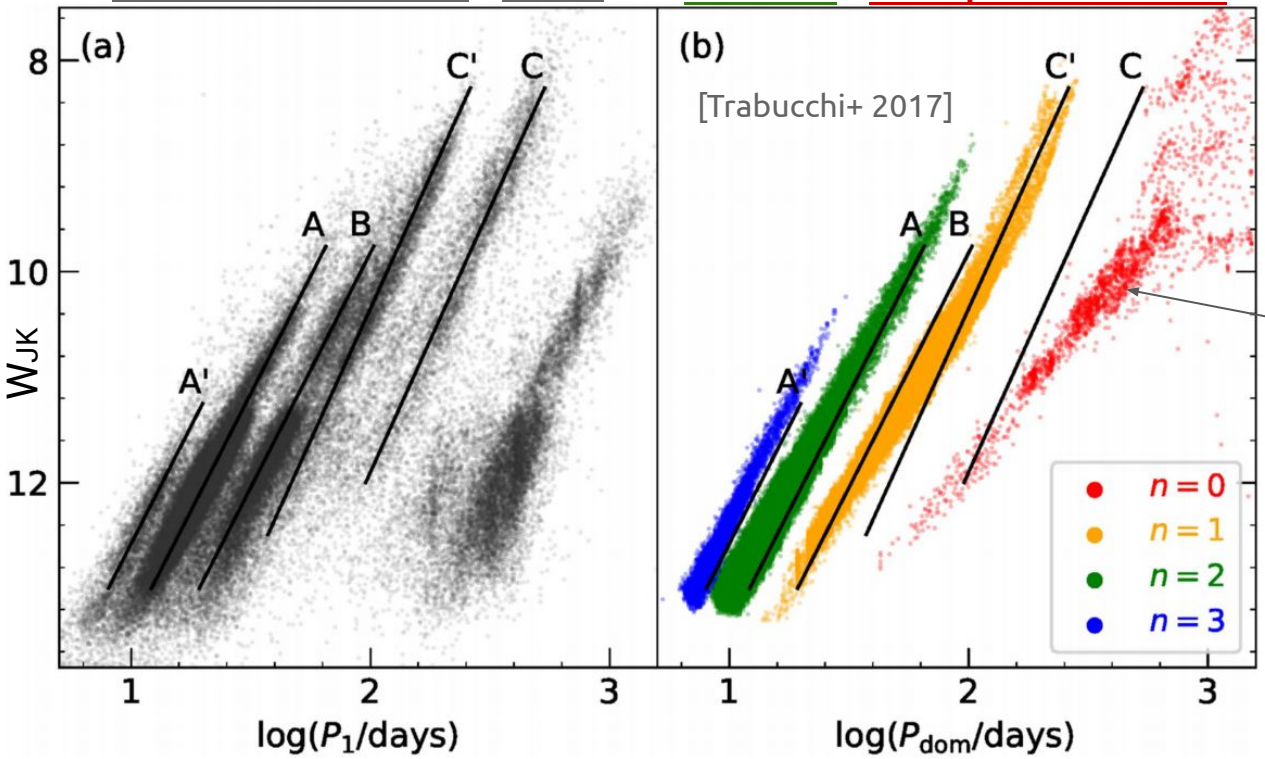
Simulating Miras & Long-Period Variables in LSST

Michele Trabucchi
University of Padova / INAF-OAPd

NON-ADIABATIC LPV PULSATION MODELS + SYNTHETIC STELLAR POPULATIONS

OGLE-III LPVs in the LMC + 2MASS

Synthetic LPV population model:
TRILEGAL + linear pulsation models

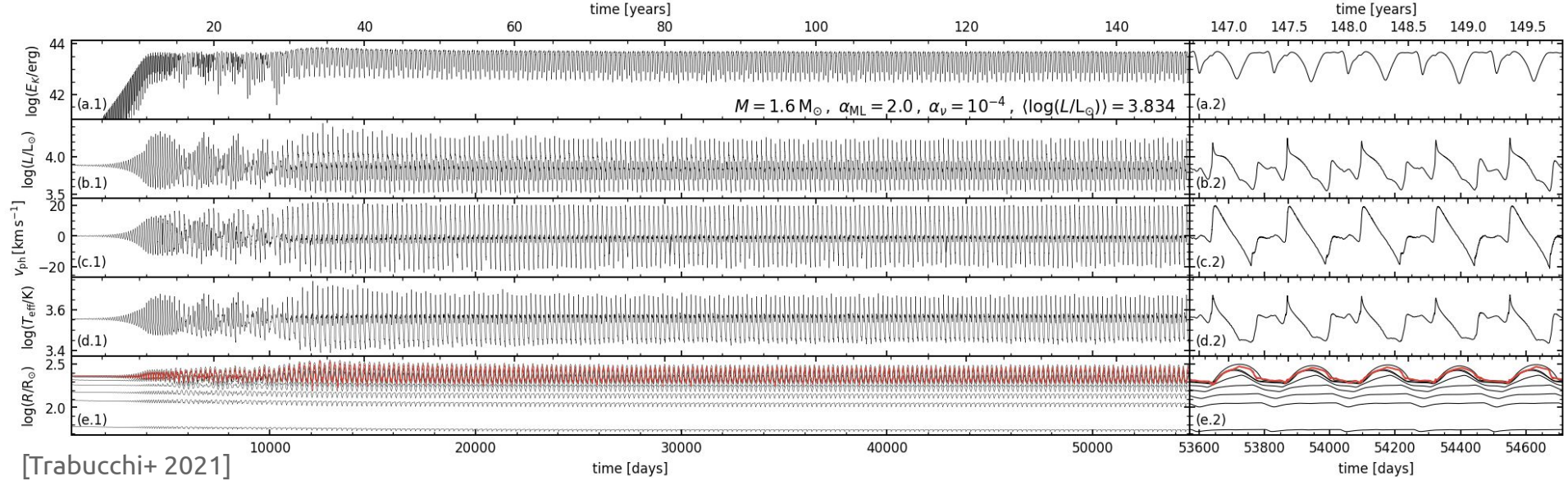


- Accurate overtones (Trabucchi+19)
- Demonstrated 1OM pulsation on sequences B, C' (Trabucchi+17)
- Modal assignment consistent with asteroseismology of RGB stars (Yu+20)

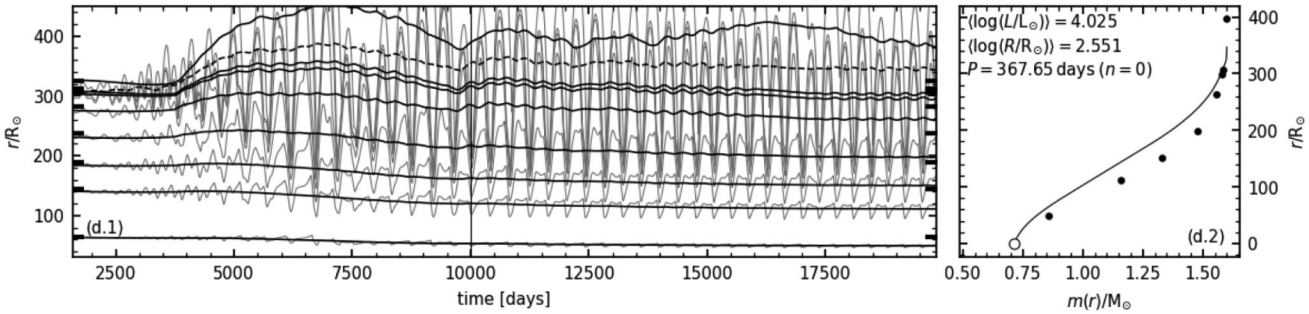
The puzzle of sequence C

Linear pulsation models not suited for describing the variability of Miras and related FM pulsators (Trabucchi+20)

HYDRODYNAMIC CODE / NON-LINEAR LPV PULSATION MODELS



[Trabucchi+ 2021]

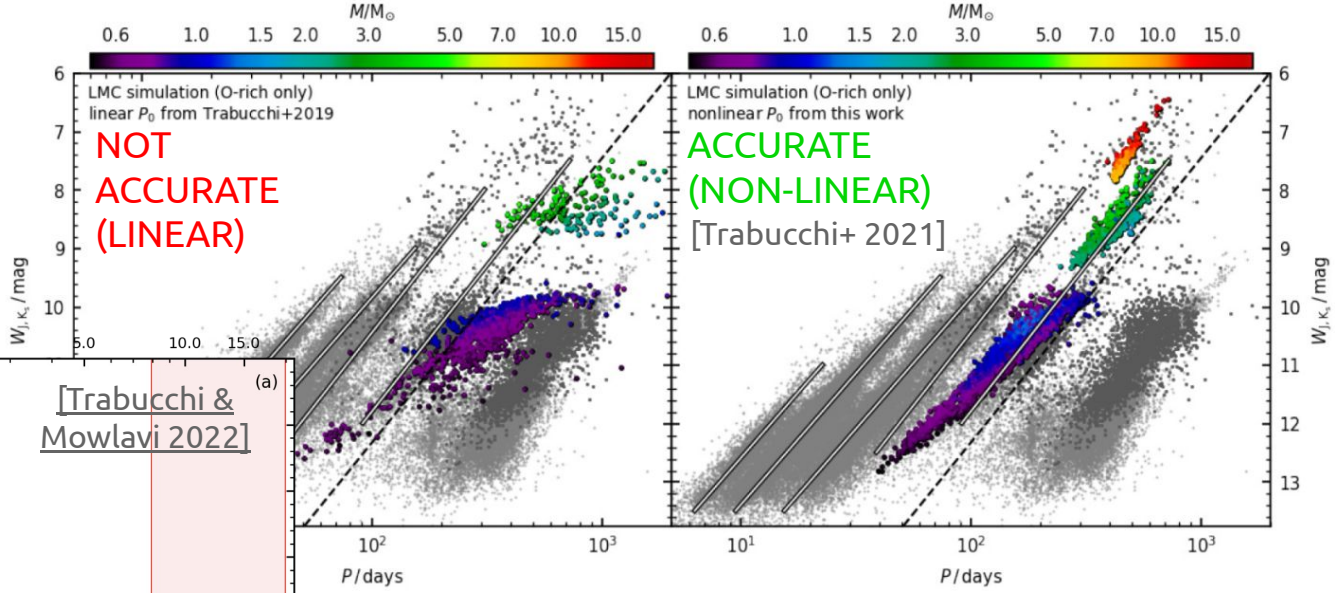


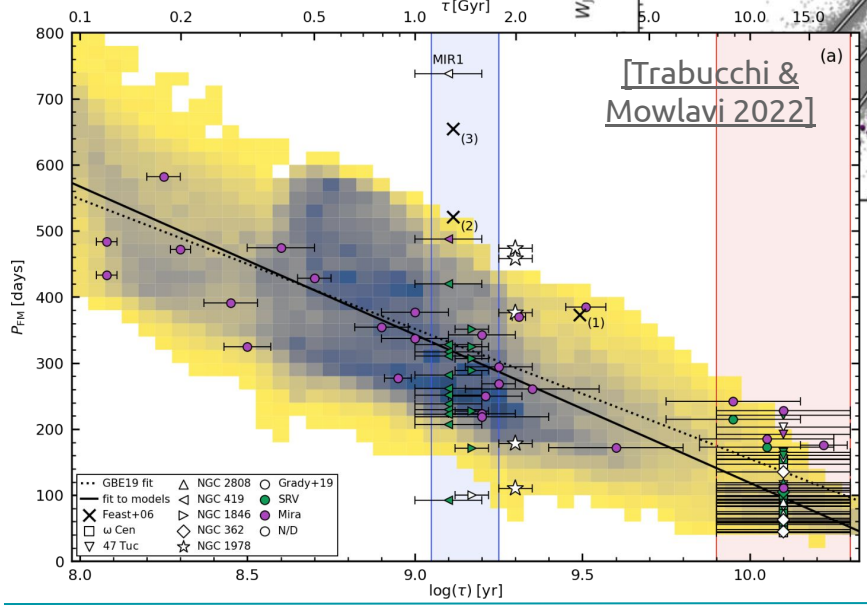
Pulsation - structure feedback (Trabucchi+21)

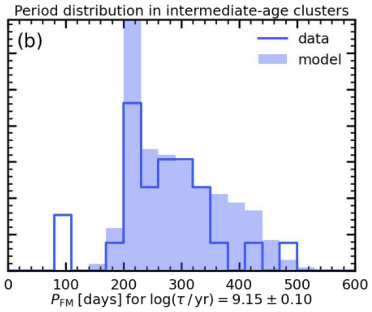
1. Large-amplitude pulsation increases the envelope cycle-averaged mean density
2. Higher density = shorter period

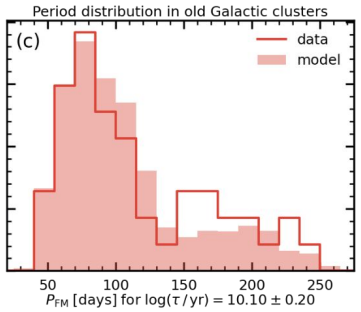
NON-ADIABATIC, NON-LINEAR LPV PULS. MODELS + SYNTHETIC STELLAR POPULATIONS

- Pulsation - structure feedback
- Accurate FM periods
- Consistent with observations
- Allows for the study of the *period-luminosity relation* and *period-age relation*









Glossary & Acronyms

- Updated LPV prescriptions in TRILEGAL simulations
- Computation of wide grid of hydrodynamic pulsation time series
- Semi-automated post-processing
  - Periods, multi-mode characterization, dominant mode & instability strips
  - Templates curves of surface displacement, velocity, temperature, …
- Other variability in TRILEGAL simulations
  - Updated prescriptions for pulsating stars (Cepheids, RR Lyrae, …)
  - Other stellar variability (long secondary periods, …)

European LSST collaborations

Pulsation calculations to be run on **HPC facility "Bura" @ University of Rijeka**, part of the **Croatian in-kind contribution** to Rubin-LSST
(see Tomislav Jurkic's talk on Friday's "European Contributions" plenary session).