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On the first ν_6 anti-aligned librating asteroid family of Tina

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Asteroid families are groups of bodies identified in the space of proper elements or of frequencies that share a common origin in the collisional break-up of their progenitors. Their dynamical evolution is shaped by the interaction with the local web of mean-motion and secular resonances and by non-gravitational effects such as those called "Yarkovsky" and "YORP". Thus, obtaining information on their age and original ejection velocity field is generally a difficult task. Recently two families were found to have a large fraction of members in the non-linear secular resonance z_1: the Agnia and the Padua families. Conserved quantities of the z_1 resonance allowed for a more precise determination of their ages and ejection velocity fields. So far, however, no family was known to be in a linear secular resonance such as the ν_6 resonance, although individual asteroids were known to be in ν_6 anti-aligned librating states. The ν_6 resonance occurs when there is a commensurability between the frequency of precession of the pericenter of an asteroid and that of Saturn. As a consequence, in librating states the resonant argument oscillates around a stable point. In anti-aligned librating states the resonant argument oscillates around the stable point at $180°$. Here we show that the newly identified Tina family is characterized by having all its members in such a state, making it the only family in the asteroid belt known to be completely embedded in a secular resonance configuration. This rare dynamical configuration limits the maximum eccentricity of Tina members, preventing them from experiencing Martian close encounters, and forming a stable island of a new dynamical type. The current dispersion of asteroid resonant elements suggests that the family should be at least 2.5 My old, while Monte Carlo simulations including the Yarkovsky and YORP effects suggest that the Tina family should be 170^{+20}_{-30} My old.