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Sublimation-Driven Evolution of the Local Radius and the Moment of Inertia of Short-Period Comets

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A b s t r a c t

This article is a continuation of the previous one considering the evolution of a long-period comet. The changes of the local radius and the moment of inertia as well as the orientation of the rotation axis are calculated. With reference to the previous model, the time-dependent orbital parameters are introduced. The procedure of sublimation-driven evolution is implemented to the comets 67P/Churyumov-Gerasimenko, 9P/Tempel 1, and 81P/Wild. The inclination of the rotation axis of Comet Ch-G is calculated. The position of the rotation axis is a result of the best fit of the water production rate curve received from modelling to the observational water production rate curve. The method is verified through application to Comets 9P/Tempel 1 and 81P/Wild with well-known positions of the rotation axes. The best fit is for inclination of the rotation axis which is close to the position of the rotation axis with minimum energy (maximum of the moment of inertia). For the best fitted position of the rotation axis $I = 90°$ and $\Phi = 60°$, the largest decrease of radius was about 5.6 m in the northern polar region. The smallest decrease of radius, of about 0.3 m, was noticed on cometographic latitudes between 39° and 46°.

Key words: Comet 67P/Churyumov-Gerasimenko, Comet 9P/Tempel 1, Comet 81P/Wild 2, moment of inertia, short-period comets.