THE 3:1 KIRKWOOD GAP AND THE MARIA FAMILY: GENETIC FAMILY MEMBERSHIP AND PROBABLE SOURCE BODY OF MESOSIDERITES

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Introduction: The Kirkwood gaps are severely depleted zones in the asteroid belt located at proper motion resonances with Jupiter. In the chaotic zone near the 3:1 Kirkwood Gap, objects have their eccentricities pumped up and are removed from the resonance by collisions with other asteroids, by collisions or gravitational encounters with Jupiter or other planets, or by collisions with the Sun [1]. Theoretical models indicate that a majority of asteroidal material delivered to the inner Solar System, particularly to the Earth, originates from the 3:1 mean motion and ν_6 secular resonances [2-9]. We have spectroscopically identified several probable parent bodies for the mesosiderites in the chaotic zone of the 3:1 Kirkwood Gap.

Results: Spectral studies of eleven members of the Maria dynamical family (asteroids #'s 292, 652, 714, 787, 875, 897, 1158, 1215, 2089, 3066, and 3637) have been identified as assemblages dominated by HED-type pyroxenes. Compared to spectra of HED meteorites and V-type asteroids, the Maria family spectra exhibit weakened features and reddened spectral curves. This does not appear to be the result of asteroid-type space weathering [10], but instead is probably due to the presence of an abundant NiFe metal phase, resulting in assemblages analogous to mesosiderites. It is probable that these Maria family asteroids were once part of a larger mesosiderite-type body containing HED pyroxenes mixed with metal which was collisionally disrupted and dispersed. Based upon our findings, we suggest the Maria family is a probable source of mesosiderites. Two additional Maria dynamical family members were examined and found not to be genetically related to the other family members. The spectrum of (695) suggests an additional possible source of the H-chondrites. Asteroid (1379) resembles the shock-blackened ordinary chondrites.

The asteroids near the 3:1 Kirkwood gap are a mineralogically diverse population located in a region that should deliver meteoroids to Earth. The results of this study support models of the 3:1 Kirkwood Gap as a major source of meteorites.

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