

Asymmetric Dust Jets and Extended Structure of 22P/Kopff Observed during 2009 Appearance

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We observed the short-period comet 22P/Kopff during the 2009 appearance with MITSuME 3-color simultaneous imaging CCD cameras of Ishigakijima astronomical observatory and a 2kCCD camera of Kiso observatory from 2009 August to December after the perihelion passage on 2009 May [1].

In the observation, we confirmed the diffuse coma structure around the nucleus and the asymmetric fanshaped jet structure toward the south (Fig. 1). In addition, the dust trail was detected on the project orbit of the comet, while the obvious neck-line structure could not be confirmed.

With the observational data of the asymmetric jet, we deduced the direction of the rotational axis. We analyzed the time evolution for the position angle of the rotational axis and obtained the pole orientation of $(\alpha_{pl}, \delta_{pl}) = (302^\circ \pm 30^\circ, 62^\circ \pm 10^\circ)$ or $(\alpha_{pl}, \delta_{pl}) = (122^\circ \pm 30^\circ, -62^\circ \pm 10^\circ)$.

Then, we modified the theoretical model of the dust ejection [2] in order to explain the dust trail and the asymmetric jet, and performed the numerical simulation (Fig. 2). As a result, we found the observed dust structure can be well reproduced by the dust emission near the south polar region (Fig. 3).

This means that the polar region of the comet is still active, while most of the surface is becoming dormant.

References

- [1] Hanayama, H., et al.: 2012, *PASJ*, **64**, 134.
- [2] Ishiguro, M., et al.: 2007, *Icarus*, **189**, 169.

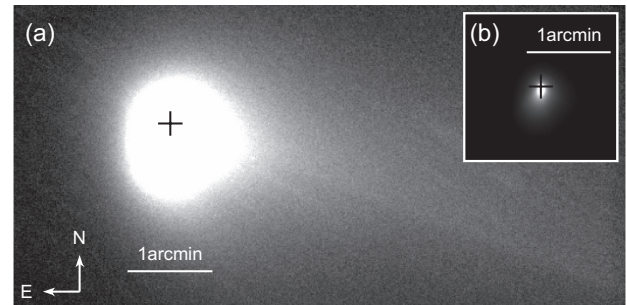


Figure 1: Images of 22P/Kopff on 2009 August. (a) shows the diffuse dust structure, including a linear tail. (b) shows the fan-shaped jet structure around the comet nucleus.

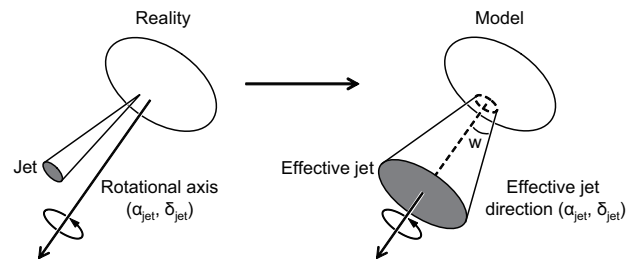


Figure 2: Image of the cone-shaped dust jet influenced by rotation of the comet nucleus.

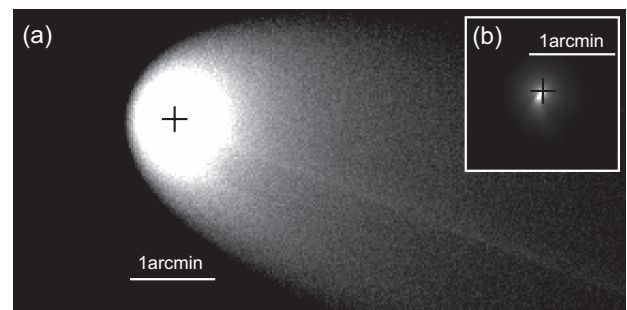


Figure 3: Images of the numerical simulation of 22P/Kopff based on the dust ejection model considering the asymmetric jet.