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# Potentially Hazardous Co-orbiting Materials of Asteroid 138175 Identified by Interplanetary Field Enhancements

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Interplanetary Field Enhancements (IFEs) were discovered almost 30 years ago in the PVO magnetic-field records. Our current understanding is that IFEs result from interactions between solar wind and clouds of nanometer-scale charged dust released in interplanetary collisions. These charged dust clouds are then accelerated by the solar wind and moving away from the Sun at near solar wind speed.

This IFE formation hypothesis is supported by the discovery of co-orbiting materials associated with asteroid 2201 Oljato: IFE rate peaked when Oljato was close and IFE occurrence clustered in the longitudes near which the orbit of Oljato intersects the orbital plane of Venus. A followed up study with Venus Express observations suggested that the co-orbiting materials dissipated in 30 years
At 1AU, based on ACE and Wind observations, IFEs have a significant cluster in the longitude range between 195° and 225°. Thus we use the same IFE technique to identify the 'parent' Near-Earth Objects of co-orbiting materials which should be responsible for those IFEs. There are more than 5000 JPL documented NEOs whose ecliptic plane crossings are near to or inside the Earth's orbit and whose orbital periods are less than five years. By comparing their trajectories, we find that the asteroid 138175 is a good candidate for the 'parent' body. This asteroid orbits the Sun in a 5.24° inclined elliptical orbit with a period of 367.96 days. Its descending node is at about 206°, where the IFE occurrence rate peaks. We also find that there is a spread of the IFE rate around the descending node, indicating that the co-orbiting materials have significant dispersion about the asteroid's orbit. The mass distribution of the associated IFEs indicates that most of the materials had a dimension of tens of meters before the collisions. Interplanetary objects in such size range are difficult to be identified by traditional surveys.

Although asteroid 138175 itself has now been removed from the potentially hazardous NEO list, its co-orbiting materials may have high impact probability and cause significant damage due to their dispersed orbits and non-negligible size range.

The same technique can be applied to the remaining thousands of known NEOs crossing the ecliptic plane inside the Earth's orbit and find those that have co-orbiting materials which might be hazardous to the Earth. Thus alerts can be issued when the Earth approaches the orbits of objects with co-orbiting debris.