THE EARTH-BASED OBSERVING PLAN FOR THE STARDUST-NExT MISSION. K. J. Meech[1], J. Pittichova[1], and M. J. S. Belton[2], [1]Institute for Astronomy, 2680 Woodlawn Drive, Honolulu HI 96822, meech@ifa.hawaii.edu, jana@ifa.hawaii.edu, [2]Belton Space Exploration Initiatives, LLC, 450 S. Randolph Way, Tucson AZ 85716, michaelbelton@beltonspace.com .

Introduction: The Stardust-New Exploration of Tempel (Stardust-NExT) mission uses the Stardust spacecraft to flyby of the nucleus comet 9P/Tempel 1 at 200 km on February 14, 2011 (39 days post perihelion) and obtain high-resolution images of the coma and nucleus, as well as measurements of the composition, size distribution, and flux of dust emitted into the coma. The mission will image the crater made by Deep Impact [1], and will look for changed in the surface morphology between perihelion passages.

Earth-Based Observations: A critical component of timing the flyby will be knowledge of the comet's rotation period. The observing campaign for Deep Impact [2] showed that since 1999 the rotation period of the comet is changing (Fig. 1) [3]. We have developed a model of the changing spin period caused by torques from non-uniform outgassing of the nucleus. We have embarked upon an international campaign to observe the nucleus when it is inactive to precisely determine the spin period to enable the mission to time the flyby so that the DI impact crater can be imaged.

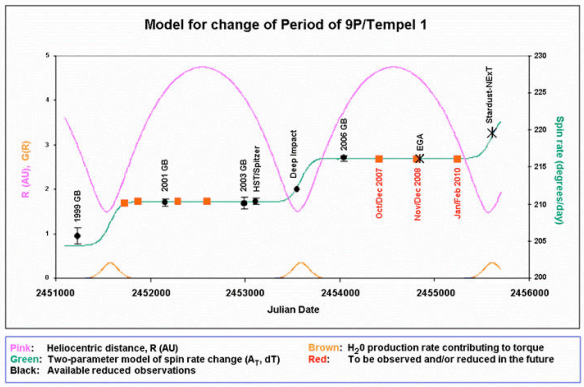

Figure 1. The black points with error bars are observations of the spin rate of 9P/Tempel 1 (right axis). The red points are where observations are either intended to be taken in the future or where currently unreduced data exist. The green line is a model of spin rate change. Also marked are the Earth gravity assist and encounter dates.

The latest time that a major adjustment can be made to the arrival time at the comet is at EGA on 01/15/2009 some 2.1 years before encounter. We need to be able to predict the rotational phase of the comet when the spacecraft arrives to a precision of 0.015 revolutions, and this will require international observing campaigns during Oct/Nov 2006, Oct-Dec 2007, Nov-Dec 2008 and Jan-Feb 2010. We already haveexcellent data from 2006- 2007. To meet these requirements from ground-based observations, the comet should be near opposition. The rotation rate is expected to remain unchanged while the comet is inactive; thus, observations from late 2006 through 2010 can be combined to obtain a very accurate spin period. The ability to determine the rotation rate depends on two factors: (1) the time difference between the earliest and latest light curves obtained, and (2) how well the earliest and latest light curves obtained can beregistered to each other.

We will present the results of the international campaign and discuss the implications for the rotation.

References:

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