THE EPOXI EARTH-BASED OBSERVING CAMPAIGN. K. J. Meech[1], the EPOXI Earth-based observing team and the EPOXI/DIXI Science Team, [1]Institute for Astronomy, 2680 Woodlawn Drive, Honolulu, HI 96822, USA, meech@ifa.hawaii.edu.

Introduction: As was the case for the Deep Impact mission [1], a large Earth-based observing campaign was coordinated for the EPOXI mission to characterize the target comet nucleus in preparation for encounter and to cover timescales, wavelength regimes and instruments not accessible to the in-situ observations. When combined with the spacecraft encounter observations, this provides a comprehensive portrait of the comet. Here we provide an overview of the Earth observing coordinated observing program.

Observing Coordination: The observing campaign began in May-July 2008 with the recovery observations of comet 103P/Hartley 2 [2] and Spitzer infrared observations of the nucleus [3]. During April-June 2009 there was a coordinated effort to determine the rotation period [4]. Telescope time was allocated with the LBT in March, the Hubble Space Telescope in April, Gemini North and South telescopes in May, and the VLT, the GTC and the SALT 11-m telesopes in July. Only the HST and the Gemini runs were successful (owing to weather problems). During 2010, leading up to encounter, the Earth-based observers were coordinated with an email listserve, and information was shared via a password protected website with weekly, then daily updates near encounter. The collaboration utilized over 500 whole or partial telescope nights on 51 telesopes, from 10 countries and additionally data from 7 space and airborne facilities (WISE, Swift, ODIN, HST, Chandra, Herschel and SOFIA). All together there were 134 registered collaborators.

Fig. 1 – World map showing the location of the Earth-based facilities utilized in the EPOXI campaign.

Results: The Earth-based observers reported the detection of a variety of parent and daughter species in the UV, optical, infrared and radio wavelengths. Strong temporal variation was seen in the activity levels of many species with rotation. There was significant variability seen in relative abundances, not necessarily correlated with rotation, or with the variation in water production. The water production rate peaked several weeks post-perihelion.

Rotation Period. The early photometry of the comet during April-May 2009 when it was r = 4.7-4.5 AU was consistent with a rotation period near 16.43 ± 0.1 hr, and a similar value (16.6 ± 0.5) hr was observed in Aug. 2010 at r = 1.4 AU [5]. Once active, the rotation period was determined by enhancing images, in particular those in the CN filter, to trace the motion of a prominent jet. During September as the comet approached perihelion (1.3 < r [AU] < 1.1) the reported periodicity was longer at 17.6 hr [6], and when measured with Doppler radar from Arecibo the period was 18.1± 0.3 hr [7], suggesting that the period was increasing and that the comet was not in a state of principal axis rotation [6]. Data taken during November suggested a further slowing of the rotation rate [8].

Dust. Many observers searched for coma features, and there was one, possibly two prominent features seen from Earth,very dissimilar to the multiple "porcupine" jet structures seen leading up to the Deep Impact encounter with comet 9P/Tempel 1. Observations in the near and mid-IR indicated a low albedo and gave evidence for grain populations from microns to mm sizes, and the dust trail was imaged with the WISE space telescope showing grain sizes up to 12 mm [9]. As in previous apparitions, the comet was seen to have a very low dust to gas ratio.

Development of Activity. The photometric light curve of scattered light from the dust was compiled from monitoring observations from a large number of observers over a period of months and the behavior showed that the activity was not consistent with water-ice driven sublimation. Simple surface sublimation models were able to fit the behavior with a combination of water-ice and CO_2-ice driven sublimation.

References: [1] Meech *et al.* (2005) *Science* **310**, 265-269. [2] Snodgrass, C., Meech, K. and Hainaut, O. (2010) *A&A* **516**, L9. [3] Lisse, C. M. *et al.* (2009) *PASP* **121**, 968-975. [4] Meech, K. *et al.* (2009) *BAAS* **41**, 1029. [5] Knight, M. and Schleicher, D. G. (2010) *IAUC 9163*. [6] Samarasinha, N. *et al.* (2010) *IAUC 9178.* [7] Harmon, J. K. *et al.* (2010) *IAUC 9179*. [8] Jehin, E. *et al.* (2010) *CBET 2589.* [9] Bauer, J. M. *et al.* (2010) *IAUC 9179*. **Acknowledgements**: This work was supported by NASA through the Discovery Program contract for the EPOXI mission, NNM07AA99C, to the University of Maryland.