ON DUST EMISSIONS FROM THE JOVIAN SYSTEM; H. A. Zook[1], E. Grün[2], M. Baguhl[2], A. Balogh[3], S. J. Bame[4], H. Fechtig[2], R. Forsyth[3], M. S. Hanner[5], M. Horanyi[6], J. Kissel[2], B.-A. Lindblad[7], D. Linkert[2], G. Linkert[2], I. Mann[8], J. A. M. McDonnell[9], G. E. Morfill[10], J. L. Phillips[4], C. Polanskey[5], G. Schwehm[11], N. Siddique[2], P. Staubach[2], J. Svestka[12], and A. Taylor[9]; [1]NASA Johnson Space Center, Houston, TX 77058, USA, [2]Max-Planck-Institut für Kernphysik, Postfach 103980, 69 Heidelberg 1, Germany, [3]Imperial College, London, UK, [4]LANL, Univ. of California, Los Alamos, NM 87545, USA, [5]Jet Propulsion Laboratory, Pasadena, CA 91109, USA, [6]LASP, Univ. of Colorado, Boulder, CO, USA, [7]Lund Observatory, 221 Lund, Sweden, [8]MPI für Aeronomie, 3411 Katlenburg-Lindau, Germany, [9]University of Kent, Canterbury, CT2 7NR, UK, [10]MPI für Extraterrestrische Physik, 8046 Garching, Germany, [11]ESA ESTEC, 2200 AG Noordwijk, The Netherlands, [12] Prague Observatory, 11846 Prague 1, CSFR.

As described by Grün et al.[1,2], the dust impact detector on the Ulysses spacecraft detected a totally unexpected series of dust streams in the outer solar system near the orbit of Jupiter. Five considerations lead us to believe that the dust streams emanate from the jovian system itself: 1. The dust streams only occur within about 1 AU of the jovian system, with the strongest stream being the one closest to Jupiter (about 550 R_J away); 2. The direction from which they arrive is never far from the line-of-sight direction to Jupiter; 3. The time period between streams is about 28 (+/-3) days; 4. The impact velocities are very high--mostly around 40 km/s; and 5. We can think of no cometary, asteroidal, or interstellar source that could give rise to the above four phenomena; such streams have never before been detected.

In Figure 1 is plotted the logarithm of the dust grain impact rate, in events per day, versus time, in days, for a 400 day period centered on Jupiter closest approach (CA) on Feb. 8, 1992. Depicted is a continuous four-impact running average of all impacts with dust masses above the detector threshold ($4*10^{-15}$g at 20 km/s to $6*10^{-16}$g at 40 km/s impact velocity). 16 hours before CA, sensitivity was reduced, partly to protect the instrument, so that grains smaller than about 10^{-13}g could not be detected. Full sensitivity was restored about 16 hours after CA. The Ulysses spacecraft velocity well away from Jupiter, but with respect to Jupiter, is about 14 km/s.

The eye is immediately struck by the rough periodicity of the six dust streams before and after Jupiter CA (2 streams before and 4 after). The average period between streams is 28 to 29 days. A second feature is that the streams only occur within about 1 AU (approx. 2100 R_J) distance from Jupiter and average about 505 R_J apart; the most intense stream is the one closest to Jupiter. A third feature, again striking, is observed in Fig. 2 where each dust grain impact is represented as a symbol on a plot showing spacecraft rotation angle versus days from CA. Large grains ($m>5*10^{-14}$g) are shown as diamonds and small grains as "plus signs". The dust detector points nearly perpendicular (85 degrees) to the spacecraft rotation axis which, in turn, points continuously to Earth; zero degrees rotation means the dust detector then points, during spacecraft rotation, closest to ecliptic north. It is seen that each stream (shown as "plusses" inside an enclosed field) is made up of small grains that arrive from a single direction (allowing for the 140 degree sensor field-of-view). It is further seen that the radiant of approach of each stream changes by about 150 degrees in rotation angle from before CA to after CA. The direction from which the streams appear to arrive is, in all cases, close to the line of sight direction to Jupiter.