

International Meteor Organization

MONOGRAPH N° 3

HANDBOOK
FOR PHOTOGRAPHIC
METEOR OBSERVATIONS

Jürgen Rendtel

Handbook for Photographic Meteor Observations

ISBN 2-87355-002-3

Print: André Gabriël, Edegem, Belgium

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Potsdam 1993, original handbook production by Jürgen Rendtel

Utrecht 2002, minor textual changes by Marc de Lignie

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Foreword

Observational meteor astronomy differs from most other types of observational astronomy in that the events of interest can not be predicted to occur in a given direction or at a precise time. Although the major meteor showers perform more or less reliably each year, there is still a considerable element of chance if the observer has a limited time to devote to observations. Perhaps it is just this unpredictable nature that makes meteor observing so attractive to many enthusiasts – that spectacular fireball, a new meteor shower, or a true meteor storm from a classical shower, might just occur the next time we observe.

As is clearly explained in this *Handbook*, the amateur astronomer is sometimes in a position to make observations of unique importance. Photography has been the traditional means of securing permanent records of meteoric activity and it remains a major technique today. The equipment to be used and the observing techniques require considerable planning, however, plus a basic understanding of meteor astronomy, if the best results are to be achieved.

In the pages that follow, the elements of photographic meteor astronomy are carefully explained. Whether the observer chooses to develop a simple observing facility or a complex one with sophisticated controls, the *Handbook* will steer him in the right direction. Experience may then indicate areas in which the observer can improve his productivity. Meteor astronomy remains one of relatively few fields where the amateur can make a real contribution to our knowledge of the solar system. The probability of success is greatly increased, however, if the observational program has been planned with care.

Ian Halliday,
Ottawa, Canada.

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INTRODUCTION

Meteors are fast moving atmospheric phenomena of short duration. When choosing an appropriate observing method, one has to bear in mind this fact. Currently there are several different methods developed and in use:

OPTICAL

- Visual observations – naked eye
 - telescopes/binoculars
- Photographic observations
- Video observations

RADIO

- Meteor forward scatter
- Radar (meteor backscatter)

These methods have advantages and disadvantages and require differing amounts of effort and equipment. Some examples will help to illustrate this point.

The cheapest method is the visual observation, using no instrumentation except a precise watch and some means of noting the observed facts. Unfortunately, our brain cannot store the meteor data such that their appearances can be correctly repeated later. This is the main source of uncertainty, affecting both position and brightness estimates. On the other hand, video observations, for instance, require expensive equipment but do allow a more complete analysis of all meteors recorded. All the methods that rely on the optical emission of a meteor are dependent on a clear sky and a low amount of scattered light, but are generally restricted only to nighttime observations.

The alternative to this is to use the radio range of the electromagnetic spectrum in place of the optical. Meteor forward scatter observations are somewhat easy to make despite weather or daylight, but generally will not give information about the meteor's direction or shower association. Also, the reflections depend on complicated geometrical conditions being met between the transmitter and the receiver. An alternative method in the radio range does exist in the form of radar (backscatter) observations. This technique may yield information about shower association and direction amongst other things, but it requires very expensive and technically advanced equipment and special permission to use the appropriate frequencies. Details about the methods briefly mentioned here can be found in other handbooks of the *IMO*. This text deals with photographic work and the advantages of photographic observations.

These advantages include the facts that the meteor trails are permanently recorded, information is simply stored, and because the information about the use of photography for astronomical purposes is known.

In this book you will find a description of suitable equipment for meteor photography, some suggestions and practical hints for photographic meteor observations and some guidelines for the analysis of successful meteor photographs.

The four main topics covered are:

- (1) Photography of faint meteors in a small field of view by common camera types
- (2) Photography with all-sky cameras, fish-eye and wide-angle lenses for fireball patrols
- (3) Photography of meteor spectra
- (4) Photography of persistent trains

For all these methods you will find details on the following covered in this handbook:

- cameras
- lenses
- films
- recommendations
- additional equipment
- practical work
- handling of materials

Besides these subjects which are dedicated to the practical side of the work, you will find information about the measurement and analysis of data from the photographs, including:

- Construction hints for additional equipment recommended earlier
- Calculations concerning double-station work
- Measurement of positions
- Photometric measurements

We do not delve into topics where other *IMO* handbooks cover material in detail, such as astrometric measurements and calculations. Also, we will avoid describing technical solutions that require special equipment or electronic circuits that are not generally available. This may be discouraging to a few advanced amateurs with special skills, but it would be unfair to the average amateur to show devices that work only under certain circumstances. In this respect we will use an approach that gives a description of the task and one example of how to solve the problem, though other solutions do exist. Finally, we will include a list of references and additional bibliographic information that should enable the reader to gain more insight on the techniques that are described in the text and provide greater background knowledge on the topic of meteors in general.

We hope you will find this book helpful in your photographic meteor work, and look forward to welcoming your results into the *IMO's* Photographic Commission databases. Good luck!