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THE P/HALLEY'S COMET ENCOUNTERING THE INTERPLANETARY MEDIUM

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RESUMEN. Las observaciones del cometa P/Halley en la noche del 15 de noviembre de 1985, T.U., se programaron con emulsiones espectroscópicas Eastman Kodak, 103 a 0 bajo filtro Corning 5030 + Schott GG13, λλ3900-4825, 103aE bajo filtro Wratten 29, para registrar sus características físicas a una moderada distancia del perihelio 1.72 U.A., Yeomas (1983). En los detalles de estructura a la escala de 94.7" por mm. de la cámara Schmidt 26"/28" de Tonantzintla, se imprimieron trazos en forma de bucles desplazados, cambiando de posición, mostrando un posible encuentro o impacto con material interplanetario o quizás desprendimientos.

ABSTRACT. The observations of the P/Halley's comet during the 15th. nigh of November, 1985, were programmed by using Eastman Kodak spectroscopic emulsions type 103 aO + Corning filter 5030 + Schott GG13, λλ3900-4825, and type 103aE under Wratten filter No. 29. This was done in order to register the physical characteristics at a moderate distance of the perihelion 1.72 a. u., Yeomans (1983). The structural details in a scale 94.7 arc-sec. per mm. of 26"/28" Schmidt Camera in Tonantzintla, traces loops that shift in shape, changing its position. They show a possible encounter or impact with interplanetary material.

Key words: COMETS-HALLEY — INTERPLANETARY MEDIUM

The observations of the P/Halley comet during the 15th. night of November, 1985, were performed using Eastman Kodak spectroscopic emulsions type 103aO + Corning filter 5030 + Schott GG13, λλ3900-4825, and type 103aE under Wratten filter No. 29. This was done in order to register the physical characteristics at a moderate distance of the perihelion 1.72 A.U. (Yeomans 1983). The structural details, in a scale of 94.7 arc sec. per mm. of 26"/28", Schmidt camera in Tonantzintla, traces a loops that shift in shape changing its position. Such shift show a possible encounter or impact either with interplanetary or released material.

The traces are weak on the 103aO plates, but on the 103aE, a brighter small trace is registered eliminating the possibility of poor/guiding, or turbulence effects or contrast effects in the emulsions.

The structures produced inside the comma are not perceived.

We think that the supposed Halley's encounter, at the date mentioned above, was due to the interplanetary medium.

Fig. 1 shows the plate ST7902, 103aE; 15.329 on November, 1985, U.T. with an exposure of 20 mins. The traces and the direction of the comet are marked, the approximate coordinates of the comet are R.A. $3^h54.4^m$ and Dec. +21°52.9' (1950).

The behaviour of the traces on the plate ST7902 is very similar to the graphics given by Alfvén (Alfvén 1976).

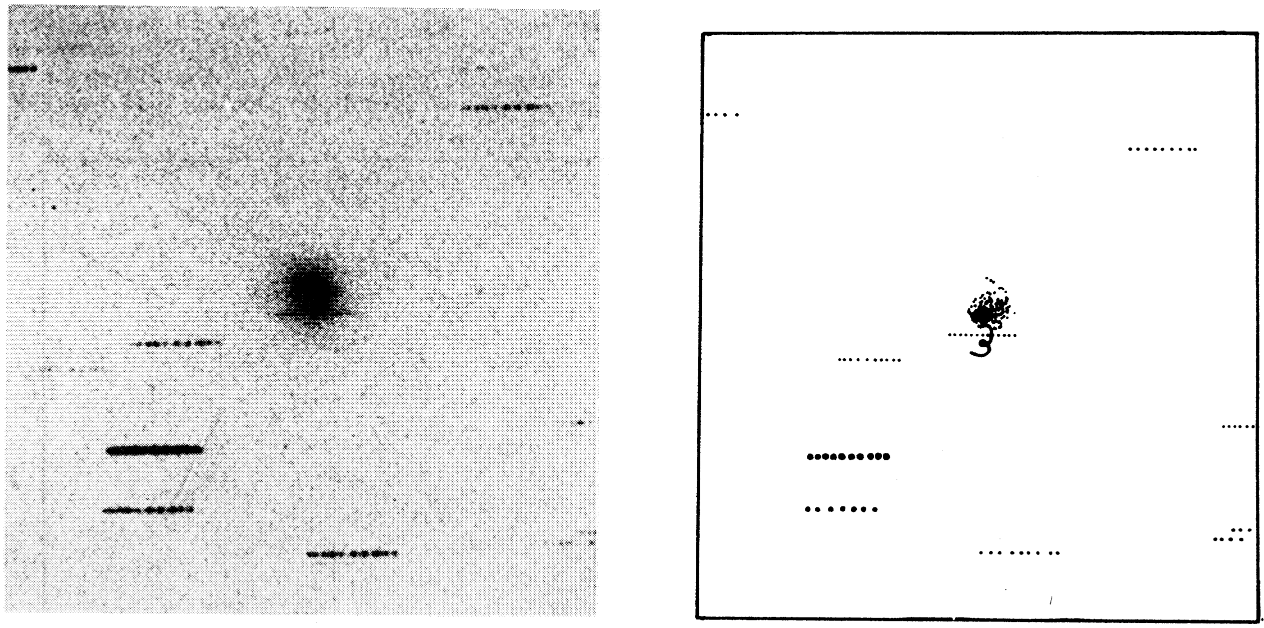

Fig. 1. Plate ST7902, 103aE under Wratten filter 29, Exp. 20 mins, 15.329 november 1985, U.T. on the right hand side are shown the drawings of the fragments.

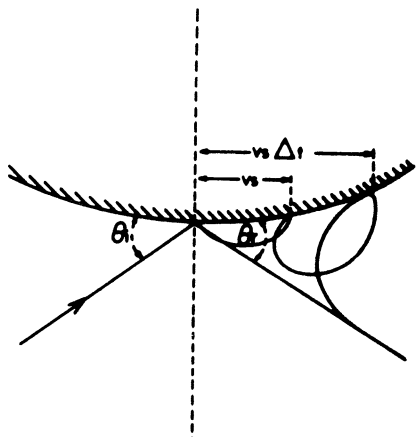

Fig. 2. Idealized scheme of the front of incident and reflect material at subsequent moments.

According to Alfvén, it is a prototype of Keplerian movement in bodies perturbed by collisions without taking into account the elastic and electromagnetic effects (see Fig. 2).

Another aspect to be sketched is the presence of weak traces in the neighborhood of the comet along the direction of its path -this can be seen also on the plate ST7902-. A digitalization of the image with a band step done by A. Vázquez, shows traces that may be the results from a diffuse reflection due to collisions of pieces of different sizes with a supposed rough border of the comet (see Fig. 3, Plate).

If we assume the material along the way of the comet as incident, it will be reflected at successive instants as crashed material. We assume a plane wave (Fig. 4) at 0 that becomes after collision a vibrating source with velocity Vs (this velocity does not contain the propagation -and elasticity- velocities). Other interaction possibility is due to the impact of meteorites and asteroids with the exterior rough part of the comet with possible rebound into the comet mass (Mc) with helicoidal paths producing an interface tangent line, at the different crests. That gives rise to a trajectory O with an apparent longitudinal attraction (see Fig. 4).

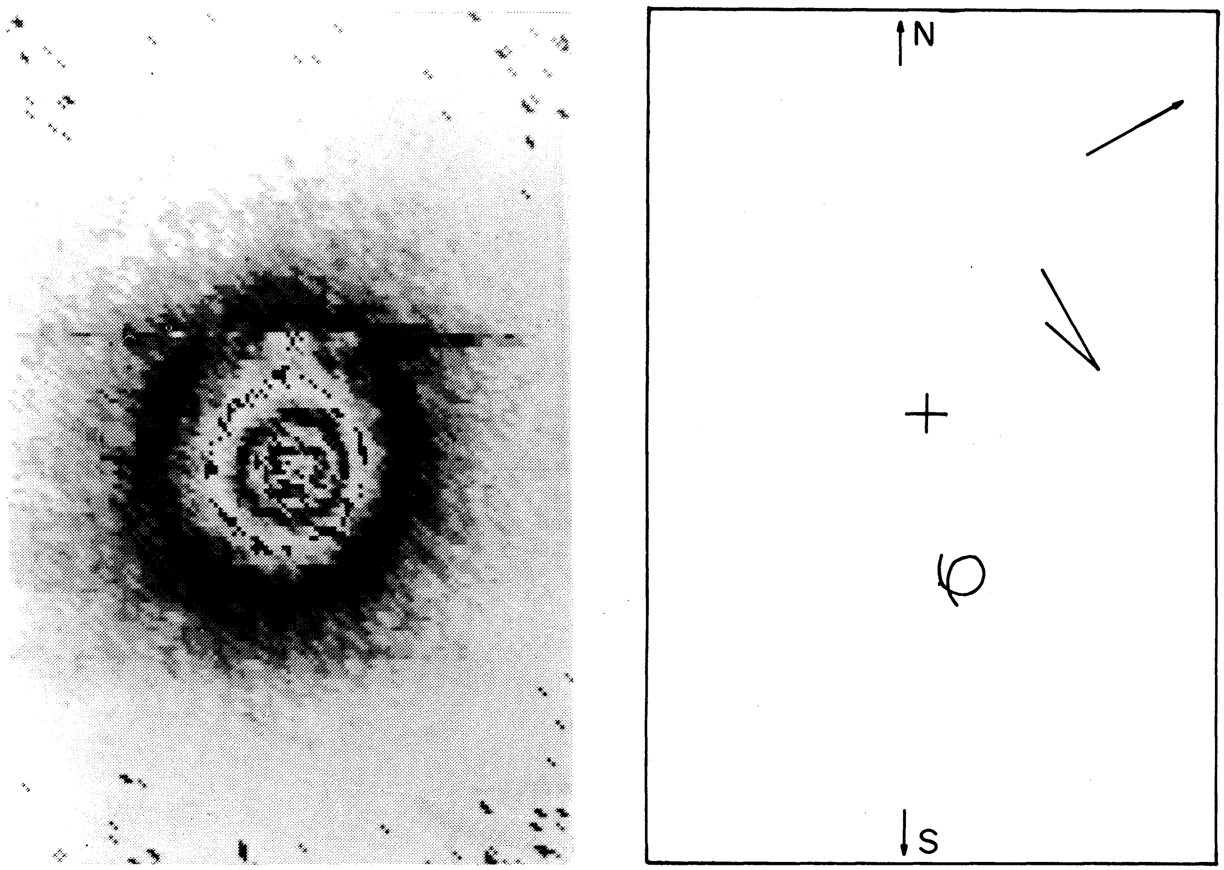

Figure 3. The left hand side of the figure shows the digitalization of the plate ST7902 and the right hand side shows weakly the outlines of the fragments.

The impact of such moving particles may produce break up pieces of the comet. To infer a definitive conclusion about the origin of the ringlets is critical because of the absence of plates showing this effect, specially at dense portions. However, a violent impact at the surface of the comet must have taken place because the traces of loop shapes show different distances. We assume that the separation time of the "boulders" from the comet is that of the exposure of the plate. Moreover, we must have in mind that only if the reflected particle is excited strong enough, an impression of its path on the plate, showing the shape and characteristics of the movement, may be possible. Therefore, if there are other observational data of the position of P/Halley at similar at dates, we have to recalculate the orbital elements in order to establish partial anomalies (Skripnichenko 1970).

About the relative movements of the pieces of surface broken material, we can assume that the "boulders" could originate craters, grooves, fissures, increasing the volume or diminishing the mass. A plate taken later has been digitalized, its image has also been reconstructed and it shows at the denser part of the comet, vestiges of irregular cleavages with pass band at higher resolution. The observation could not be repeated with shorter exposure time. Wherefore our assumption could be uncertain. With sufficient data of the physical properties of the comet we could analyse better the paths of the "boulders" and we would get more convincing

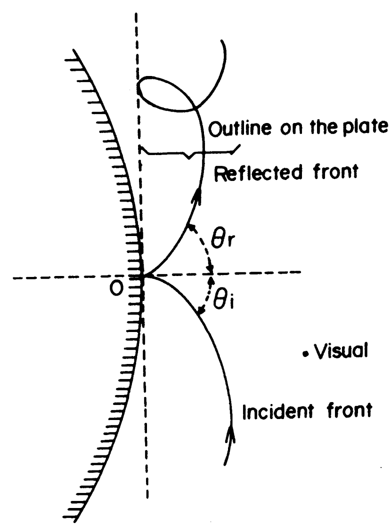

Fig. 4. Supposed incident -and reflected fronts- of material by a rough border of the P/Halley comet, where the influence of a planewave front is perhaps present.

information about the physical effects of the collisions between boulders and the comet. Harwit (1968) in his analysis about the spontaneous break up of comets, lists data on the processes of "non-mareas". We transcribe a paragraph that is close to our observations: "A possible explanation for this concentration might be found in collisions of these comets with interplanetary "boulders"-roughly 10-meter-sized meteorites that might be expected in interplanetary space. Harwitt (1967) has discussed the possibility of finding such objects in large numbers. Although the kinetic energy of impact of a boulder colliding with a parabolic comet could be high enough to produce the observed velocities of separation, it is more likely that the impact itself only triggers the action. The heating produced in the impact (we deal here with impact crater sizes well over 100 meters in diameter) could lead to explosive exothermic reactions among cometary materials; ..."

The abrupt asteroidal impacts exposed here, demand a more extensive and detailed analysis of our material.

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