

## THE SPIN OF 103P/HARTLEY 2 AND ITS EVOLUTION DURING THE EPOXI/DIXI ENCOUNTER

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Clear evidence of an excited spin for the nucleus of comet 103P/Hartley 2 was obtained in EPOXI approach photometry beginning 60 days before encounter (UT 2010 Nov 4, 13:59:47.7). We discuss the seven periodicities that were found, their internal harmonic relationships, and the evidence for their change with time. One group of periodicities was found to increase while the other was found to decrease as the encounter progressed (Figure 1). One of the periodicities ( $18.34 \pm 0.04$  hr at encounter time) is close to independent estimates made by a number ground-based studies including  $16.43 \pm 0.1$  hr by Meech et al [1] and  $18.15 \pm 0.05$  hr by Harmon et al [2] who both observed the nucleus directly but at different times. We identify this periodicity as the period of precession of the long axis of the nucleus around the angular momentum vector. We present an analysis of the remaining periodicities that shows they are consistent with one of two possible periods of the spin component around the long axis. We expect to remove this ambiguity by comparing predictions of the two possible states with the approach light curve and the periodic behavior of jet activity seen in the EPOXI images and spectra. Regardless of which period is appropriate the nucleus appears to be losing rotational energy rapidly while the measured periodicities indicate that the primary components of the spin are in a

near commensurate relationship as was seen earlier in the case of comet 1P/Halley.

We also present an analysis of the orientation of the spin state in space. This employs measurements of the changing length of projected axis of figure on approach to encounter and position angles of the axis of figure. This work was supported by NASA through the Discovery Program contract for the EPOXI mission, NNM07AA99C, to the University of Maryland.

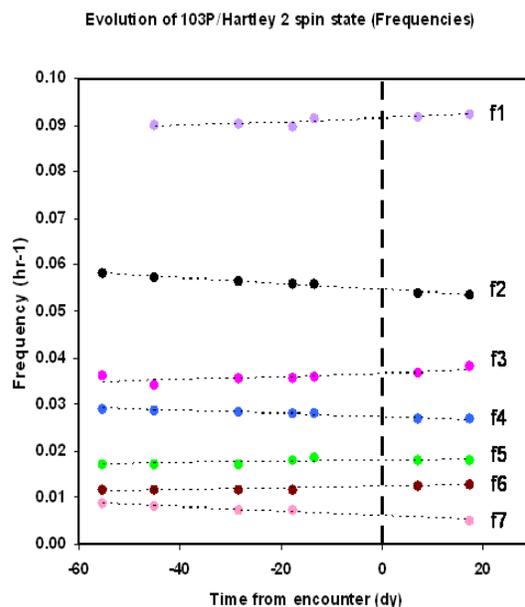


Figure 1. Evolution of the spin rate of 103P/Hartley 2 through the encounter. For each of the seven periods shown we have super-posed an equal weight linear trend-line.

Three of the frequencies are seen to decrease with time ( $f_2$ ,  $f_4$ ,  $f_7$ ) and four are seen to increase ( $f_1$ ,  $f_3$ ,  $f_5$ ,  $f_6$ ).

**References:**[1] Meech *et al.* 2011. LPS Abstract (this meeting); [2] Harmon *et al.* 2010, IAU Circ. #9179.