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Non-hydrostatic effects on Mars' nutation

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Mars' tidally forced nutation can be resonantly amplified owing to a rotational normal mode called the Free Core Nutation (FCN) which exists because the mantle and fluid part of the core can have a relative rotational motion. The period of the FCN and the amplitude of the nutation depend on the moments of inertia of the mantle and core, as well as on the deformation of the planet due to rotation rate variations and tidal forcing. One of the goals of the RISE experiment on InSight and of the future LaRa experiment on ExoMars 2020 is to infer the core radius of Mars by measuring nutation. Precise core radius determination from the FCN period requires knowledge of the core shape. Here we study how non-hydrostatic core shape models affect the FCN and discuss to what extent the shape of the core could be inferred if its radius were known.