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ULTRAVIOLET SPECTROSCOPY OF METEORIC DEBRIS OF COMETS, Thomas J. Wdowiak, Department of Physics, University of Alabama at Birmingham, Birmingham, AL, 35294, William R. Kubinec, Department of Physics, College of Charleston, Charleston, SC 28424, and Joseph A Nuth, Solar System Exploration Div., NASA HQ, Washington, DC 20546

Introduction. It is proposed to carry out slitless spectroscopy at ultraviolet wavelengths from orbit of meteoric debris associated with comets. The Eta Aquarid and Orionid/Halley and the Perseid/1962 862 Swift-Tuttle showers would be principal targets. Low light level, ultraviolet video technique will be used during night side of the orbit in a wide field, earthward viewing mode. Data will be stored in compact video cassette recorders. The experiment may be configured as a GAS package or in the HITCHHIKER mode. The latter would allow flexible pointing capability beyond that offered by shuttle orientation of the GAS package, and doubling of the data record. The 1100-3200 A spectral region should show emissions of atomic, ionic, and molecular species of interest on cometary and solar system studies.

Discussion. Analysis of middle to far ultraviolet spectral data of meteoric debris of cometary origin has yet to be carried out. Objectives of such a study include:

1. Observation of many of the atomic species, both neutral and ionized, including the strong feature due to MgI at 2850A and the strong blend at 2800A due to MgII and MnI. An interesting possible metal emission is that of BeI at 2349A.

2. Carbon is an expected constituent of comet-associated meteors. Though spectral features can exist in the visible region, carbon cannot be observed due to masking, principally by iron. The 1000-2000A region should be relatively free of FeI and FeII emission allowing observation of CI 1193A, CI 1330A, CI 1561, and CI 1657A. In addition, strong SiI and SiII emissions exist in the region suggesting determination of the C/Si ratio.

3. Lyman alpha emission at 1215A due to hydrogen from H_2O and hydrocarbons. The video technique allows examination of temporal development of expected strong Lyman alpha.

4. Sulfur at 1807A, 1820A, and phosphorus at 1672A, 1675A, 1680A, and 1775A. Sulfur is a relatively abundant component of carbonaceous chondrites and its existence in cometary debris is of interest. The recent IUE observations by the U. of Maryland group, led by A'Hearn revealing dimer sulfur (S_2) emissions between

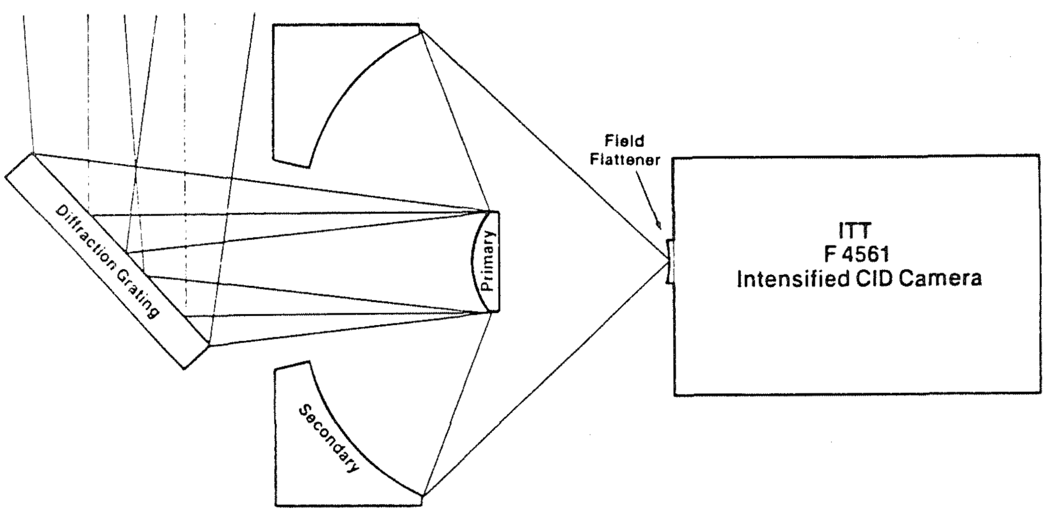
2820A and 3090A of comet IRAS-Araki-Alcock, makes the search for meteor sulfur all the more interesting.

5. SiO at 1310A.

Instrumentation. The experiment makes use of high speed (f ratio of 0.75) reflecting optics viewing a 12° by 12° field with an objective grating. The imaging detector is an intensified solid-state array having the following characteristics:

1100-3200A	6 ma/watt sens. (1500A)
UV intensified CID	20 ma/watt sens. (2500A)
244 x 388 pixels	CsTe/MgF_2 p.c./wind.
8.7 x 11.4 mm	ex. ITT F.4561

The dispersing element would be a 300 l/mm grating blazed for first order with a 250 A MgF_2 protective coating. Fig. 1 displays the proposed optical configuration.



In the GAS configuration, video data will be stored in a stack of up to four compact video cassette recorders. Depending upon recording speed, a total record duration for the four-stack would be eight to twenty-four hours. Because data is recorded for approximately twenty minutes per orbit, data would be gathered over twenty-four to seventy-two orbits. Control would be by microprocessor and total power required would be less than 1.2 KWH from a battery pack of less than 1 ft^3 and 100 lb.

A HITCHHIKER configuration would allow greater volume by utilizing shuttle power and additional GAS type containers for data storage. The optics/detector could then be gimbeled to allow pointing capability.

Comet Associated Meteor Showers (Cook 1973).

Shower & Comet	Dates	Peak Date
η Aquarids, Orionids, and P/Comet Halley[A,B]	Apr. 21-May 12 Oct. 02-Nov.07	May 03
Perseids and Comet 1862 III Swift-Tuttle[C]	July 23-Aug 23	Aug 12
τ Herculids and Comet 1930 VI Schwassmann-Wachmann 3	May 19-June 14	June 03
o Draconids and Comet 1919 V Metcalf	July 07-24	July 16
Annual Andromedids and the predicted orbit of P/Comet Biela for 1972	Sept. 25-Nov.12	Oct. 03
October Draconids and P/Comet Giacobini-Zinner 1946 V	Oct. 09	Oct. 09
Leo Minorids and Comet 1739 Zanotti	Oct. 22-24	Oct. 24
Pegasids, December Phoenicids, and Comet 1819 IV Blanplain	Oct. 29-Nov. 12	Nov. 12
Leonids and P/Comet Tempel-Tuttle 1965 IV	Nov. 14-20	Nov. 17
Monocerotids and Comet 1917 I Mellish	Nov. 27-Dec. 17	Dec. 10
Ursids and P/Comet Tuttle	Dec. 17-24	Dec. 22

A,B - Principle targets
C - Principle back up target

References

Cook, A.F., 1973, in Evolutionary and Physical Properties of Meteoroids, ed. C.L. Hemenway, P.M. Millman, and F.F Cook (NASA SP-319).

Bibliography

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