GRAINE balloon experiment in 2015: Precise observation of cosmic gamma rays by high-resolution emulsion telescope

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Observation of cosmic gamma rays is important for studying high energy phenomenas in the universe. Since 2008, the Large Area Telescope on the Fermi satellite has surveyed the whole gamma-ray sky in the sub-GeV/GeV energy region, and accumurated a large amount of data. However, observation at the low galactic latitude remains difficult because of a lack of the angular resolution, increase of background flux originated from the galactic diffuse gamma rays, etc.

Gamma-Ray Astro-Imager with Nuclear Emulsion (GRAINE) is a gamma-ray observation project with a new balloon-borne emulsion gamma-ray telescope. Nuclear emulsion is a high-resolution 3D tracking device. It determines incident angle with 0.1° resolution for 1 GeV gamma rays (1.0° for 100 MeV), and has linear polarization sensitivity. Our group has developed a high-speed emulsion readout system, and its current scanning speed is 4000 cm^2/h (this value will be achieved 9000 cm^2/h). GRAINE aims at precise observation of gamma-ray sources, especially on the galactic plane, by repeating long-duration balloon flights with large-aperture-area (10 m^2) high-resolution emulsion telescopes.

In May 2015, we performed a balloon-borne experiment in Alice Springs, Australia, in order to demonstrate the imaging performance of our telescope. The emulsion telescope that has the aperture area of 0.4 m^2 was employed in this experiment. It observed Vela pulsar (the brightest gamma-ray source in the GeV sky) at the altitude of 37 km for 6 hours out of the flight duration of 14 hours. In this presentation, we will report the latest results and the status of GRAINE project.

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