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New transient co-orbital asteroids of Venus

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Venus has no known natural satellites but has 9 known co-orbitals. These are objects trapped in a 1:1 mean-motion resonance with Venus. Co-orbital configurations include retrograde satellite orbits (RS), tadpole orbits (T) around the Lagrangian equilibrium points L4 or L5, and horseshoe orbits around both L4 and L5 (H). At high eccentricity or inclination, co-orbital configurations may also involve compounds of T and RS (T-RS, T-RS-T), H and RS (H-RS) orbits, or transitions between different co-orbital modes. Here we identify asteroids in 1 RS, 1 L4-tadpole, and 2 T-RS orbits, as well as 8 additional asteroids in possible temporary co-orbital status. Although the majority of these objects do not yet have well-characterized orbits, 2020 CL1 does and is very likely to be a new co-orbital asteroid. With the new candidates, Venus would have a population of 21 co-orbital asteroids, comparable to those of Mars and Earth.

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