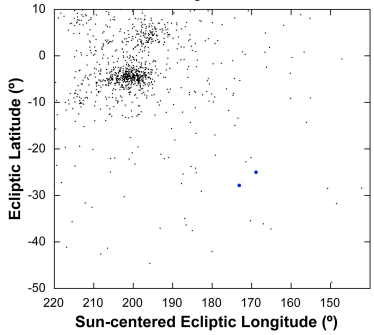
FIRST RESULTS FROM AN OBSERVING CAMPAIGN TO DETECT THE METEOROIDS OF BENNU AT EARTH. P. Jenniskens[1], D. S. Lauretta[2], M. C. Towner[3], P. A. Bland[3], S. Heathcote[4], E. Jehin[5], T. Hanke[6], T. Cooper[7], and J. Baggaley[8], [1]SETI Institute, Mountain View, CA (petrus.m.jenniskens@nasa.gov), [2]Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ (lauretta@orex.lpl.arizona.edu), [3]Space Science and Technology Centre, Curtin University, Perth, Australia (P.Bland@curtin.edu.au), [4]Cerro Tololo Inter-American Observatory, La Serena, Chile (sheathcote@ctio.noao.edu), [5]University of Liege, Liege, Belgium (ejehin@uliege.be), [6]High Energy Stereoscopic System Consortium, Windhoek, Namibia (cthess@afol.com.na), [7]Astronomical Society of Southern Africa, Bredell, South Africa (tpcoope@mweb.co.za), [8]University of Canterbury, Christchurch, NZ (jack.baggaley@canterbury.ac.nz).

Introduction: Asteroid (101955) Bennu passes only 0.0029 AU from Earth's orbit, a distance that will further decrease towards the end of this century. NASA's OSIRIS-REx showed Bennu to be an active asteroid [1]. Some meteoroids were found on hyperbolic orbits, which evolve to elliptical orbits around the Sun. For material ejected since 1500 CE, ejection velocities are too small and planetary perturbations not sufficient to bridge the gap to Earth [2]. However, if Bennu was active in the past, and the ejected particles can survive for thousands of years, planetary perturbations may create a meteor shower on Earth.

Figure 1. Only two possible meteoroids from Bennu in 2010–2016 CAMS data during solar longitude 174.6–187.4 have semi-major a = 0.5–1.5 AU.



Meteors are expected to radiate from a geocentric R.A. = 5º, Decl. = -34º, entering at a geocentric speed of 6.0 km/s (apparent speed 12.7 km/s), around September 22–26. This southern hemisphere meteor shower has not yet been detected (Fig. 1).

Here, we describe an effort to detect this shower at Earth in the coming years.

Methods: The particles ejected from Bennu are about 1–10 cm in size [3]. If the luminous efficiency is ~0.7% [4], they are expected to have an apparent brightness of +2 to -5 magnitude when impacting Earth at 12.7 km/s. Meteors in this range of brightness are detected by low-light video cameras.

The CAMS meteor shower survey deploys large numbers of video cameras to track meteors against the star background and triangulate those tracks to calculate the trajectory radiant and speed [5]. The software is capable of detecting slow-moving meteors efficiently [6]. In early 2019, 299 video cameras spread over 8 networks were routinely mapping meteor showers on the northern hemisphere, but only 34 on the southern hemisphere (32 in New Zealand, 2 in Brazil).

Now, new CAMS networks are being established in Australia, Chile and southern Africa. Since mid-June, CAMS Australia is deployed near Perth. The network consists of three stations with 16 cameras each. Since mid-July, CAMS Chile is deployed at Cerro Tololo Observatory and at La Silla Observatory, with a third station near La Serena. We also added one 16-camera station to the CAMS New Zealand network near Christchurch, and a two-station 8-each network has come online near Johannesburg, South Africa.

Results: At the time of writing, the Bennu shower is still a month away. We expect to be able to present first results of the observations at the workshop.

In the meantime, the new southern hemisphere networks are producing hundreds of meteor orbits per night. This has already resulted in the detection of a compact meteor shower associated with long-period comet C/1939 H1 (Jurlof-Achmarof-Hassel) on August 4–6, 2019. This comet is now a newly established parent body of one of our meteor showers.

Discussion: The survey is intended to continue for the duration of the OSIRIS-REx mission and is expected to greatly increase our understanding of meteor showers in the southern hemisphere, including potentially detecting streams from other active asteroids. This can help understand the population of large meteoroids on short orbits in the interplanetary medium [6].

References: [1] Lauretta D. S., et al. (2019) *Nature, 568*, 55. [2] Ye Q. (2019) *Research Notes of the AAS, 3*, 56. [3] Chesley S., et al. (2019) *DDA 50,* #200.06. [4] Weryk R. J., Brown P. G. (2013) *PSS, 81*, 32. [5] Jenniskens P., et al. (2011) *Icarus, 216,* 40. [6] Jenniskens P., et al. (2016) *Icarus, 266*, 384.

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