

Abstract

Understanding how primitive and differentiated material reaches Earth is an essential task in meteor astronomy as well as planetary defence. This thesis presents the first systematic analysis of source regions for different material types within the AMOS network spectral dataset. We developed and validated a kernel density estimation (KDE) method for determining source region probabilities, achieving strong agreement with previous studies.

Our results confirm that the ν_6 secular resonance and the 3:1 mean motion resonance with Jupiter are the primary escape routes from the main asteroid belt, with variations based on material specifics. Achondrites are delivered via the ν_6 resonance in agreement with their proposed origins in the inner main belt (aubrites) and the asteroid 4 Vesta (eucrites). H/L ordinary chondrites originate within the inner main belt asteroid families. LL ordinary chondrites arrive through the ν_6 resonance in accordance with their traditional source in the Flora family. Carbonaceous chondrites in the AMOS data could originate within the Erigone or Polana families. Iron meteoroids are delivered primarily via ν_6 , except an outlier from the 3:1J mean motion resonance, showing diverse sources of irons.

These results help to refine the link between the meteoritic material classifications and the dynamical histories of meteoroids in the Solar System.

Keywords: meteoroids, meteorites, source regions, AMOS