MODELLING THE DUST COMA AND TAIL OF COMET 19P/BORRELLY OBSERVED FROM GROUND DURING THE DEEP SPACE 1 ENCOUNTER. T. M. Ho[1], N. Thomas[2], I. Bertini[3], T. Bonev[4], M. Combi[5] and V. Tenishev[5] [1]ESTEC, Keplerlaan 1, Noordwijk, Netherlands, [2]University of Bern, Sidlerstrasse 5, Bern 3012, Switzerland, [3]Instituto de Astrofisica de Andalucia, Camino Bajo de Huetor 50, 18008 Granada, Spain, [4]Institute of Astronomy, 72 Tsarigradsko chaussee Boulevard, 1784 Sofia, Bulgaria, [5]Department of Atmospheric, Oceanic and Space Sciences, University of Michigan, 2455 Hayward Street, Ann Arbor, MI 48109-2143, United States.

Introduction: While comet 19P/Borrelly has been visited by the Deep Space 1 (DS1) spacecraft on September 21, 2001 at a closest distance of 2200 km, it also has been observed from the Pik Terskol observatory (Caucasus). Broad band and narrow band images of the comet's dust coma and tail have been acquired.

On all images the comet's typical coma and tail appearance with an elongated shape peaking towards the Sun direction can be recognized.

We present our Monte Carlo modeling results of the dust coma and tail of comet 19P/Borrelly. Our results support suggestions of previous authors that an anisotropic emission, comparable to the one observed by the Miniature Integrated Camera and Spectrometer (MICAS) experiment onboard DS1, is mainly responsible for the observed peculiar coma shape.

Observations and data set: The DS1 spacecraft encountered comet 19P/Borrelly at a closest distance of 2200 km on September 22, 2001 [1]. Our observation campaign has tracked the comet from September 19 - 22, 2001. The observations were performed with a two channel focal reducer mounted on a 2-m Carl Zeiss Jena telescope of the Pik Terskol (Caucasus) observatory. Continuum images of the dust coma were acquired with narrow band filters at 443.1, 525.5 and 641.6 nm.

Model results: The observed elongated shape of the coma and tail of comet 19P/Borrelly can be reproduced by a Monte Carlo model simulating five anisotropic dust emissions of Gaussian profile.

All jets of the model are positioned very close to the Sun direction. The modeled dust coma and tail contains one dominant jet (Jet1) with a FWHM of 40º and a contribution of 22% to the overall dust coma. This parameters are comparable to the ones of the so-called Main Jet observed on the MICAS images [2]. Furthermore because of its position close to the Sun, it is most likely that the Main Jet is presented by Jet1 of the model.

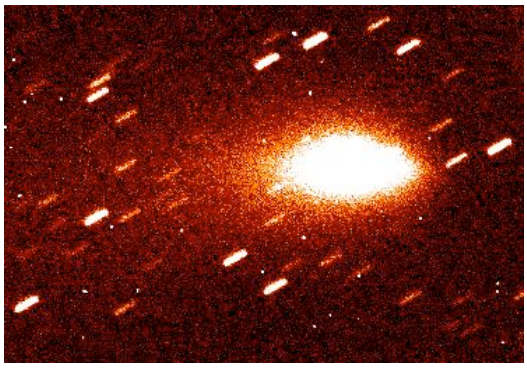

Figure 1: Comet 19P/Borrelly's dust coma and tail observed from the Pik Terskol observatory on September 20, 2001.

Four further broader dust jets, also of Gaussian profiles but with 60 - 100º FWHMs are needed to obtain a good agreement with the observed dust coma and tail. The dust particles in these jets are up to 2 times slower than the one in Jet1 and the velocities of the larger particles are slower than the large particles in Jet1. We suggest that because of their broader appearances and their high contributions to the total emission they might represent the fans which were observed in the close vicinity of comet 19P/Borrelly's nucleus [3]. The differences in the velocities versus particle radii for the jets and fans observed and modelled in this paper and their differences in FWHMs might suggest that they were emitted from different sources. This suggest that comet 19P/Borrelly's collimated Main Jet might be created by a different scenario than free-vacuum sublimation of surface or subsurface ice which should occur into a wide solid angle and thus would produce the broader dust fans.

References: [1] Soderblom L. A. et al. (2002) *Science, 296,* 1087–1091. [2] Ho T. M. et al. (2007) *Planet. & Space Sci., 55,* 974-985. [3] Soderblom L.A. et al. (2004) *Icarus, 167,* 4–15.