Pulsating hydrogen-deficient white dwarfs and pre-white dwarfs observed with TESS: Discovery of new GW Vir stars

Murat Uzundag[1,2] Alejandro H. Córsico[3] S. O. Kepler[4] Leandro G. Althaus[3] Klaus Werner[5] Nicole Reindl[6] Keaton J. Bell[7] Michael Higgins[8] Gabriela O. da Rosa[4] Maja Vučković[1] Alina Istrate[9]

1. *Instituto de Física y Astronomía, Universidad de Valparaíso, Gran Bretaña 1111, Playa Ancha, Valparaíso 2360102, Chile*

2. *European Southern Observatory, Alonso de Cordova 3107, Santiago, Chile*

3. *Grupo de Evolución Estelar y Pulsaciones. Facultad de Ciencias Astronómicas y Geofísicas, Universidad Nacional de La Plata, Paseo del Bosque s/n, 1900 La Plata, Argentina*

4. *Instituto de Física, Universidade Federal do Rio Grande do Sul, 91501-970, Porto-Alegre, RS, Brazil*

5. *Institut für Astronomie und Astrophysik, Kepler Center for Astro and Particle Physics, Eberhard Karls Universität, Sand 1,72076 Tübingen, Germany*

6. *Institute for Physics and Astronomy, University of Potsdam, Karl-Liebknecht-Str. 24/25, D-14476 Potsdam, Germany* 7. *DIRAC Institute, Department of Astronomy, University of Washington, Seattle, WA-98195, USA*

8. *Department of Physics, Duke University, Durham, NC-27708, USA*

9. *Department of Astrophysics/IMAPP, Radboud University, P O Box 9010, NL-6500 GL Nijmegen, The Netherlands*

Abstract

With the advance of high precision and high duty cycle photometric monitoring from the Transiting Exoplanet Survey Satellite (TESS), unprecedented asteroseismic measurements and tools have become available for pulsating white dwarfs and pre-white dwarfs. In this project, we aim at searching for the hydrogen -deficient pulsating pre-white dwarf stars called GW Vir stars that exhibit atmospheres rich in carbon, oxygen and helium. We processed and analyzed the high-precision TESS photometric light curves of the four target stars, and derived their oscillation frequencies. For each of these TESS targets, we obtained low-resolution spectra and fitted model atmospheres in order to derive their fundamental atmospheric parameters. We performed an asteroseismological analysis of these stars on the basis of PG 1159 evolutionary models that take into account the complete evolution of the progenitor stars. We searched for patterns of uniform period spacings in order to constrain the stellar mass of the stars, and employed the individual observed periods to search for a representative seismological model. Using the high-quality data collected by the TESS space mission and follow-up spectroscopy, we have been able to discover and characterize new GW Vir stars. In this proceeding, I will give a brief overview of the current state-of-the-art analysis of GW Vir stars from the perspective of the recent space missions.