Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

PPS022-13 Room:IC Time:May 27 09:30-09:45

Micrometeoroid Flux inside 1 AU Heliocentric Distance Measured by IKAROS-ALADDIN

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IKAROS(Interplanetary Kite-craft Accelerated by the Radiation Of the Sun), a 20-m-across solar sail demonstration spacecraft was launched by H-IIA rocket in May 2010. As the world's first solar sail in deep space, IKAROS carries ALADDIN (Arrayed Large-Area Dust Detectors for INterplanetary space) dust detector made of 0.54 mˆ2 PVDF sensors which deploy on its 7.5 micron polyimide sail membrane. As the first deep space dust detectors developed and built in Japan, ALADDIN continuously measures dust flux in the viscinity of the Earth to that of Venus within its first 6-month cruising and now in its extended mission period. On its thin sail membrane, a large-area but still light-weight dust detector arrays made of 8 channels of 9-20 micron-thick PVDF were attached in order to count and time hypervelocity impacts by micrometeoroids larger than a few micron size during its interplanetary cruise. The sensors filter electronic, thermal and vibration noises and record time, peak hold value, and relax duration of signals of micrometeoroid impacts. Inside the orbit of the Earth (˜1.0 AU) down to the vicinity of Venus (˜0.7 AU), ALADDIN has measured abundant dust flux each of which separated by a 24-hour bin, thus enabling to discuss heliocentric dependency of the flux variation around >10ˆ-12 g mass range in the finest detail among any previous spacecraft such as Helios-1/2 and Galileo. The ALADDIN dust flux in 2010 is generally consistent with flux trends of Helios in 1980's and Galileo in 1990's but some fine structures are observed.

Keywords: Micrometeoroids, In-situ Measurement, Solar Sail, Inner Region of the Solar System, Impact Flux