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# Refined rotation period and confined pole solution of main belt comet 176P/Linear

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## Abstract

## 1. Introduction

### 1.1 Background

Comets are icy relics left over from the planetary accretion disk. Most of them were scattered far out in the Oort Cloud, the scattered disk, or the Kuiper Belt during the early evolution of our solar system and only a few revolve on shorter orbits around the Sun. By investigating these most pristine bodies, we gain insight into processes and conditions in the early solar system and the subsequent evolution of small bodies. It is believed that comets played a role in the history of Earth's evolution and may have contributed significantly to the water inventory we see today on Earth. A key goal of the University of Hawaii NASA Astrobiology Institute (UH NAI) is to investigate the origin, history and evolution of water in the solar sys-tem and its relation to life.

### 1.2 Main Belt Comets

Main Belt Comets (MBCs) are a recently discovered and exciting new class of objects in our solar system [1]. These small bodies reside within the asteroid belt between Mars and Jupiter and show both comet and asteroid like characteristics. Being closer to the Sun than Kuiper Belt or Oort Cloud comets, MBCs provide a great opportunity for research. Moreover, they are accessible with low cost missions for in-situ exploration.

Currently, only seven MBCs are known: 133P/Elst-Pizarro, 176P/LINEAR, P/2005 U1 (Read), P/2008 R1 (Garrad), P/2010 R2 (La Sagra), P/2010 A2 (LINEAR), and 596 Scheila. It is crucial to learn as much about their physical properties in order to understand the mechanisms of their activity and make inferences about the origin and distribution of volatiles in the early solar system through thermal modeling and in-situ observations.

A recent study of ice lifetime on main belt asteroids showed that the ability of ice to remain on the body is a sensitive function of temperature [2]. The distribution of heat on the surface depends on rotation period and obliquity of the spin axis. At this time, limited informa-tion is available for 176P/LINEAR. For the rotation period, two likely candidate values of 14.68h and 19.53h have been found, and a rough dust production rate of $< 0.04$ kg/s was obtained using ground bases observations [3].

An investigation with the Spitzer Space Telescope combined with ground based observations enabled the determination of the geometric R-band albedo $pR = 0.06 \pm 0.02$ and the effective radius of $re = 2.0 \pm 0.2$ km [4].

Model studies of MBCs [1,5] will benefit from ob-servational determination of the rotation period and obliquity.

## 2. Observations

Between 12/13/2007 and 08/31/2010 comet 176P/LINEAR was targeted in a dozen observing runs using the UH2.2m telescope facility on Mauna Kea, Hawaii. The dataset includes observations in V and R band under mostly photometric conditions. The total integration time is >84000s. This allows the determination of the heliocentric light curve and the rotational period of the nucleus. A light curve based on data taken in previous years than the current work is being published by Hsieh H. et al. (2011) [5]. The stated rotation period of 22.23 +/- 0.01 hr seems to be in agreement with the period found in this work but final data analysis is still in progress and will be finished at the conference.

Adding the current data set of observations will help to refine the rotation period and will allow us to further narrow down the pole orientation that is currently listed between $50° \leq \varepsilon \leq 75°$ [5] .

Final results are not yet available at the time of this abstract submission and the abstract will be updated.

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