

# A Study of Disconnection Velocities in the Plasma Tail of P/Halley

*Roland Caron*<sup>1</sup>, *Serge Koutchmy*<sup>2</sup>, and *Michel Sarrazin*<sup>1</sup>

<sup>1</sup>19 av. Marcellin-Berthelot, F-92390 La Garenne, France

<sup>2</sup>Institut d'Astrophysique de Paris, 98 bis Bd. Arago, F-75014 Paris, France

During a photographic campaign on Comet P/Halley in 1986 April, a considerable number of photographs were obtained, especially on April 8, of a disconnection event in the plasma tail. Initial details were presented at the Symposium in Heidelberg at the end of 1986.

The photographs were obtained with a camera five examples of which were specially constructed (by Carron), and known as the K600. The objective is a 100-mm OG, focal length 600 mm and the image is corrected with a field lens. The camera body is a Hasselblad, taking 120 roll film, which was Agfa 1000.

Each camera was mounted on a guide telescope with means of sidereal and cometary tracking. The sites used for the expeditions were New Caledonia, La Réunion, Namibia, Chile and Tahiti. At Tahiti, a second instrument consisting of a 135-mm objective in front of an image-intensifier was used to obtain other images used in this study.

Images selected for use were: La Réunion 4; Namibia 1; Chile 9; and Tahiti 8. It should be noted that measurements were made on prints, the scale of which was rigorously controlled to be the same for each plate.

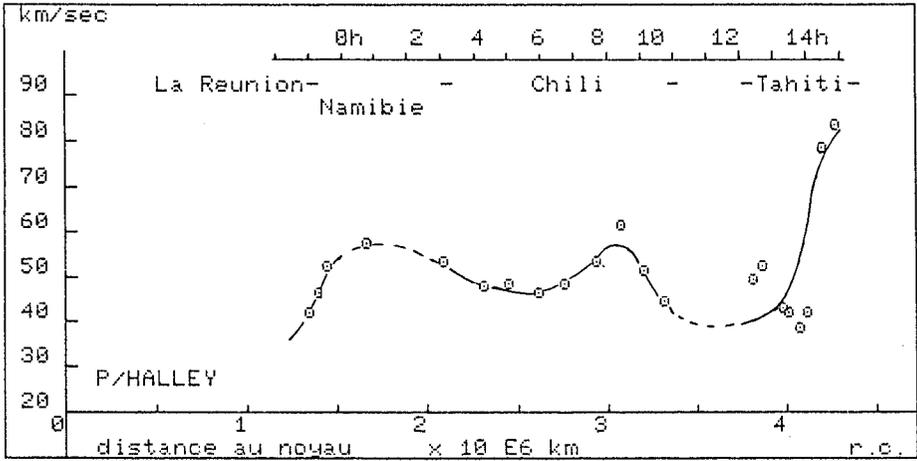
Graphic software was developed to give the maximum precision for all the positional elements of the comet within the star-field and of the position of the plasma tail. The position of the cometary nucleus is calculated from the location of several known reference stars. The anti-solar direction is determined and drawn in, graduated in  $10^5$  km as a function of phase angle, i.e. in the tail's real position with respect to the line of sight.

Various other values were calculated for the time of each exposure. The screen image was dumped to a printer and copied onto transparent overlays. Alignment of the transparencies was carried out by carefully superimposing the appropriate stars (with due regard to the trails resulting from following the comet during the 20–30 minute exposures used for the K600 images). This procedure allows all the measurements of displacements within the plasma tail to be related to the same reference point (that of the nucleus according to published ephemerides).

The measurements obtained as outlined above are shown in the Figure. As will be seen, the mass of ionized gas representing the disconnection event investigated is not carried along by the solar wind with either a uniformly accelerated or decelerated velocity. The first two accelerations take the velocity of the knot of gas to 57 km/s

and 52 km/s, while the minima are of the order of 41 km/s. The end of the curve shows a considerable increase in velocity. This is derived from the last two images obtained of this disconnection.

This study shows that particularly violent events occur in the gas tails of comets like P/Halley, driven by sudden changes in the velocity and direction of the solar wind. It should be noted that there is no evidence for tangential displacement – that is in the plane contained by the image plane.



Velocity curve for the 1986 April 8 disconnection event

**Reference**

R. Caron et al.: 20th ESLAB Symposium on the Exploration of Halley's Comet, Heidelberg, 1986