

Modelling Long-Period Variables in the *Gaia* Era

Michele Trabucchi - University of Padova

Thomas Lebzelter, Nami Mowlavi,
Paola Marigo, Giada Pastorelli,
Peter Wood, Isabelle Lecoeur-Taïbi



Vienna, 19–23/08/2019
Stars and their Variability Observed from Space

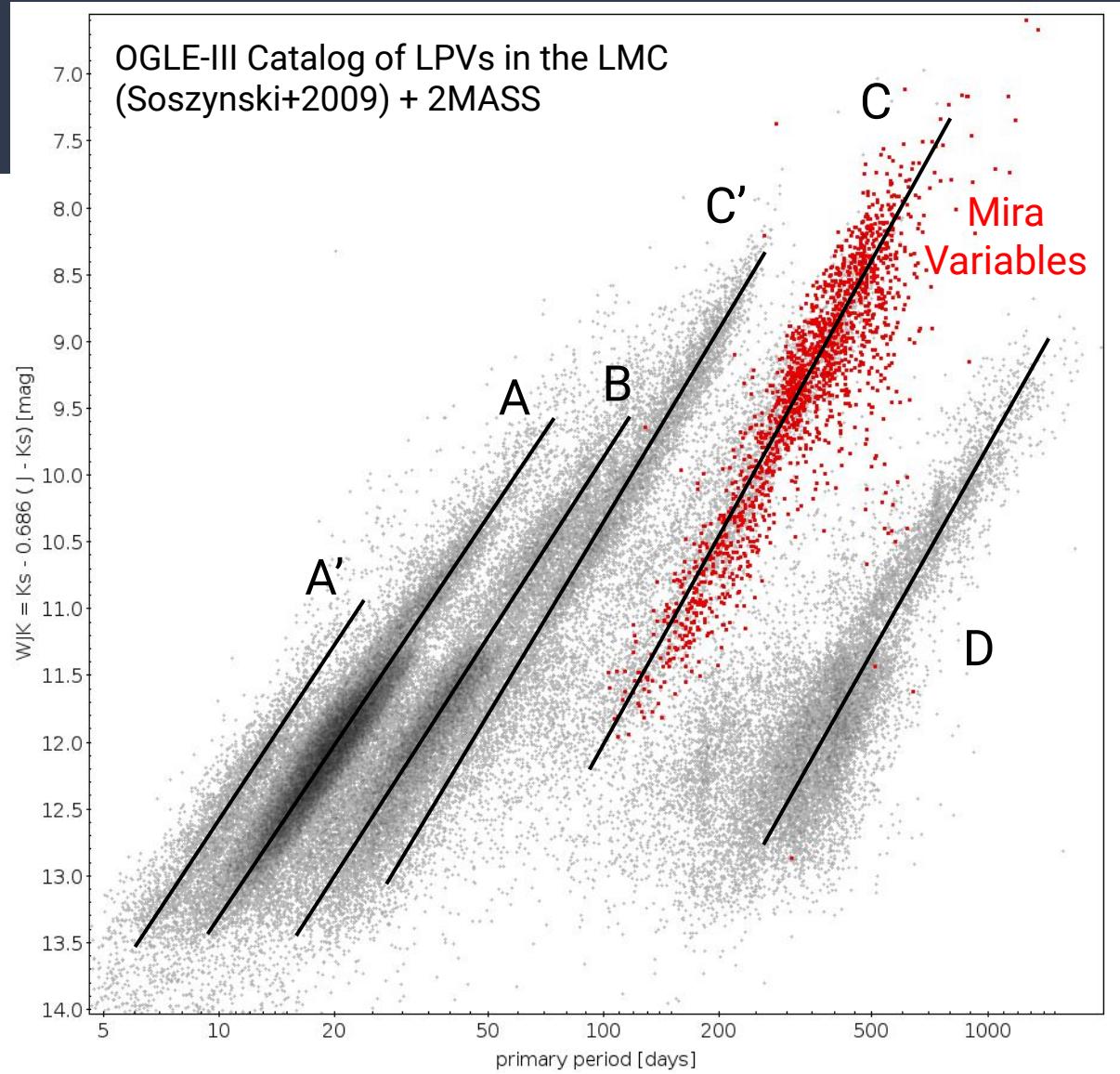
OGLE-III Period-Luminosity diagram

~8 years of observations

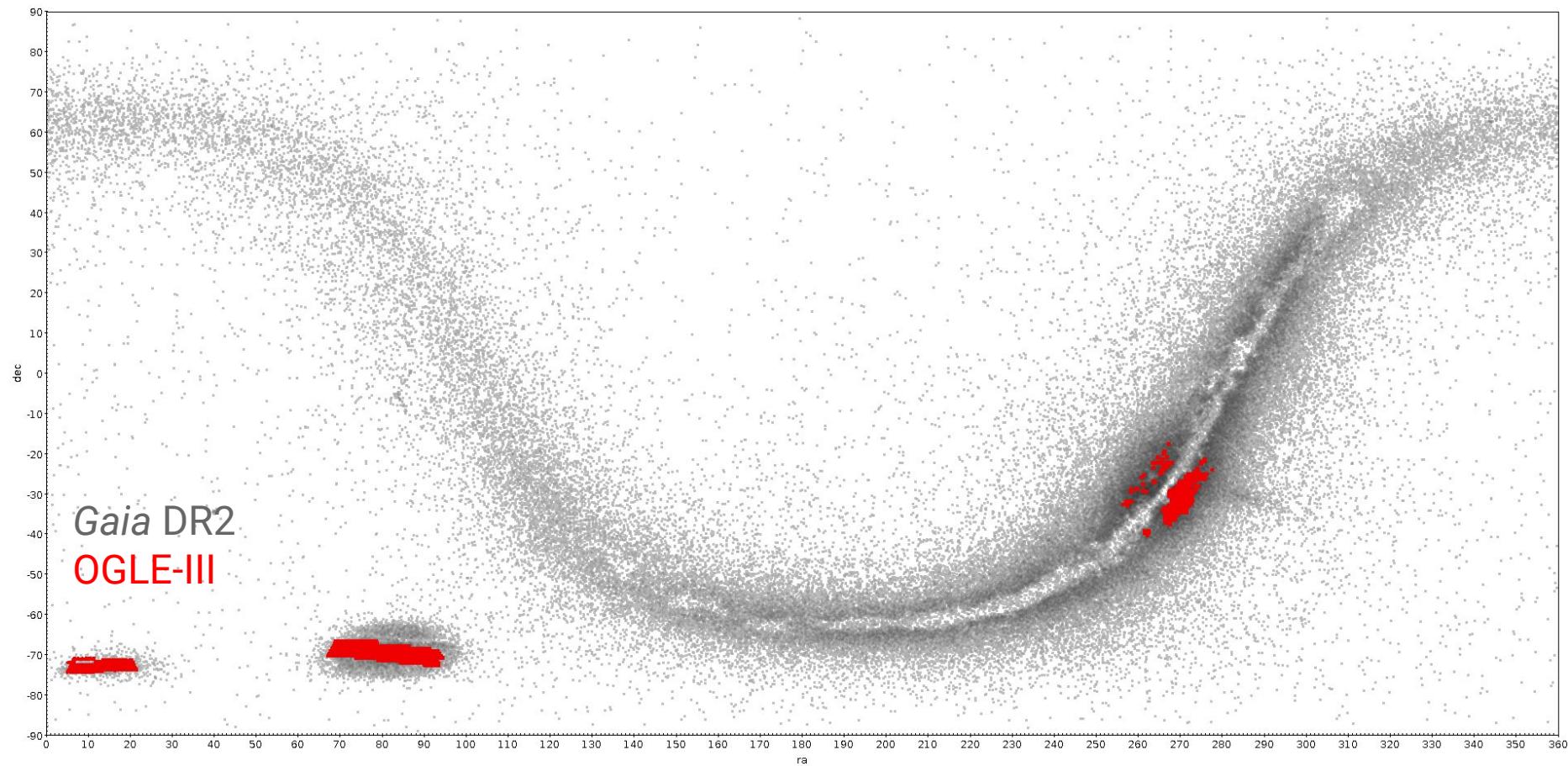
multi-periodicity: 3 periods
+ 3 I-band amplitudes for
each star

amplitudes down to
milli-mag level

multiple PL relations

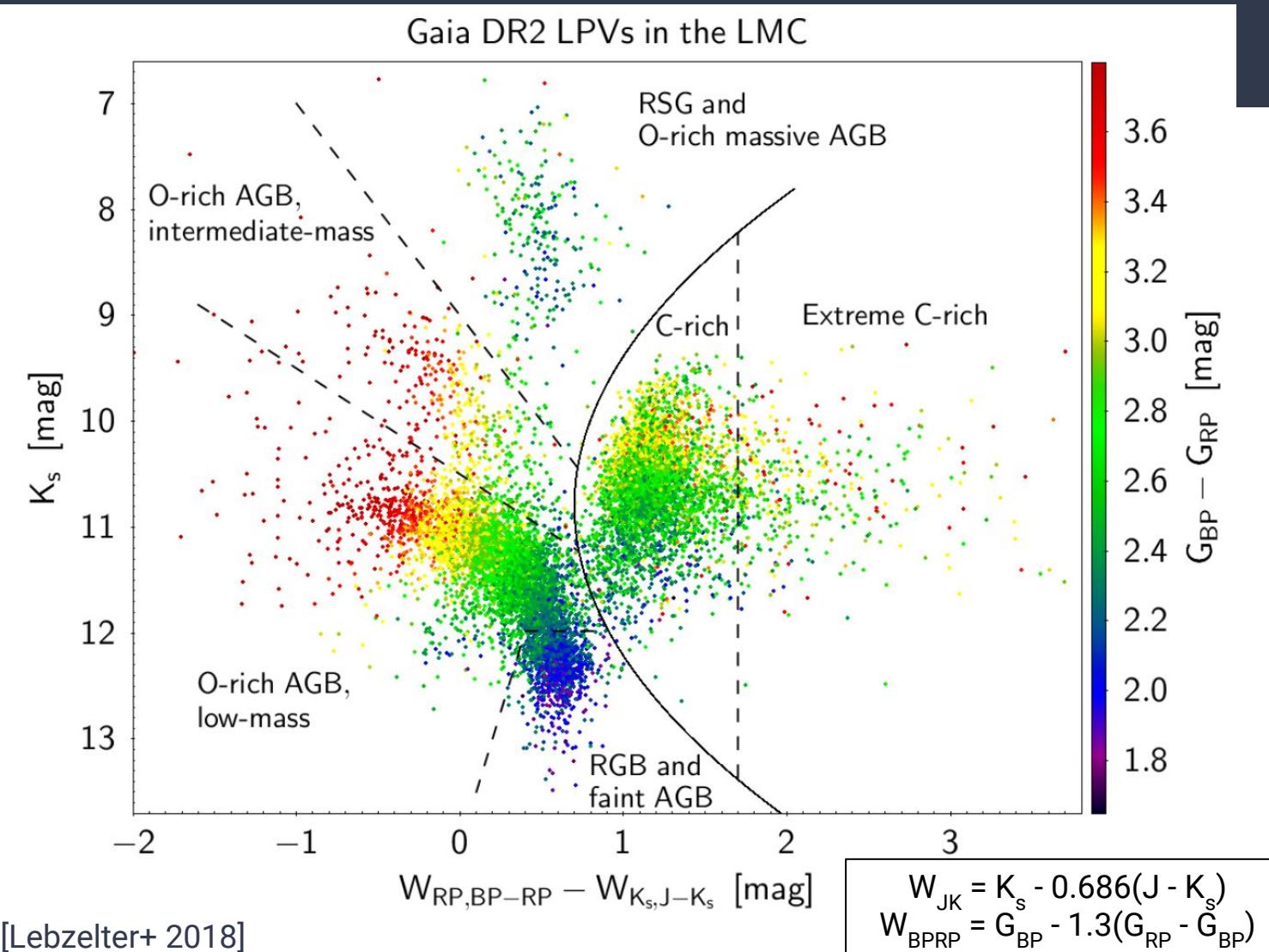


OGLE-III / *Gaia* DR2 - coverage comparison



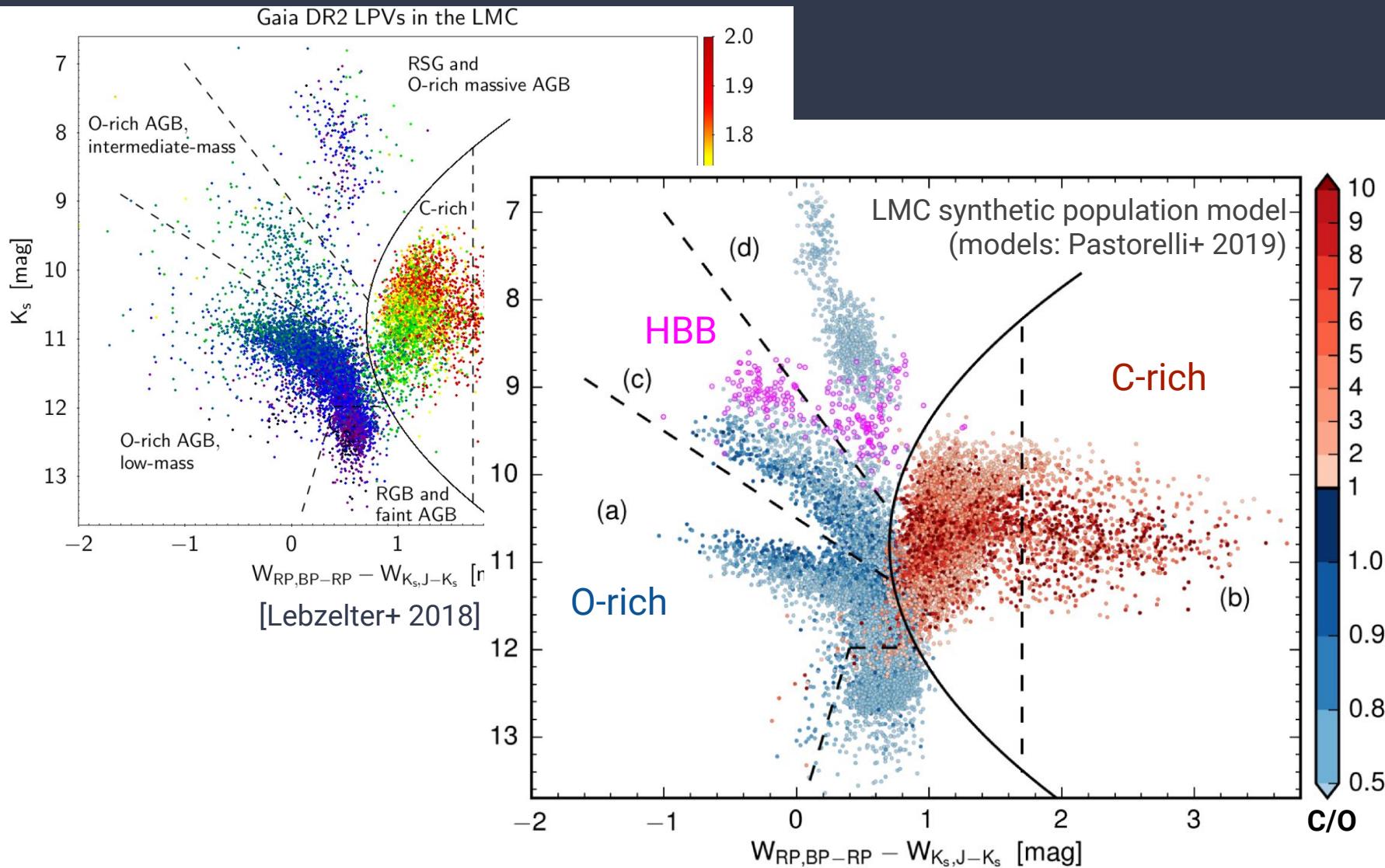
The Gaia-2MASS diagram

Catalogue of LPV candidates from the Gaia DR2 [Mowlavi+ 2018]



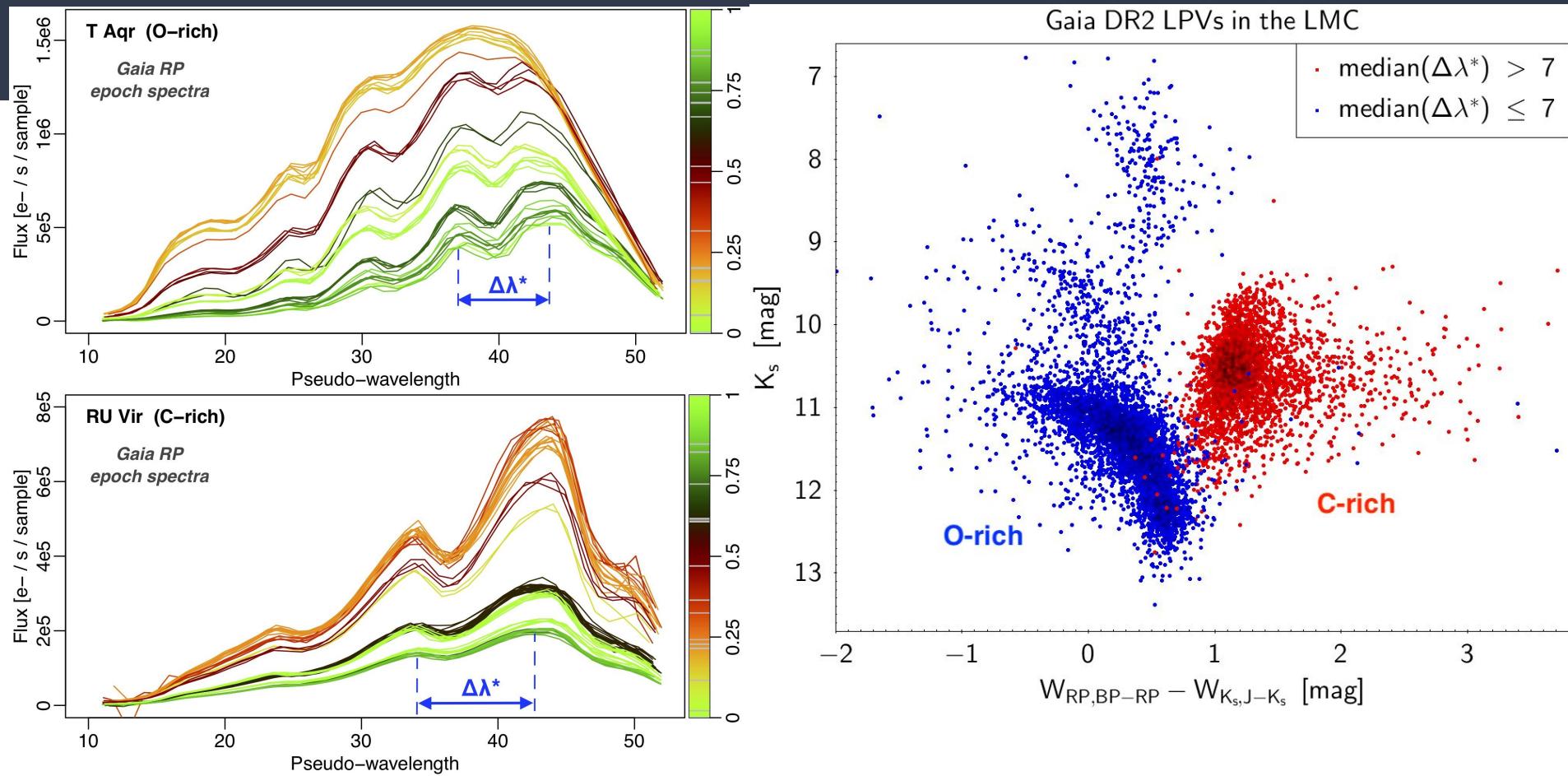
[Lebzelter+ 2018]

The Gaia-2MASS diagram & chemical type



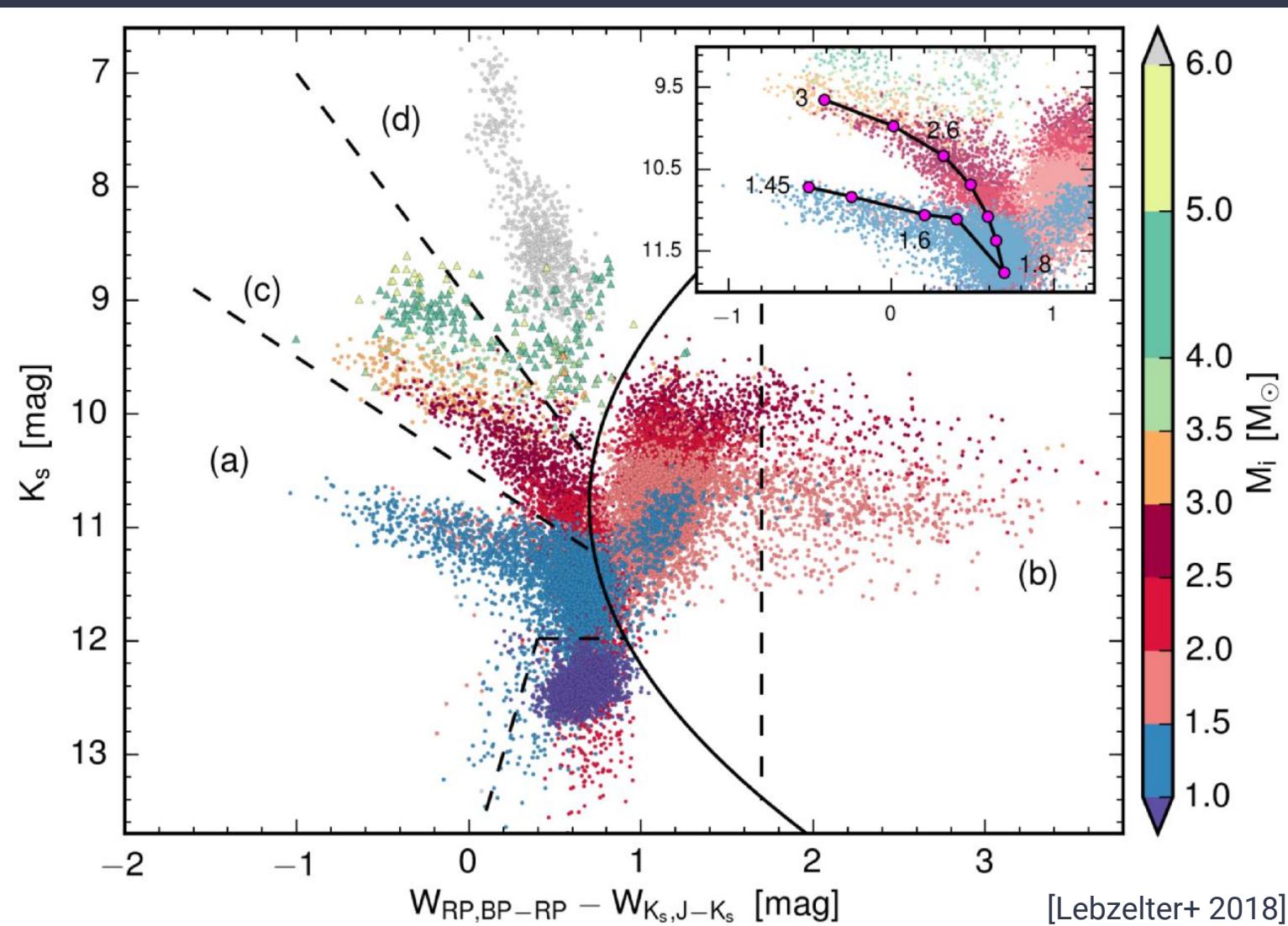
The Gaia-2MASS diagram & chemical type

Gaia Image of the Week, 15/11/2018

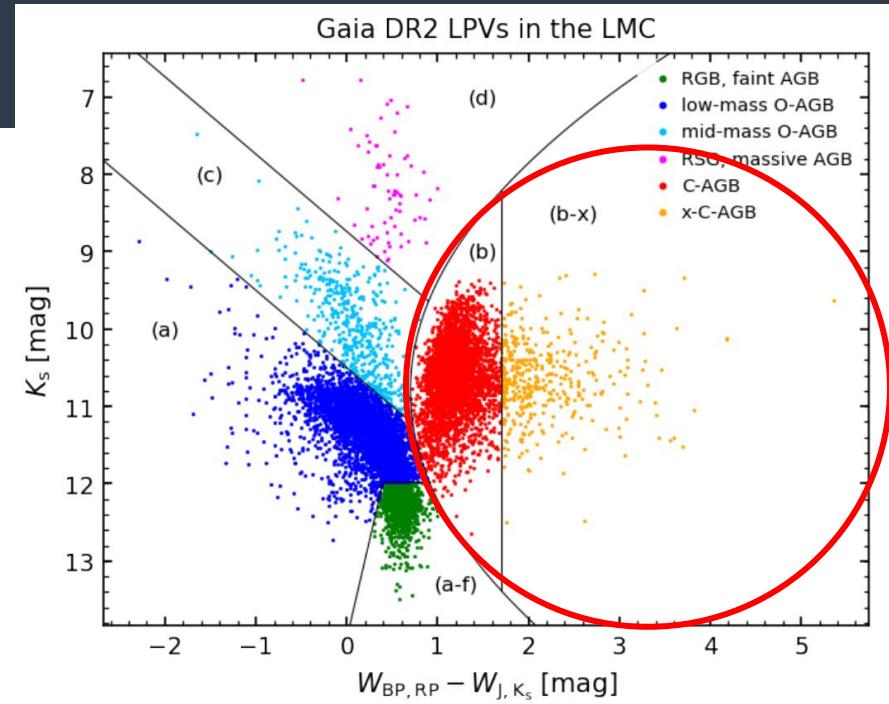
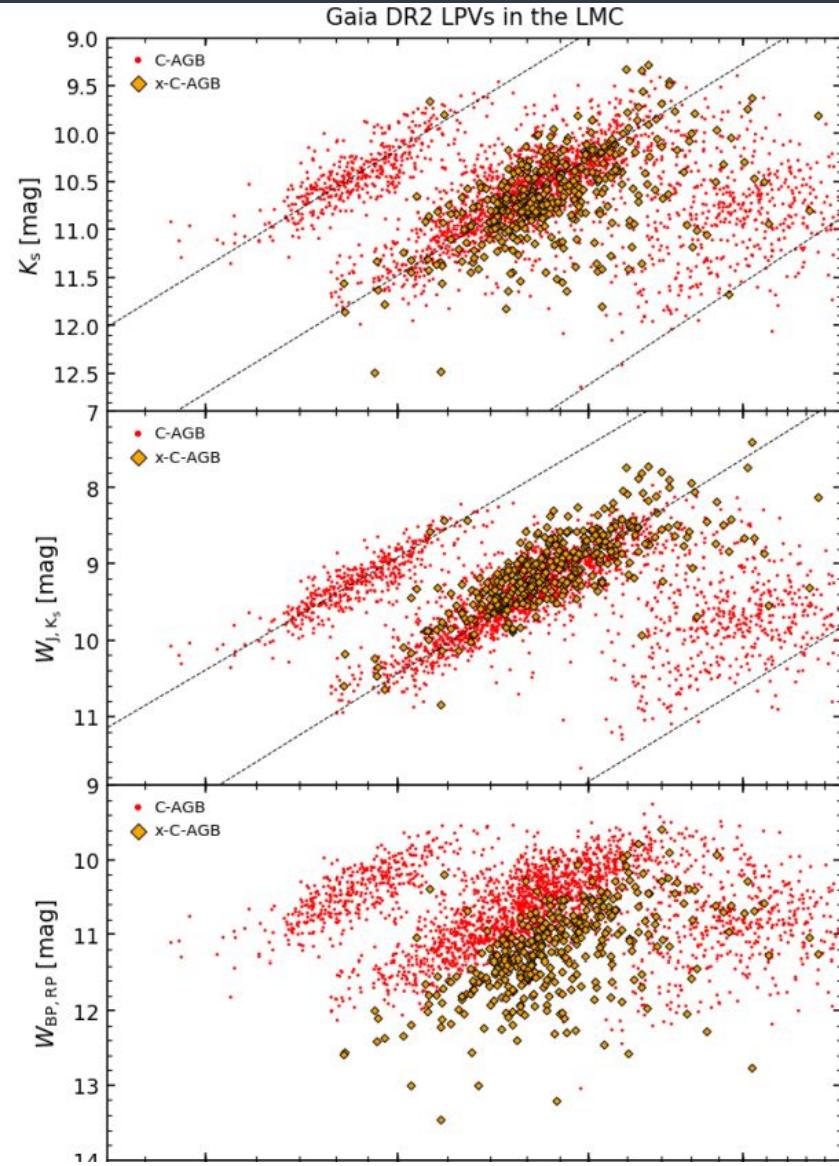


Credits: ESA/Gaia/DPAC, Nami Mowlavi, Isabelle Lecoeur-Taïbi, Maria Süveges, Thomas Lebzelter, Francesca De Angeli, Laurent Eyer, Dafydd Evans, Michal Pawlak, and the Gaia CU7 Geneva and CU5 Cambridge teams.

The Gaia-2MASS diagram & initial mass

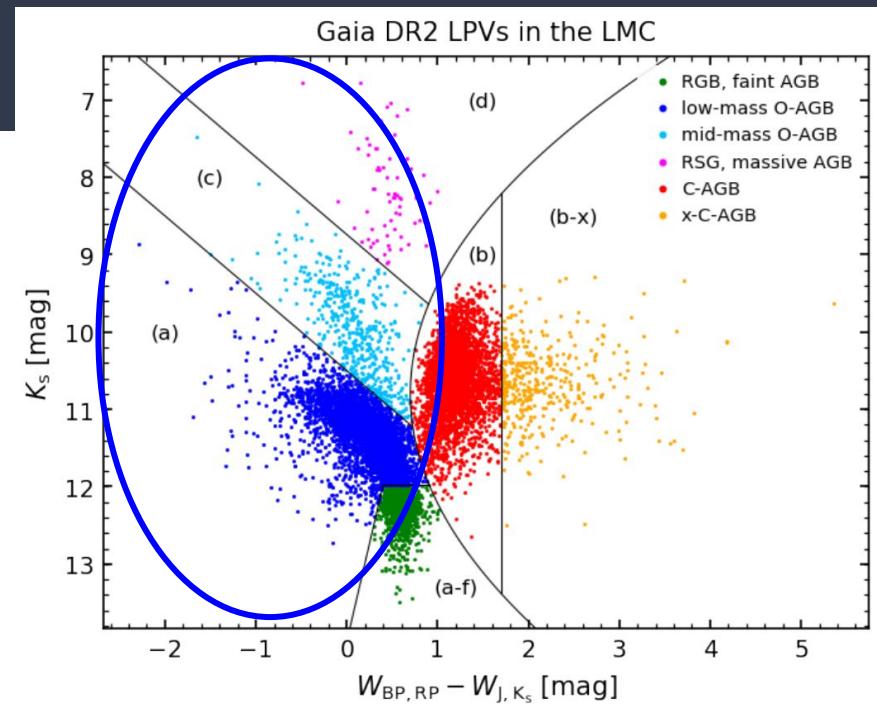
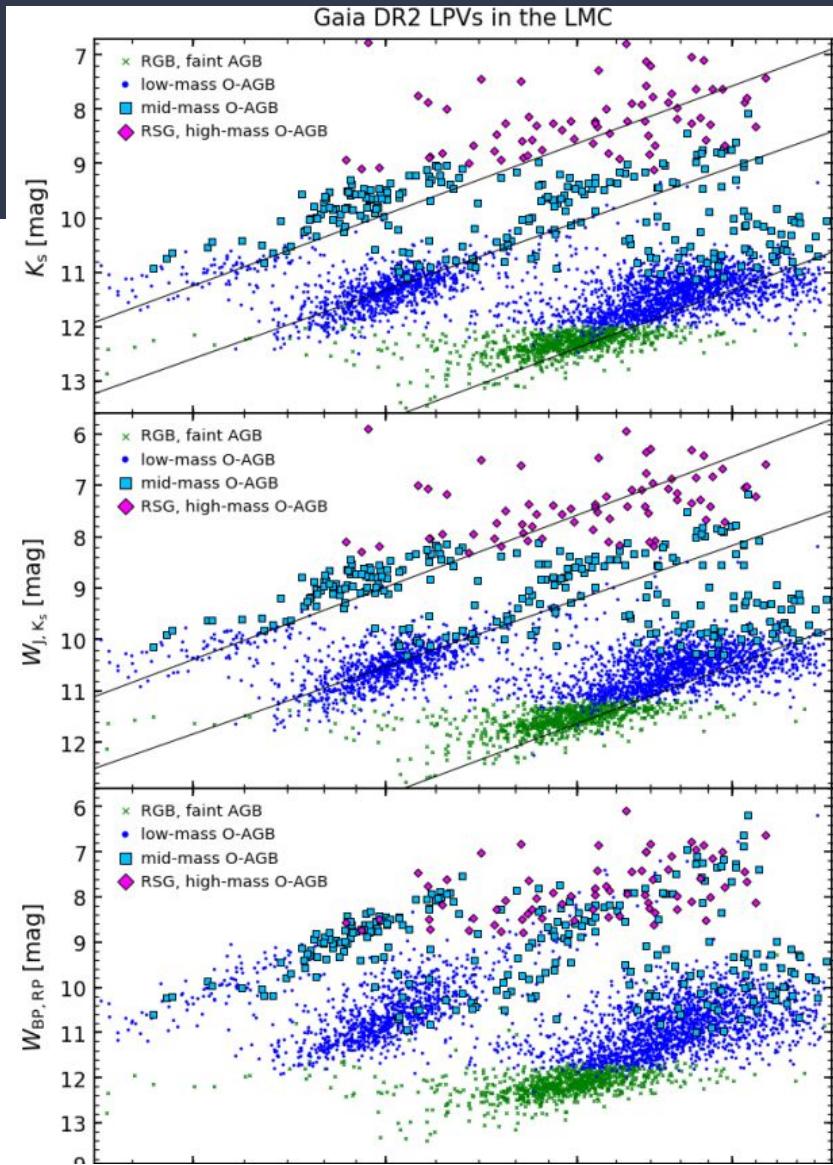


PLDs from *Gaia* DR2 - C-rich LPVs



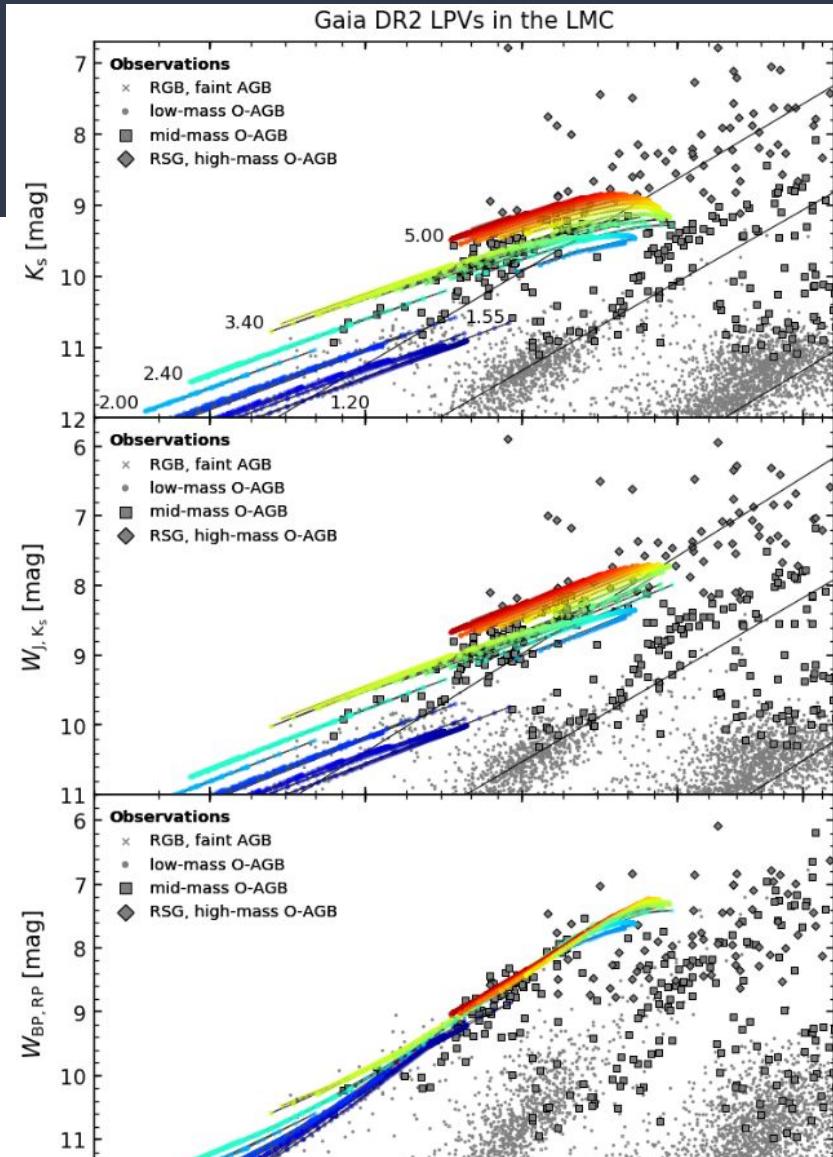
[Lebzelter+ submitted]

PLDs from *Gaia* DR2 - O-rich LPVs



[Lebzelter+ submitted]

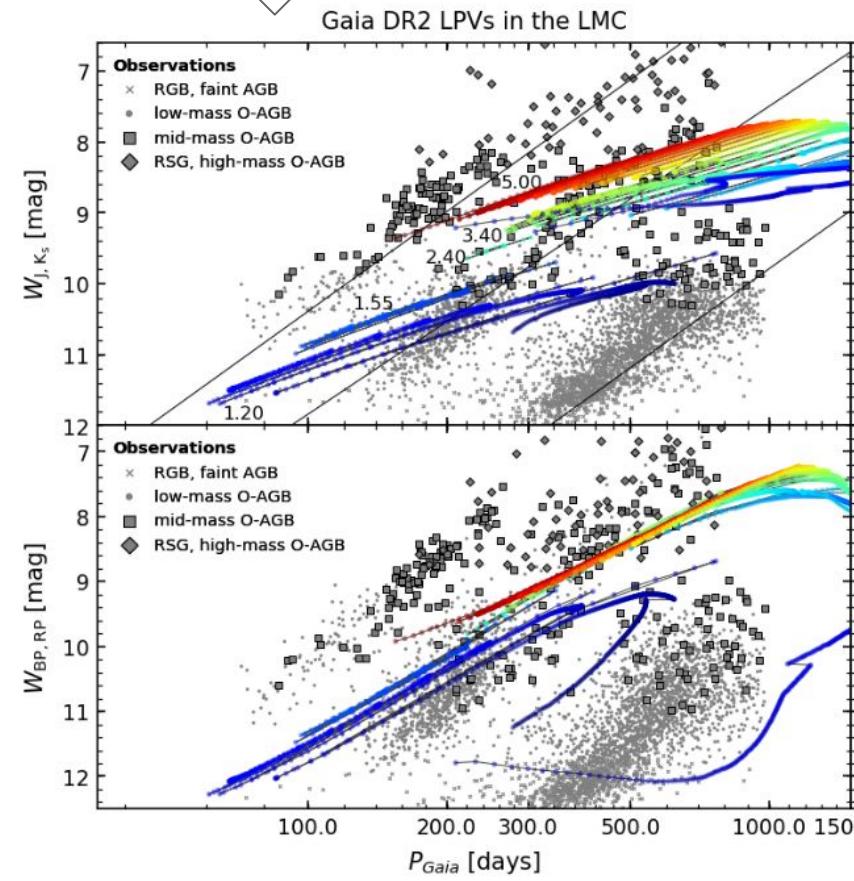
PLDs from Gaia DR2 - O-rich LPVs & models



First overtone mode pulsation models

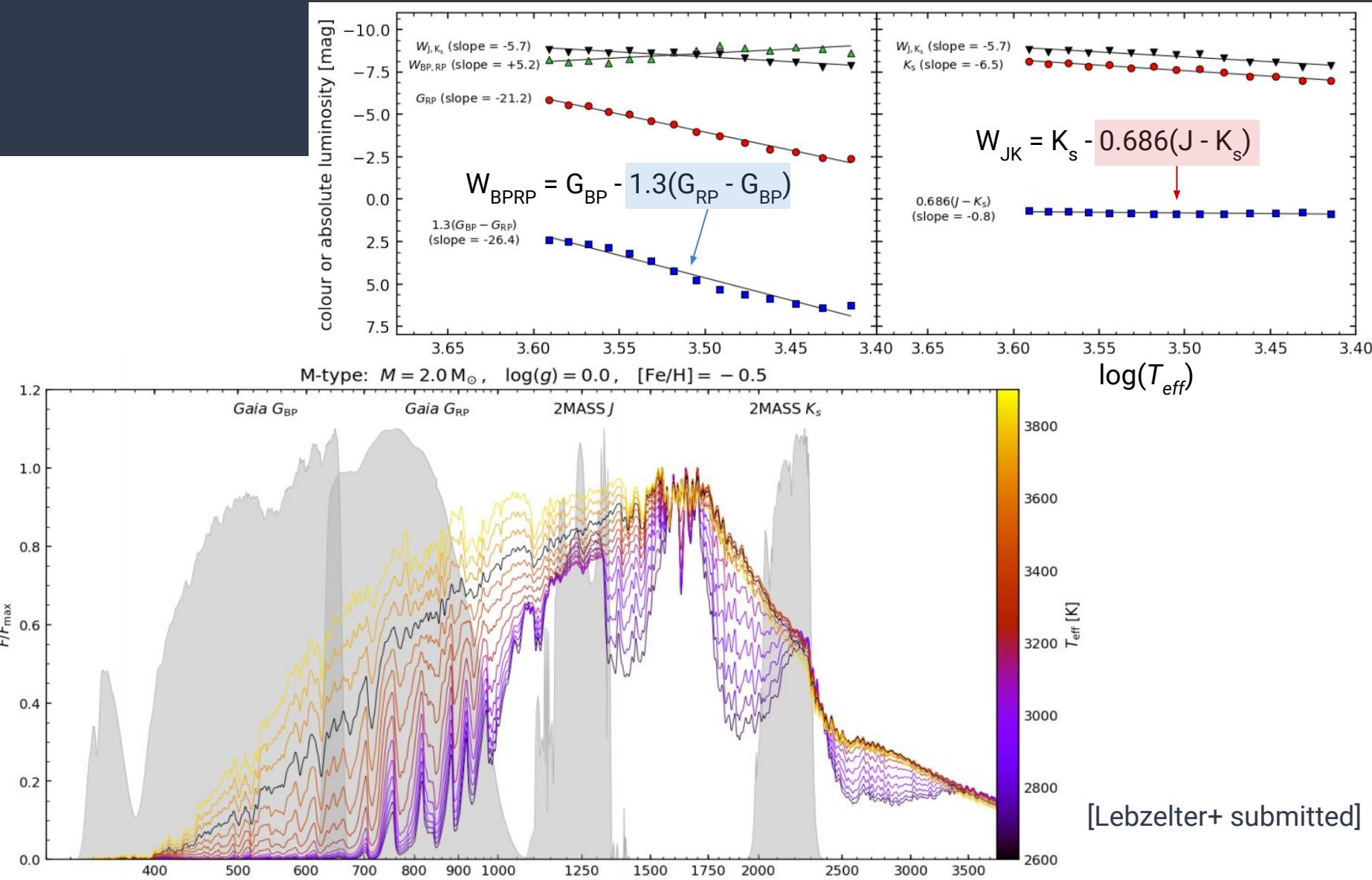


Fundamental mode pulsation models

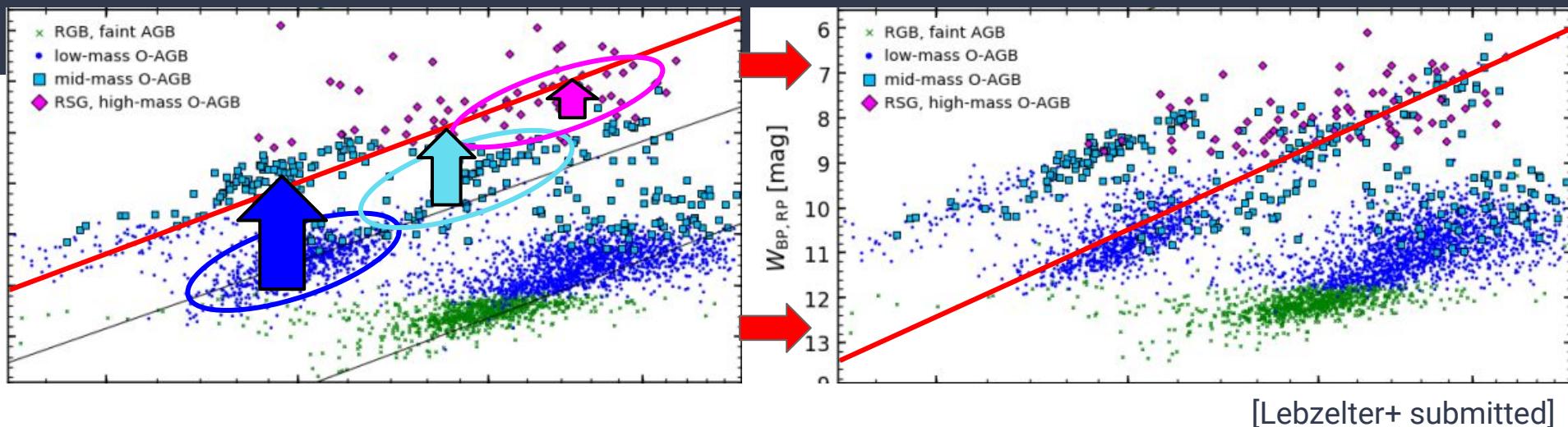


[Lebzelter+ submitted]

O-rich PLD - Mass+Temperature effect



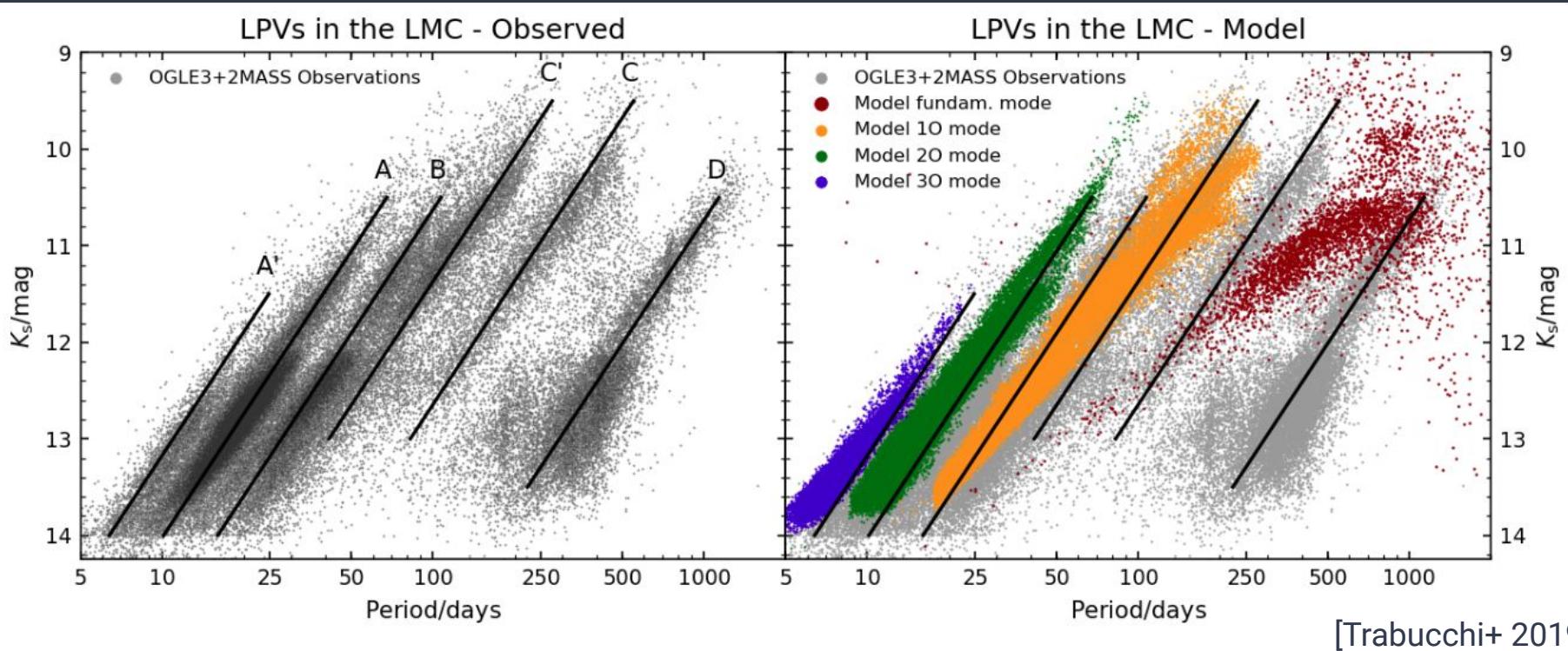
O-rich PLD - Mass+Temperature effect



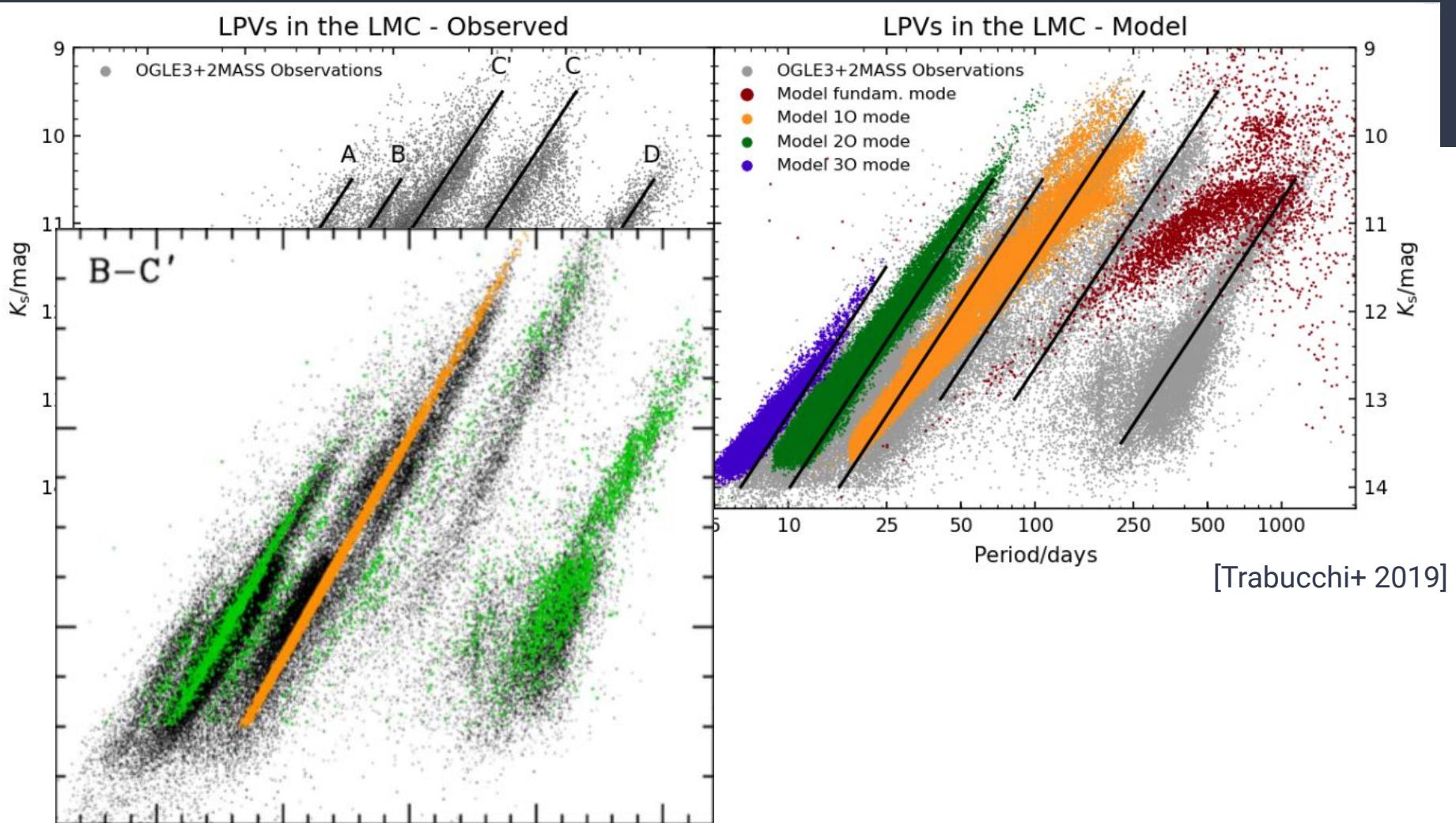
[Lebzelter+ submitted]

- At a given period, lower mass stars are colder
- Molecular band absorption makes them redder in the Gaia filters
- They have a larger colour-correction term in the Gaia Wesenheit index
- Lower-mass stars are “pushed upward” more than higher-mass ones in the PLD
- The “mass effect” is removed, all O-rich mass groups end up in the same PL relation
- This coincidence (?) provides a **well-defined visual PL relation of AGBs & RSGs**

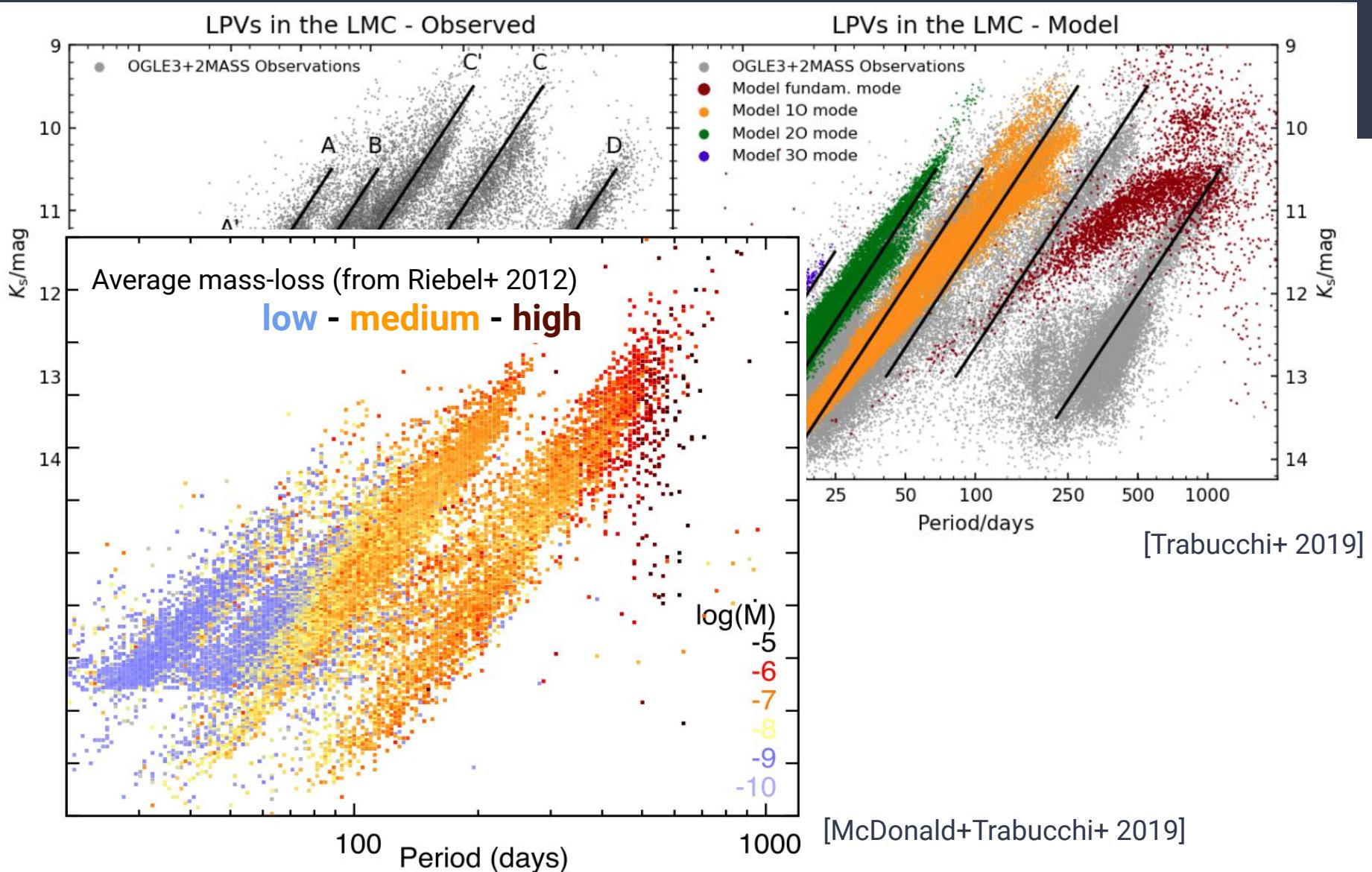
Long-Period Variables pulsation models



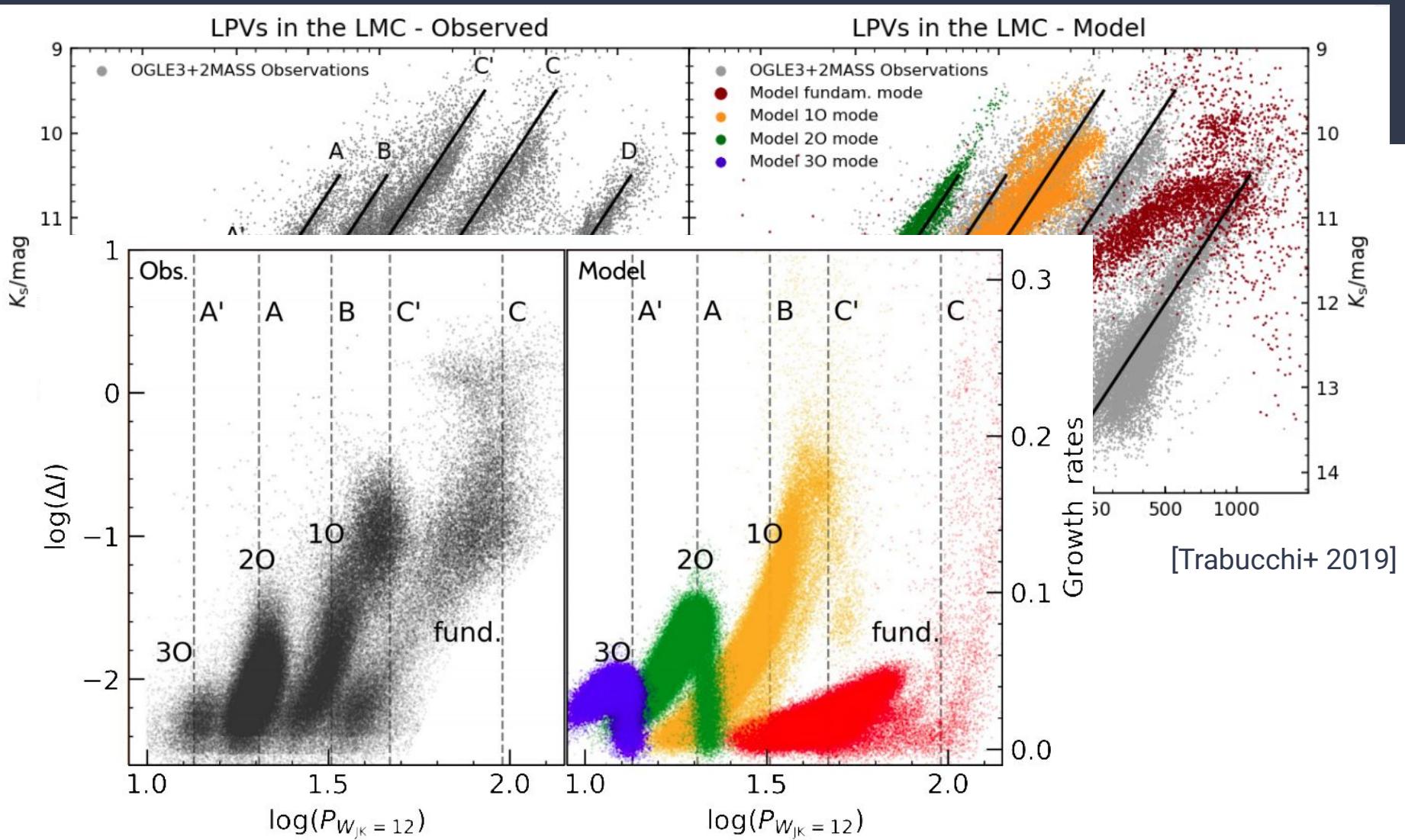
Long-Period Variables pulsation models



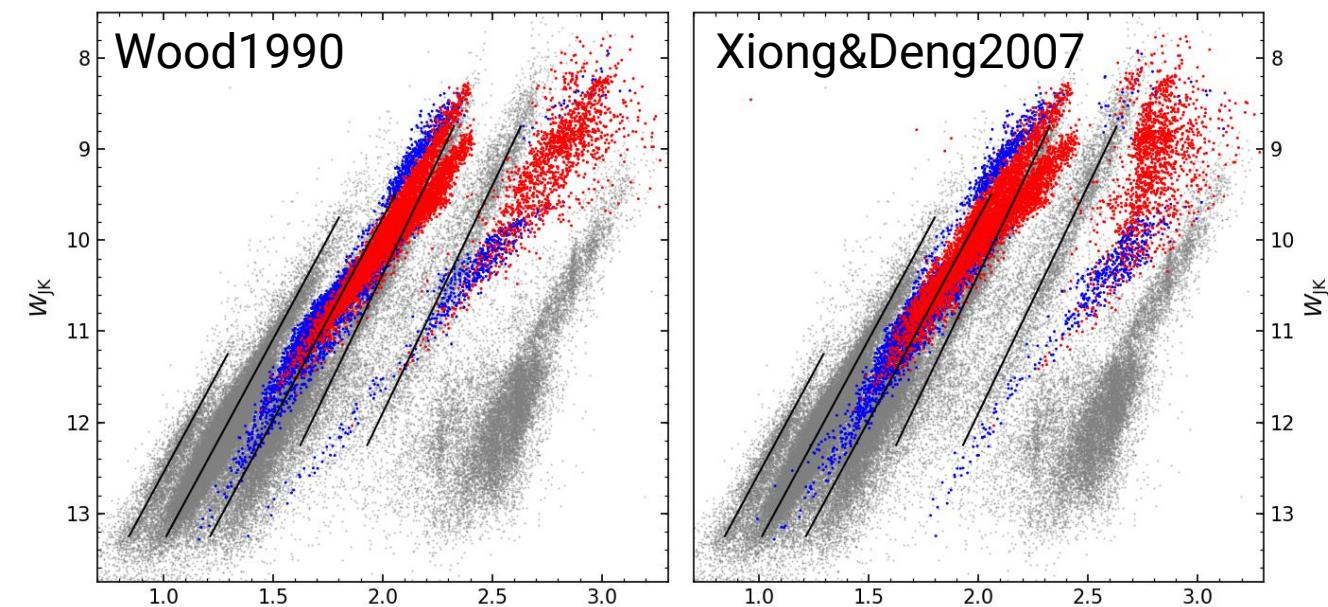
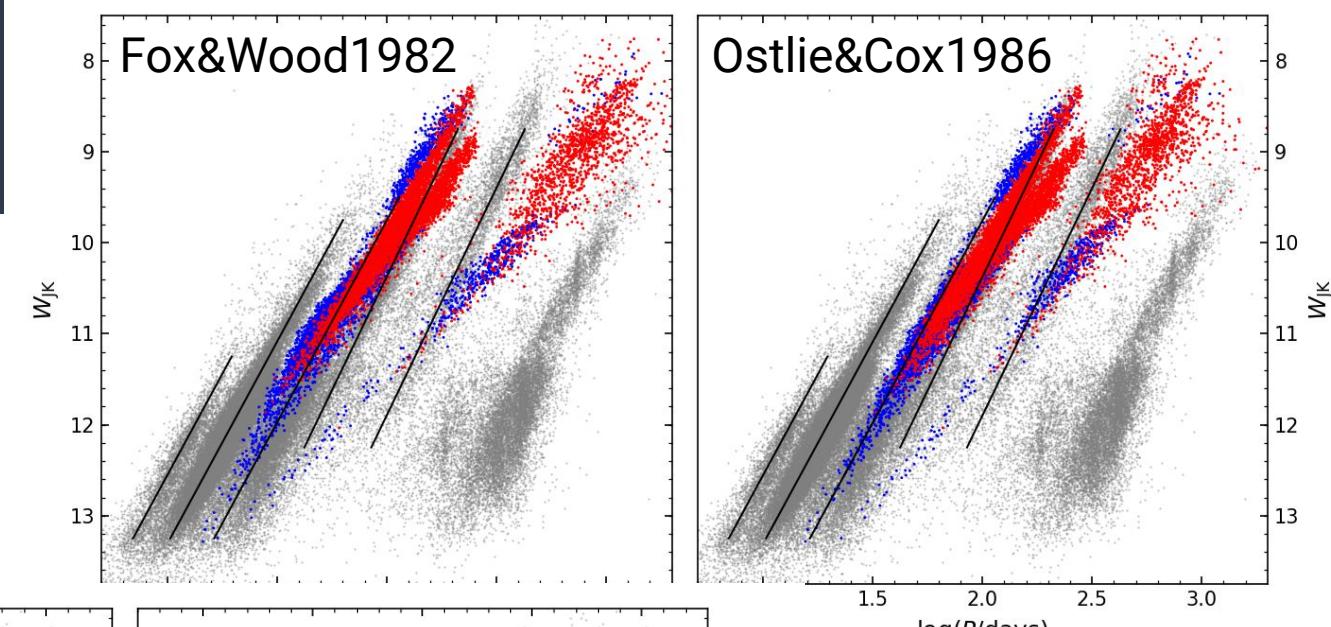
Long-Period Variables pulsation models



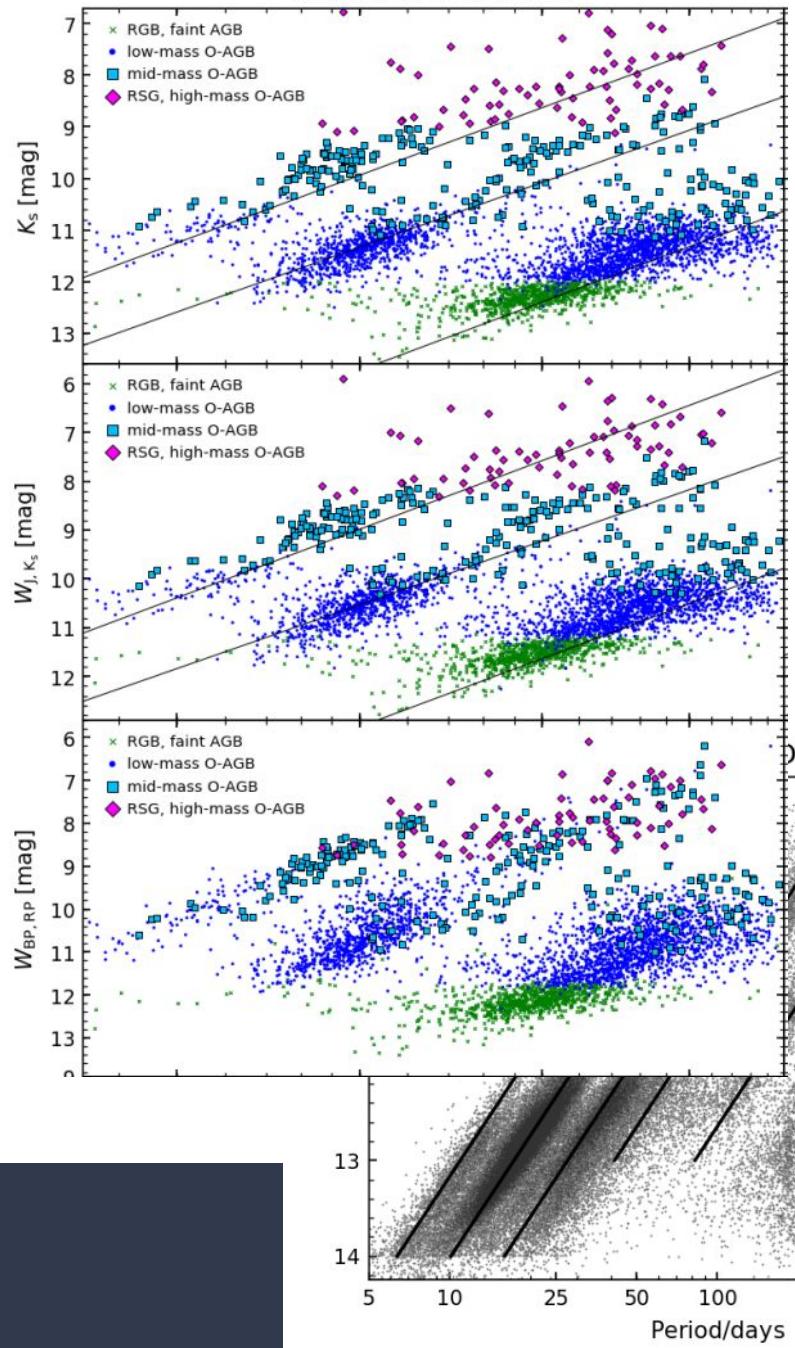
Long-Period Variables pulsation models



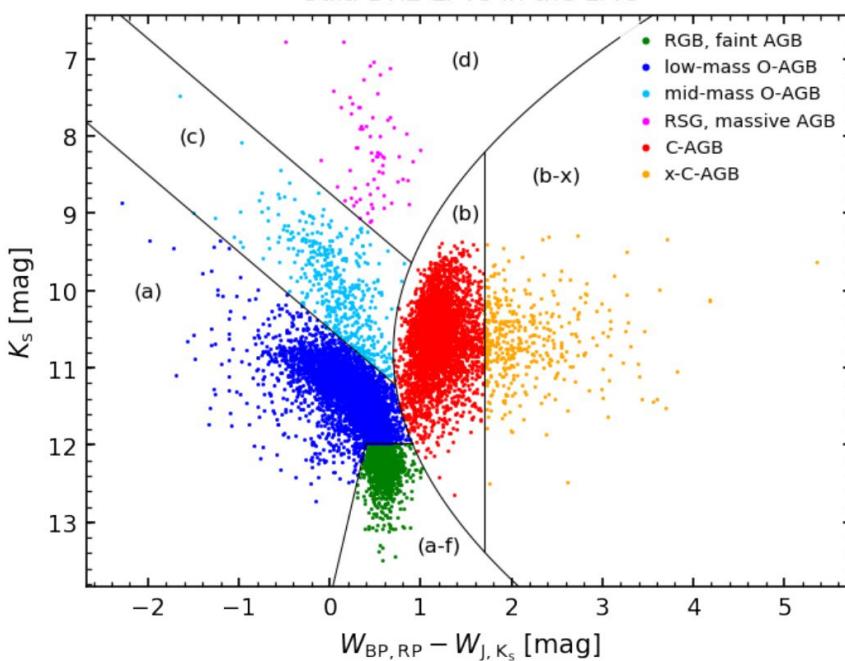
Comparing fundamental mode period models



Gaia DR2 LPVs in the LMC



Gaia DR2 LPVs in the LMC



Observed

