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The interplanetary dust population as measured by the MAG investigation on the Juno mission

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NASAs Jupiter mission Juno was launched from Earth August 5, 2011, and arrived at Jupiter nearly 5 years later, on July 5, 2016. During cruise from Earth to Jupiter, the solar powered Juno spacecraft followed a trajectory which took advantage of a gravity assist maneuver, passing close by Earth October 9, 2013. Juno's $\sim$600 W of electrical power is provided by 60m2 of solar panels arranged on three solar panel wings radiating from the main body of the spinning spacecraft. One of these wings accommodates two MAG investigation sensor suites, separated by two meters on a non-magnetic boom at the outer extremity. Each sensor suite consists of a fluxgate vector magnetometer and two μASC star cameras. The primary purpose of the μASC cameras is to provide accurate attitude for the MAG sensors, but they may also used for general low-light imaging, asteroid detection and tracking, and energetic particle detection. Here we describe how the μASC is used to detect hypervelocity dust impacts on the spacecraft, characterizing the flux of relatively large (>μm) interplanetary dust (IPD) particles that have heretofore escaped direct detection by dust instrumentation flown for IDP detection. Direct optical detection of such IDPs is prohibited by their relative velocity (order 10's km/s), but these particles impact the spacecraft and generate secondary ejecta which are readily observed and tracked by the μASC. Thus we employ Juno's 60 m2 of solar array as a very large aperture dust detector, with orders of magnitude more collecting area than any IDP instrument yet flown. This copious collecting area provides us with sufficient fluxes to characterize the distribution of interplanetary dust particles that are responsible for the Zodiacal light. We present this novel IPD detection technique, its detection sensitivity, and discuss the distribution of IDP particles between Earth and Jupiter.