

On the pre-perihelion temporal activity of comet 9P/Tempel 1 during the favorable apparition of 2005

A. de Almeida¹, G. Serrano¹, G. Sanzovo², and D. Trevisan Sanzovo³

¹University of São Paulo

²University of Londrina

³University of Northern Paraná

The short-period (5.5 years) comet 9P/Tempel 1 was revisited by NASA's Stardust-NEXT probe in 2011 February 15, in a flyby at a distance of only about 181 km. This is the first time a comet is visited twice by two different probes (the first visit in 2005 July 4, by NASA's Deep Impact probe). Tempel 1 is not a bright or very active comet. The brightest apparent magnitude in 25 appearances, since the discovery (1867), has been $m = 9.5$, well below the limit of visibility to the naked eye. Here, we study the temporal activity, based on 495 apparent visual magnitude estimates (ICQ), obtained during the very favorable apparition of 2005 (the comet passed at 0.71 au from the Earth in 2005 May 3) by the Semi-Empirical Method of Visual Magnitudes (SEMVM, de Almeida, Singh&Huebner, 1997). We determine a model dependent activity at the time immediately before the Deep Impact (4 July 2005 at 5:52 UTC) in fairly good agreement with Schleicher et al. (2006), Feaga et al. (2007) and Gicquel et al. (2012) from the Spitzer spacecraft observations, and a day later, at the time of the perihelion passage (5 July 2005 at 5:31 UTC), also in good agreement with Biver et al. (2007) and Farnham et al. (2010), most likely powered by water-ice sublimation. Our results are consistent, for an active area of 10% and a minimum nuclear radius of 2.5 km, with the radio OH observations in 18-cm (Howell et al., 2007; Biver et al., 2007), and the H₂O observations by satellites SWAN (Mäkinen et al., 2007; Bensch et al., 2007) and Odin (Biver et al., 2007), in the pre-perihelion phase.