DEVIATIONS FROM UNIFORM PERIOD SPACINGS OF GRAVITY MODES AS PROBES OF ROTATIONAL MIXING NEAR STELLAR CORES

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Our goal is to establish the simultaneous detection of uniform period spacings and rotational frequency splittings of nonradial gravity mode oscillations in a sample of carefully selected bright (i.e., Vmag below 13) F-type pulsating main-sequence stars, which are representative of massive host stars of exoplanetary systems, with the Kepler satellite. This will allow to deduce if rotational mixing near the stellar core is the cause of deviations from period spacings and/or if other yet unknown mixing processes occur. Additionally, we will determine the internal angular momentum distribution from the stellar core to the surface for all stars with rotational splitting. We plan to use the novel method we recently developed after the first detection such period spacings of gravity modes of a main-sequence pulsator, based on 150 consecutive days of high-precision space photometry gathered with the CoRoT satellite (Degroote et al., 2010, Nature, 464, 259). The small deviation from the spacing uniformity of the star HD50230 allowed to deduce the occurrence of a chemically inhomogeneous zone adjacent to the stellar core of this star. The CoRoT data have a too short time base to allow the additional detection of rotational splitting of the gravity modes. This prevented us to deduce the internal angular momentum distribution inside the star despite the readiness of the methodology. We shall overcome this limitation with Kepler data for a sample of 72 F-type gravity mode pulsators discovered in the public Q1 Kepler data. This will provide a seismically calibrated law for the near-core mixing and angular momentum distribution in main sequence stars, thanks to their gravity modes which penetrate all the way from the core to the surface.