.
- Meteors can occur on any planet or moon having a sufficiently dense atmosphere.
- The radiation phenomenon accompanying a direct meteoroid hit of the surface of a body without an atmosphere is not called a meteor but an **impact flash**.
- A meteor brighter than absolute visual magnitude (distance of 100 km) -4 is also termed a **bolide** or a **fireball**.
- A meteor brighter than absolute visual magnitude -17 is also called a **superbolide**.

- **Meteor train** is light or ionization left along the trajectory of the meteor after the meteor has passed.

Remarks to *meteoroid*

- "Roughly", because the 1 meter size limit is not a physical boundary; it is set by agreement. There is a continuous population of bodies both smaller and larger than 1 meter. Bodies larger than 1 meter tend to be dominated by asteroidal debris, rather than debris from comets.
- "Roughly", also because the 30 micrometer size limit is not a physical boundary; it is set by agreement. There is a continuous population of bodies both smaller and larger than 30 micrometers. Bodies smaller than 30 micrometers, however, tend to radiate heat away well and not to vaporize during an atmospheric entry.
- In the context of meteor observations, any object causing a meteor can be termed a meteoroid, irrespective of size.
- **Meteoroid stream** is a group of meteoroids which have similar orbits and a common origin. **Meteor shower** is a group of meteors produced by meteoroids of the same meteoroid stream.

Remarks to *dust (interplanetary)*

- Dust in the solar system is observed e.g. as the **zodiacal dust cloud**, including **zodiacal dust bands**, and **cometary dust tails**. In such contexts the term "dust" is not reserved for solid matter smaller than about 30 micron; the zodiacal dust cloud and **cometary dust trails** contain larger particles that can also be called meteoroids.
- Small dust particles do not give rise to the meteor phenomenon when they enter planetary atmospheres. Being heated below the melting point, they sediment to the ground more or less unaffected. When collected in the atmosphere, they are called **interplanetary dust particles** (IDP's). When in interplanetary space, they are simply called **dust particles**. The term micrometeoroid is discouraged.
- Small (typically micron-size) non-vaporized remnants of ablating meteoroids can be called **meteoritic dust**. They can be observed e.g. as **dust trails** in the atmosphere after the passage of a bolide.

Remarks to *meteorite*

- A meteoroid in the atmosphere becomes a meteorite after the ablation stops and the object continues on **dark flight** to the ground.
- A meteorite smaller than 1 millimeter can be called a **micrometeorite**. Micrometeorites do not have the typical structure of a fresh meteorite – unaffected interior and fusion crust.
- Foreign objects on the surfaces of atmosphereless bodies are not called meteorites (i.e. there is no meteorite without a meteor). They can be called **impact debris**.

Remark to ***meteoric smoke***

- The size of meteoric smoke particles (MSP's) is typically in the sub-100 nm range.

This document was approved by the majority of members of IAU Commission F1 participating in the electronic voting completed on April 30, 2017.