

Coma structures analysis for comet Schwassmann-Wachmann 3, components

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Introduction

Discovered in 1930, the Jupiter family comet 73P/Schwassmann-Wachmann 3 (SW3) has been widely observed since 1995 after a breaking event split the nucleus in five components labelled 73P-A to E. During the 2006 appearance, two of them (B and C) showed a very strong activity. Our observations from 21 January to 25 May 2006 (R filter images enhanced by numerical methods) revealed the presence of fan-like structures in the comae of both components and evidences of fragmentation events for component B.

Fan-like structures in the comae

For this study, we processed R filter calibrated images with an adaptive Laplace filtering as described in [2]. In case of the presence of structures in the comae, we did two independent verifications with a radial normalization and a look for anisotropies in the isophotes. We observed the presence of fan-like patterns in component B and C. For component C, the two features observed (fig. 1) were visible in almost all our exposures. Following the approach of [3] we considered these patterns as coma fan structures produced by active dust-emitting sources on the rotating nucleus. Therefore, we measured the position of the median line of the fan and, assuming no precession, we used this information to constrain a possible orientation for the rotation axis. A best fit of our model is presented figure 2.

Fragmentation events of component B

Component B displayed also a fan like pattern but this structure did not remain long enough to constrain sufficiently the rotation axis. However this component showed more activity than the previous one, and we could focus our study on an other topic. As many observer noticed, component B experienced several outbursts in April and May 2006. A few hours after these events, we discovered in our images the presence of arclets which remained one or two days. We established then the presence of small fragments in the tailward direction. We believe these sequences (outburst, arclets, fragments) to be signatures of nucleus fragmentations as described in [1].

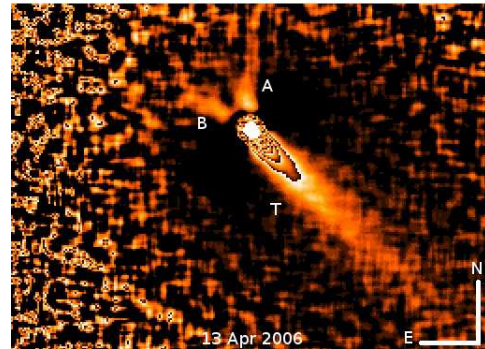


Figure 1: Images of comet 73P/Schwassmann-Wachmann 3C, enhanced by Laplace filtering, showing the two coma structures (A and B) and the dust tail (T). Orientation given in the figure, field of view $270'' \times 105''$.

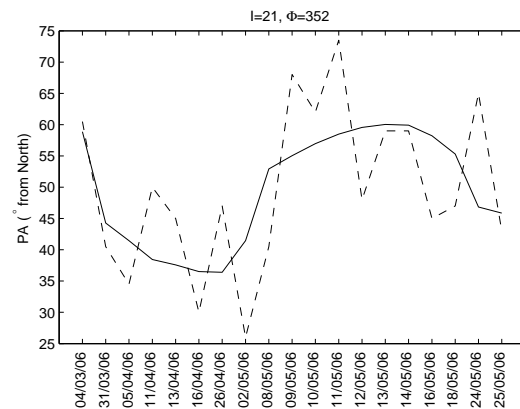


Figure 2: Best fit of the rotation axis projected position for our observation dates. The dashed lines are the measured position angles of the mean point between the two structures described in the text. The solid line is the projected position of our best possible rotation axis (defined by $I=21^\circ$, $\Phi=352^\circ$ at perihelion) assuming this position should lay close to the projected axis of the fan and a fixed rotation axis (no precession).

References

- [1] Bönhardt, H. 2004, *Comets II*, 301
- [2] Bönhardt, H. & Birkle, K. 1994, *A & AS*, 107, 101
- [3] Sekanina, Z. 1987, *ESA SP-278*, 315