



## **Benchmark between HOPT/AxiSEM3D/SpecFM3D with 3D structure of Mars: Focused on ellipticity and dichotomy**

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One of the main purposes of the InSight mission is to define structural models and seismicity catalogues of Mars. Prior to the mission, scientists prepared for the data return by assembling a priori models of Martian seismic structure, derived from estimates of bulk composition and thermal profiles, in order to develop seismic inversion methods. For instance, inverting normal modes or free oscillations of a planet can be a powerful tool for recovering its internal structure with a single station. Accordingly, we aim to compute normal modes of Mars and investigate their coupling due to several effects, such as the rotation, the ellipticity and the possible crustal dichotomy of the planet. To do so, we use the Higher order Perturbation Theory (HOPT, Lognonne and Romanowicz (1990), Lognonne (1991)) method that we benchmarked with other methods that simulate 3D seismic wave propagation, such as AxiSEM3D [Leng et al. (2016)], SPECFEM3D [Monteiller et al. (2013)] and Salvus [Afanasyev et al. (2018)].