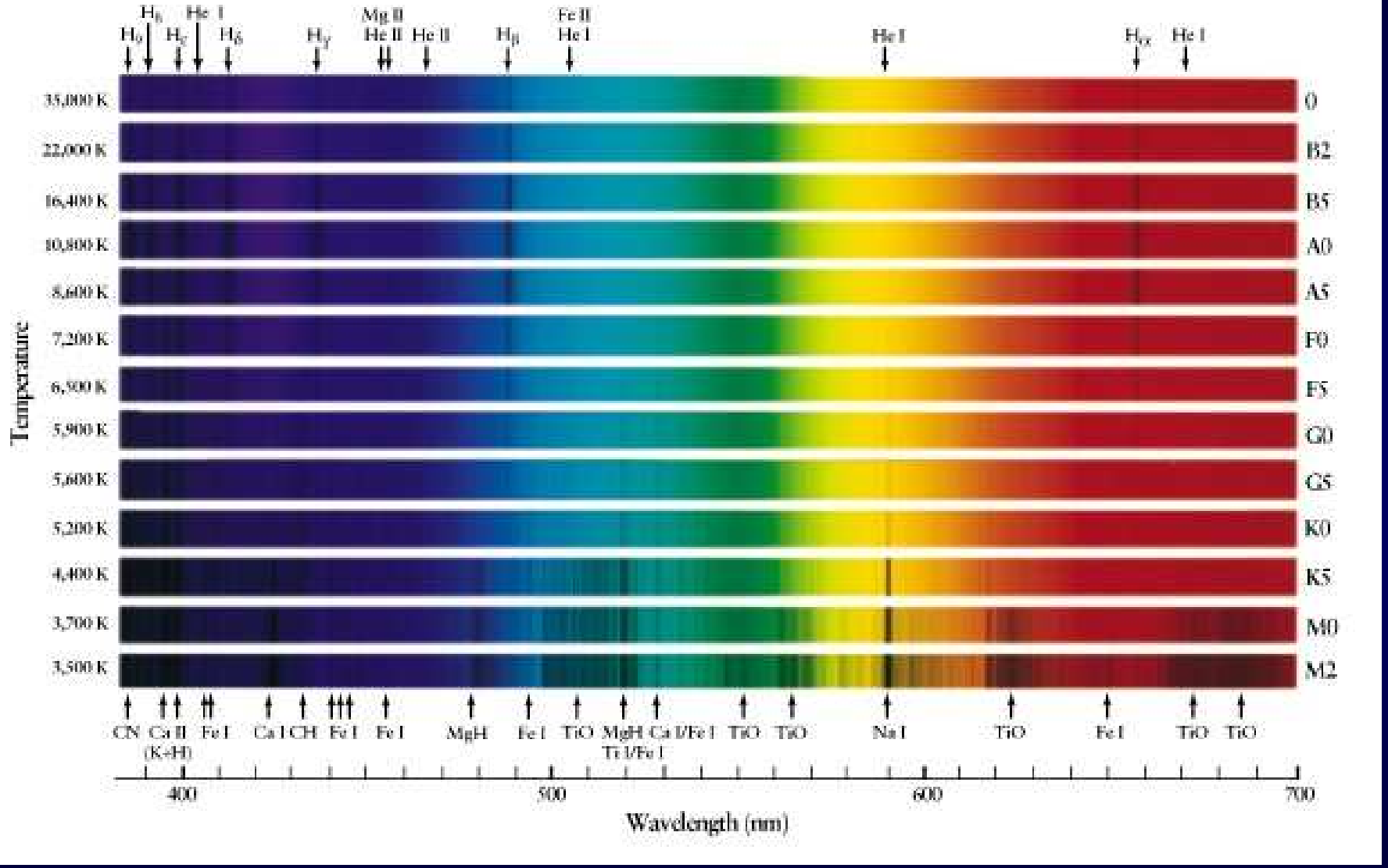
Cosa sono le RR Lyrae ?

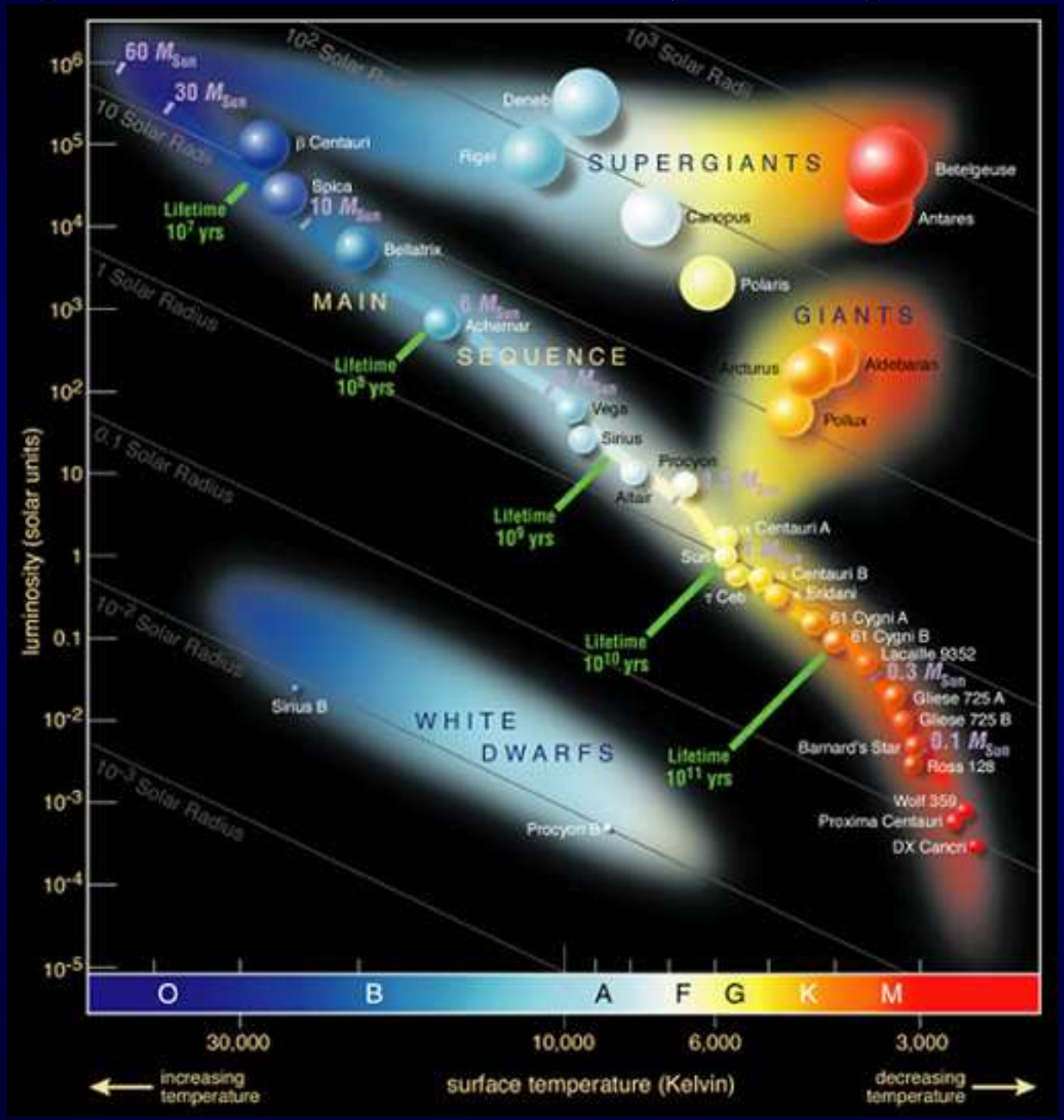
Riccardo Papini
(AAVSO / UAI / GRAV)

Le RR Lyrae: “lucciole” nel cosmo

Classificazione spettrale delle stelle

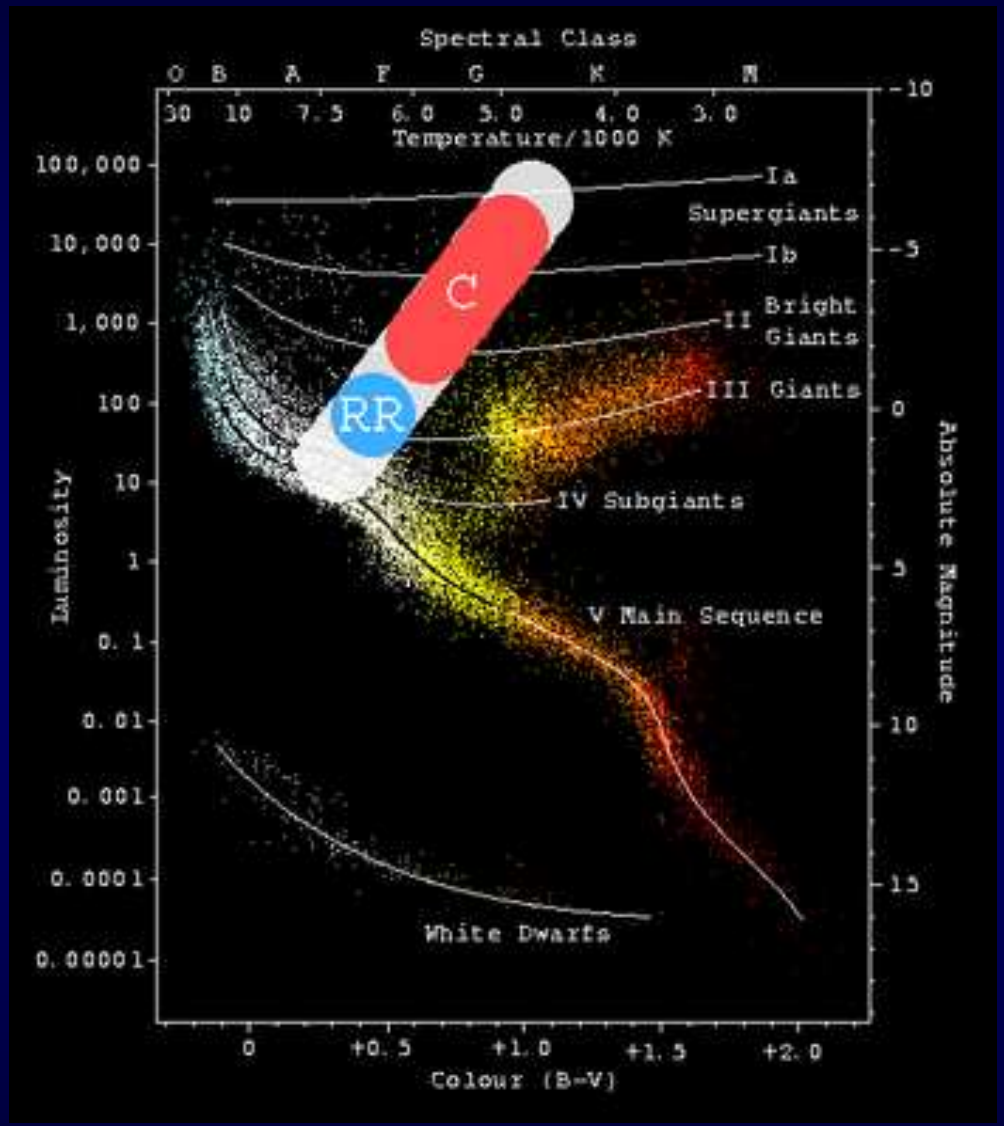


Il diagramma di Hertzprung - Russel

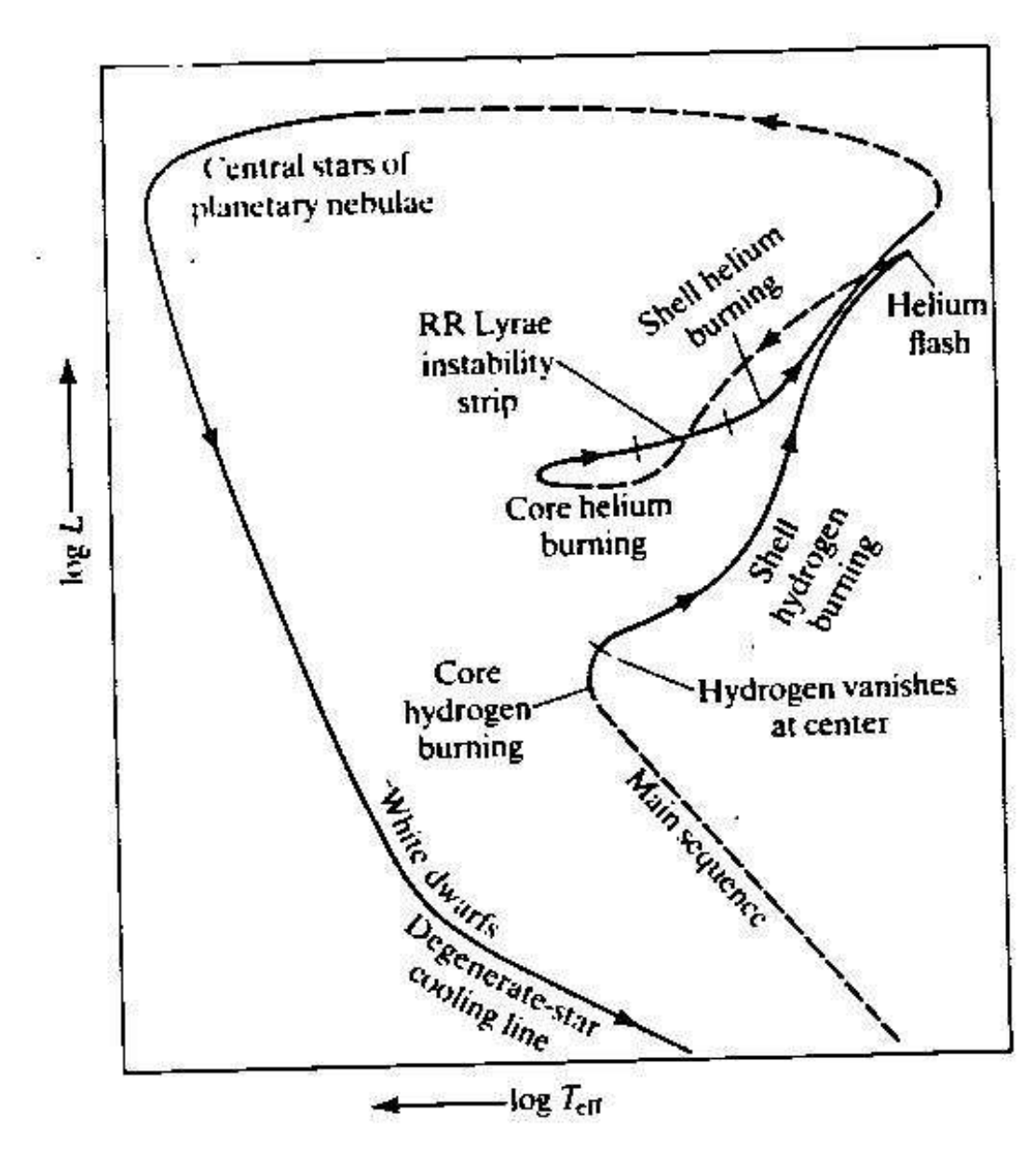


Le stelle RR Lyrae sono dunque stelle …

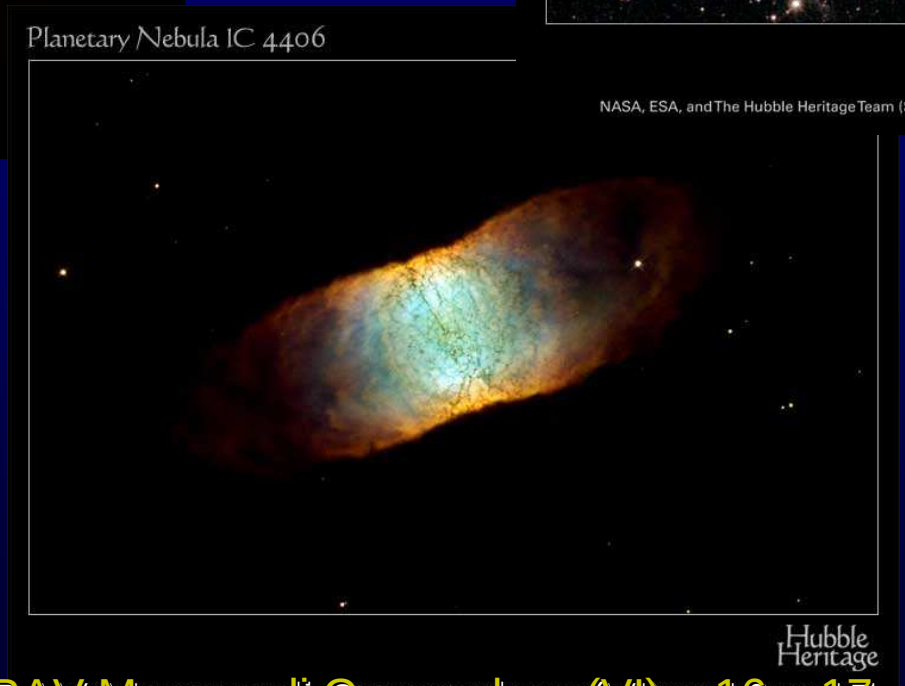
- Variabili
- Instabili
- Pulsanti
- “Bruciano” He
- “Vecchie”



… post sequenza principale



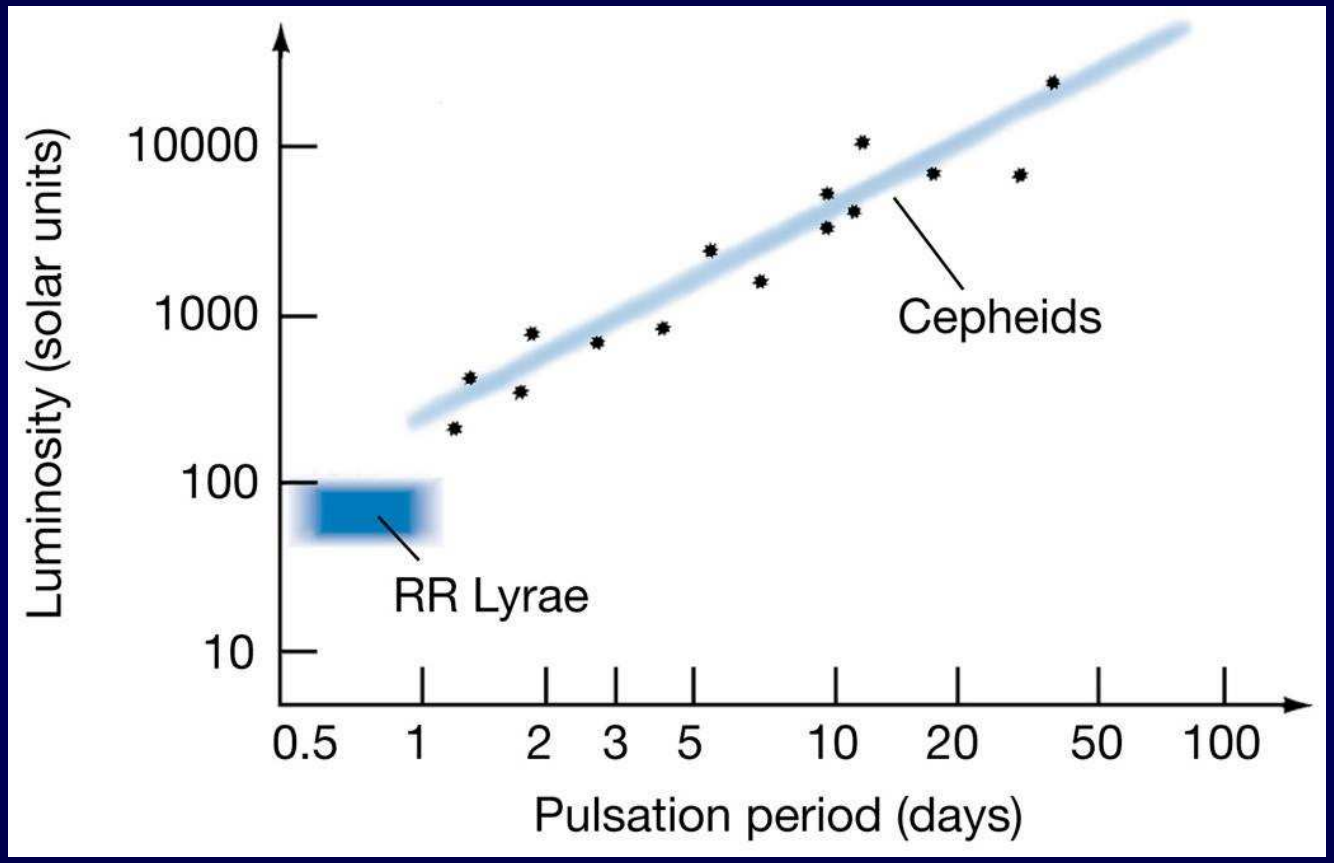
Quel che resta di una RR Lyrae …



Principali proprietà fisiche

Periodo	0.2 - 1.1 giorni
$\langle M_V \rangle$	+0.6 ±0.2
$\langle T_e \rangle$	6100-7400 ˚K
[Fe/H]	0.0 - –2.5
Massa	~ $0.7 M_\odot$
Raggio	~ 4 - 6 $R_\odot$

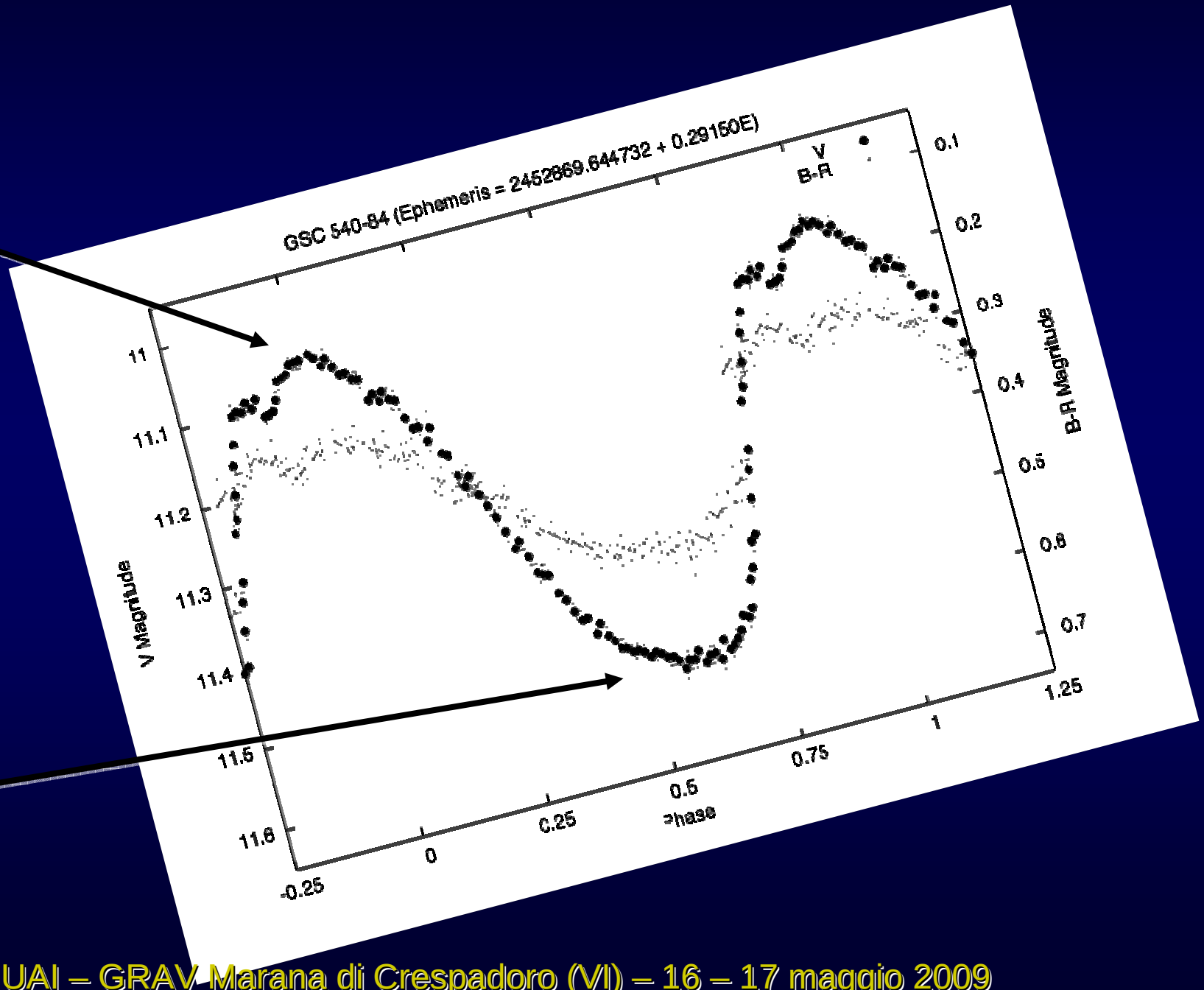
Relazione Periodo - Luminosità



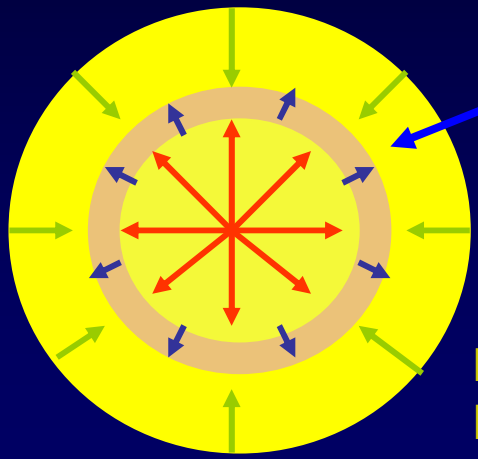
Come varia una RR Lyrae …

Piccola
e calda

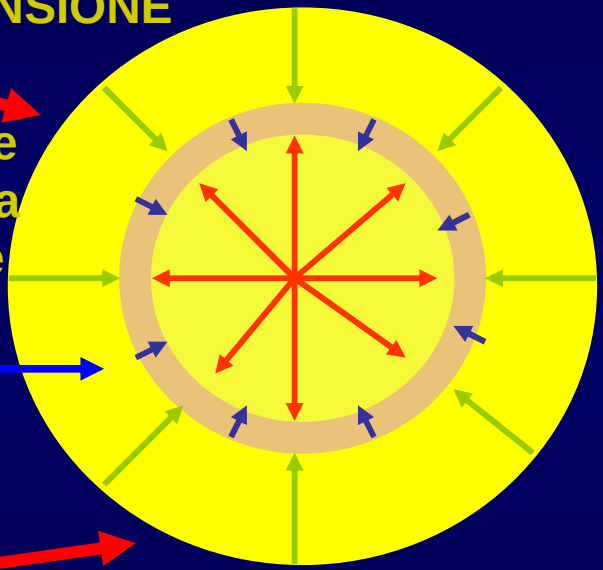
Grande
e fredda



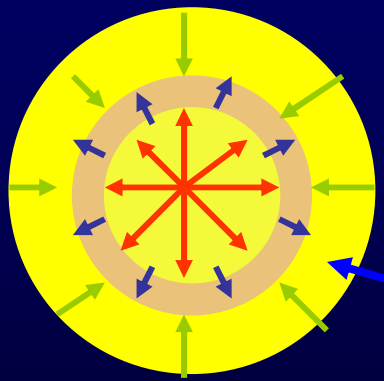
Meccanismo a “valvola” delle pulsazioni



Lo strato contenente He parzialmente ionizzato è opaco e assorbe più energia di quanto è necessario per bilanciare gli strati esterni => ESPANSIONE



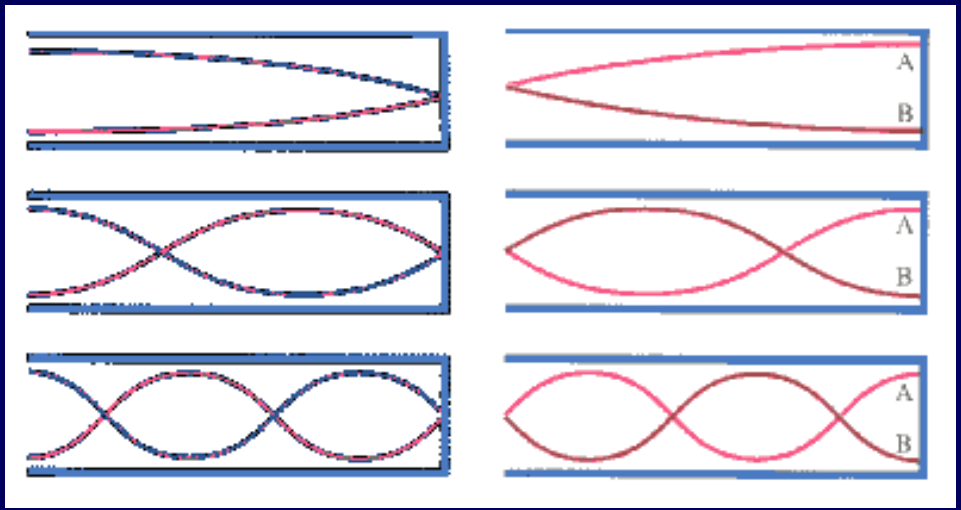
Durante l’espansione l’He ionizzato diventa trasparente, assorbe meno energia => il peso degli starti esterni lo spinge verso l’interno => CONTRAZIONE

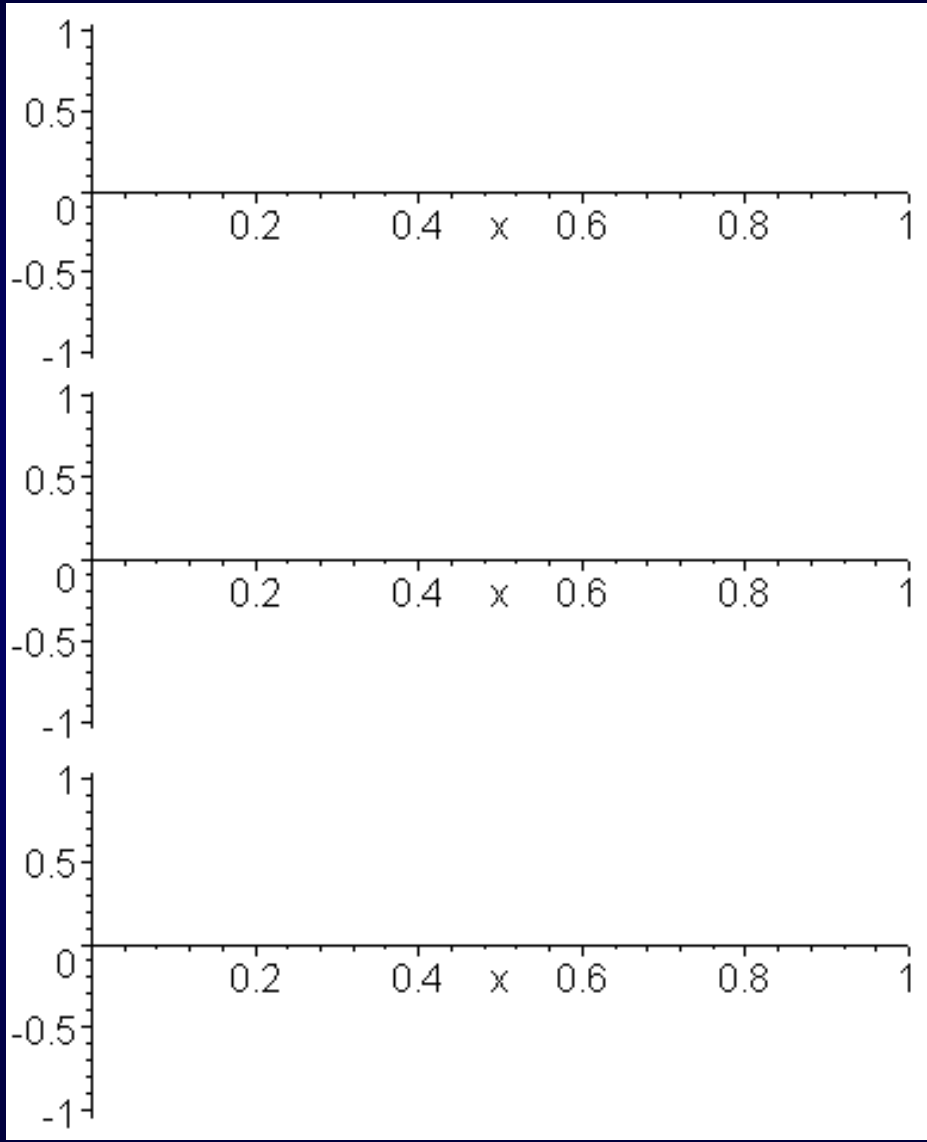


Durante la compressione lo starto di He diventa di nuovo opaco, assorbe più energia di quella necessaria per l’equilibrio => ESPANSIONE

Corde e canne d'organo …

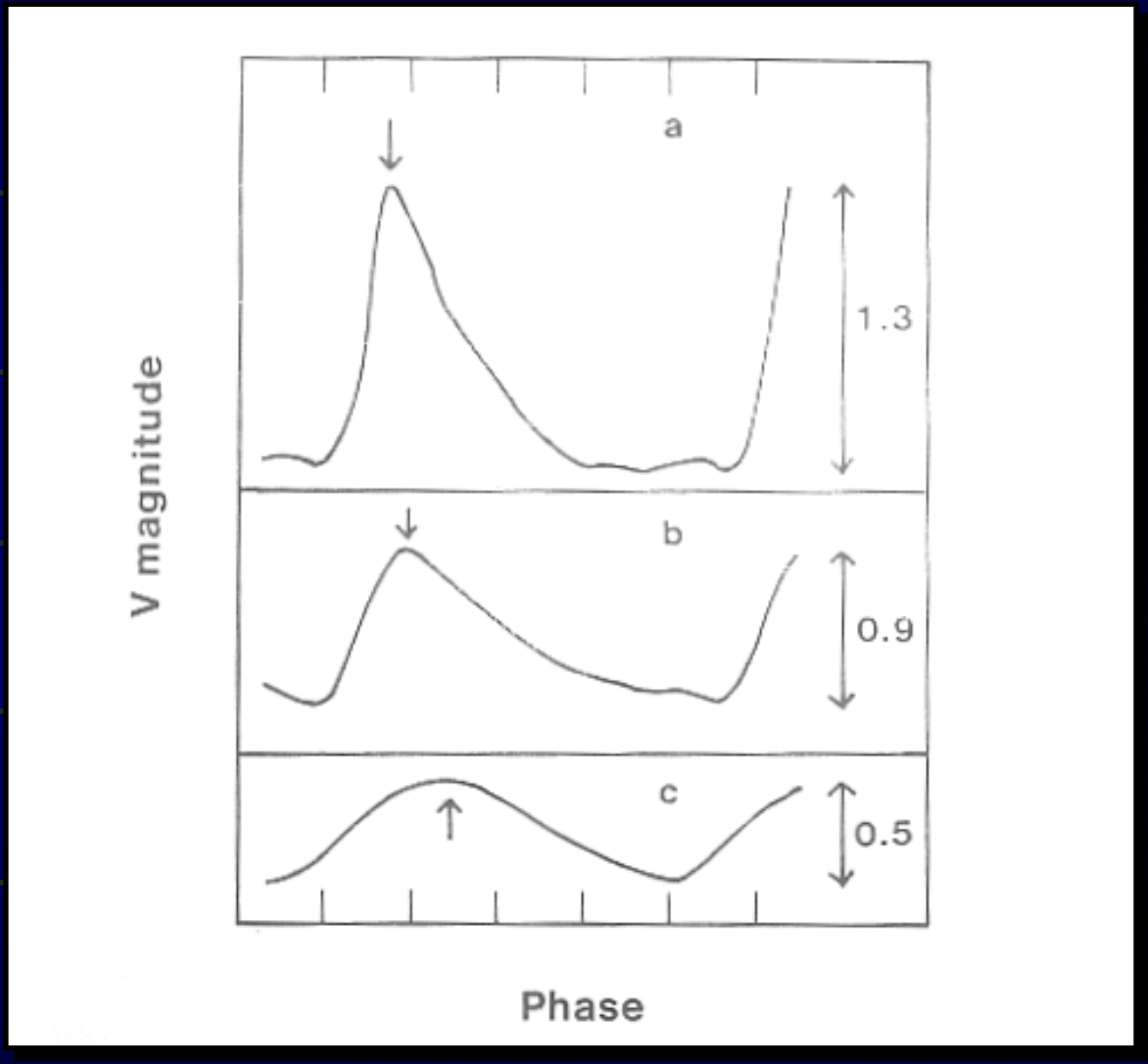
ONDE STAZIONARIE



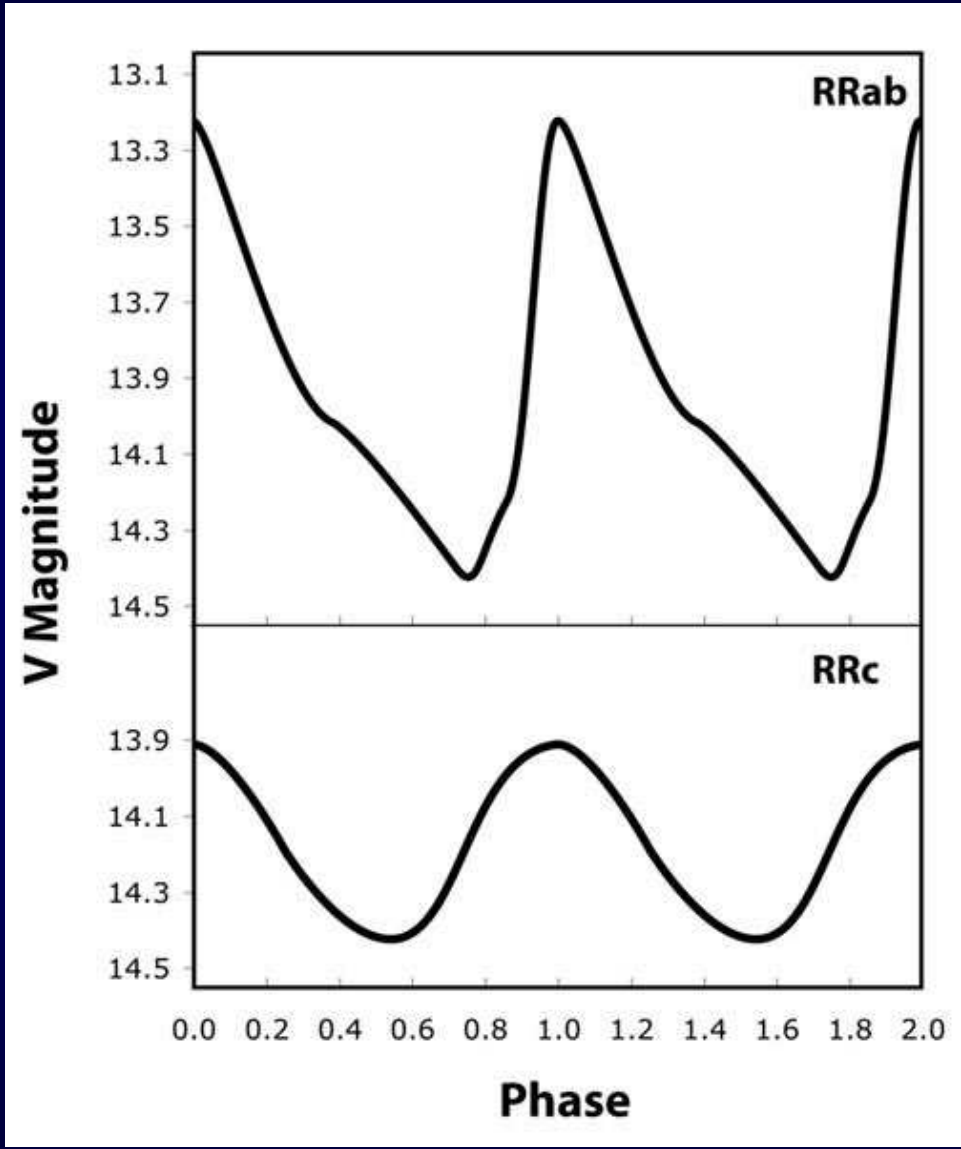


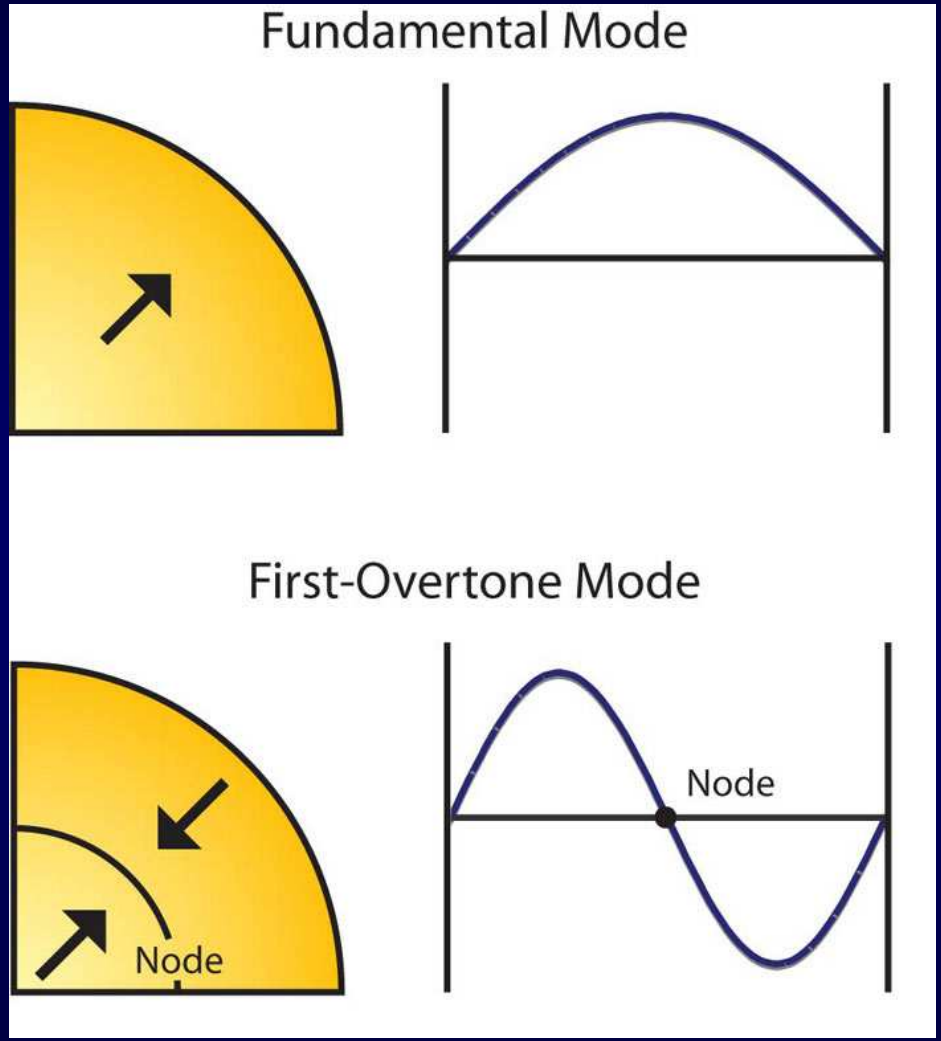
La classificazione originaria di Bailey

Type	Description
RRab	Fundamental mode pulsation
RRc	Overtone pulsation
RRd	Double-mode pulsation

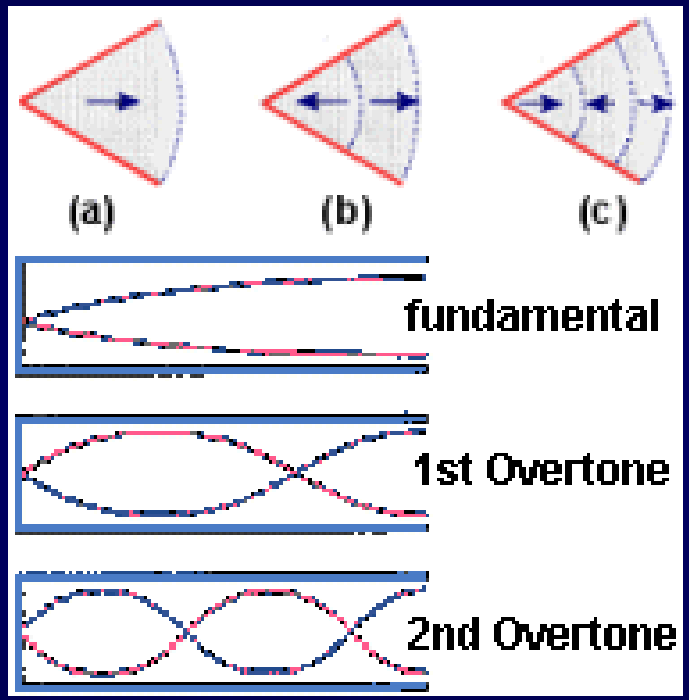


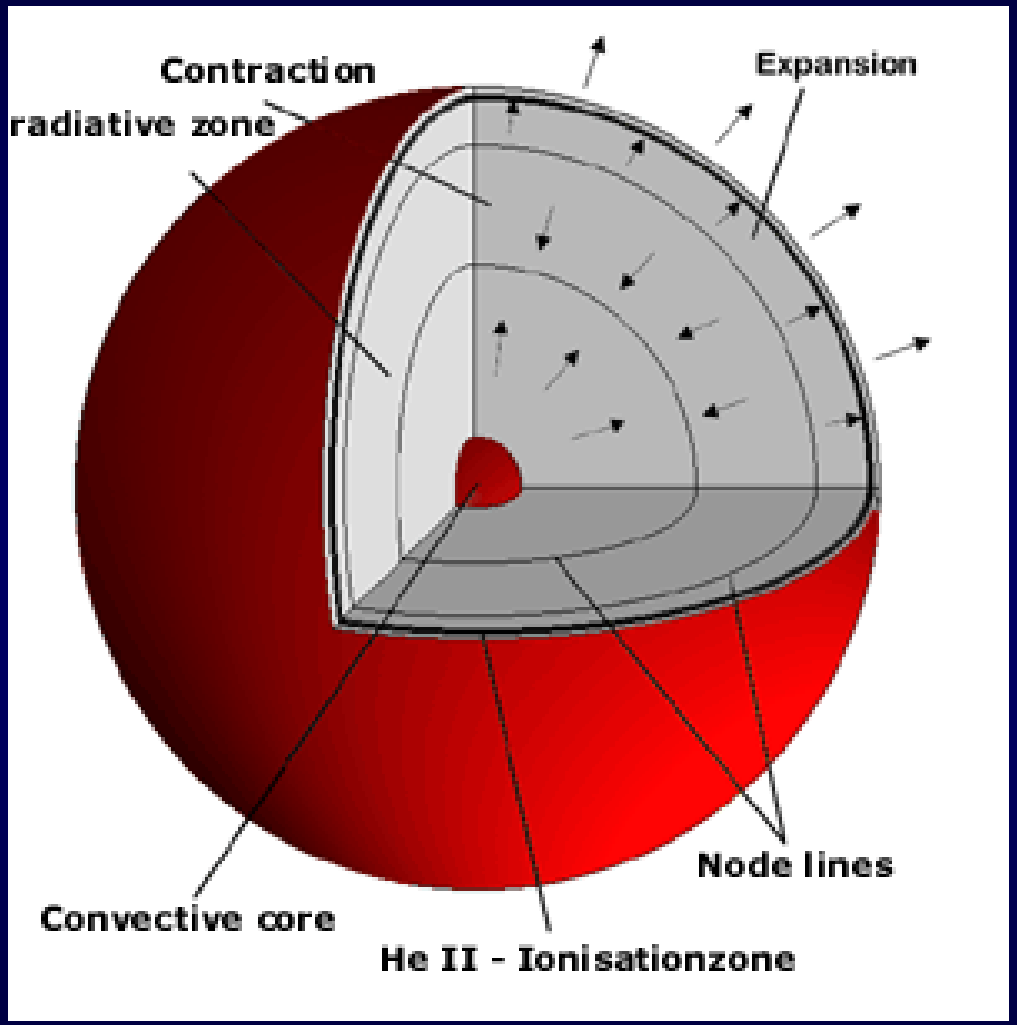
La classificazione moderna



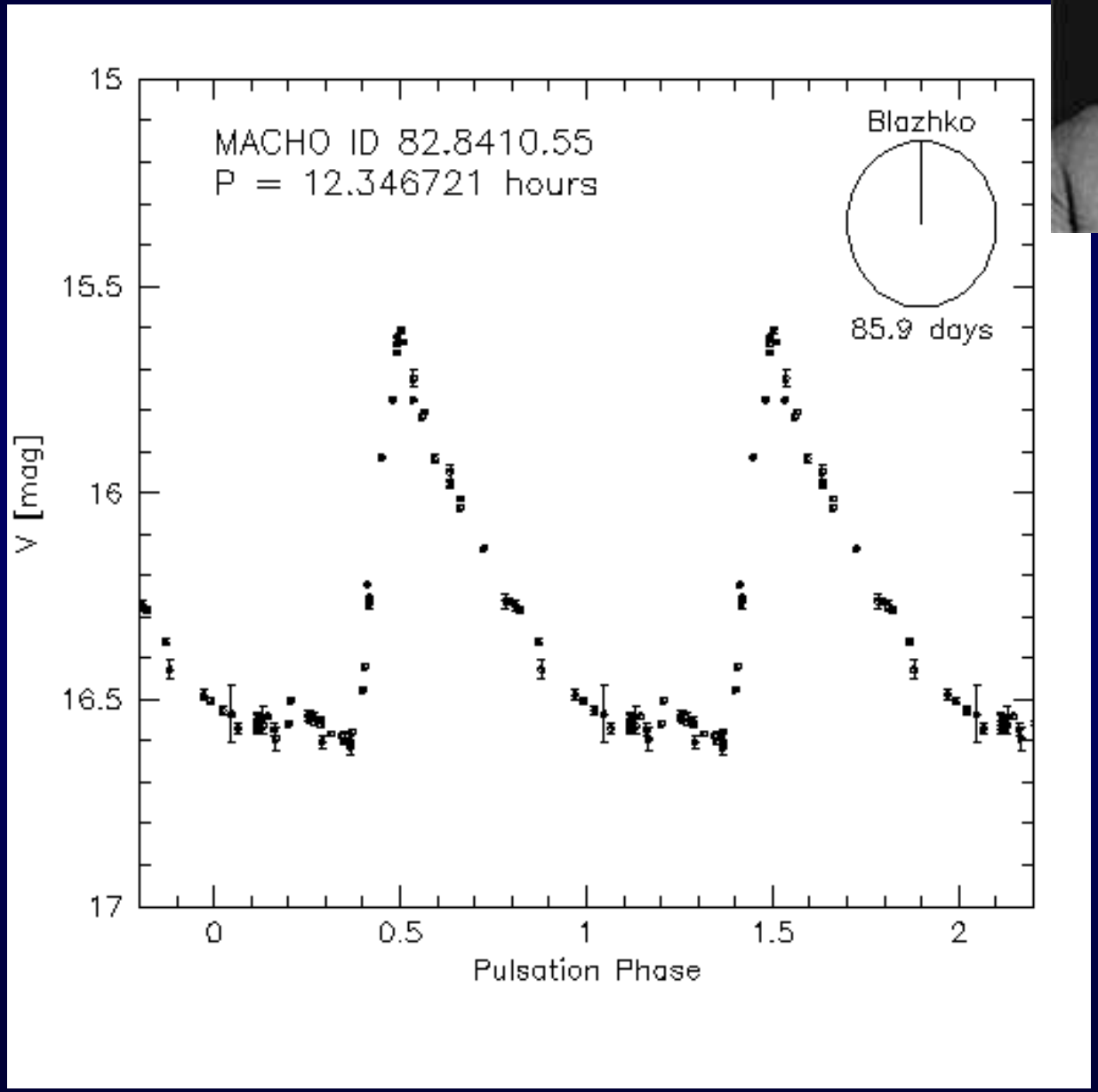


Le RRd (double mode)

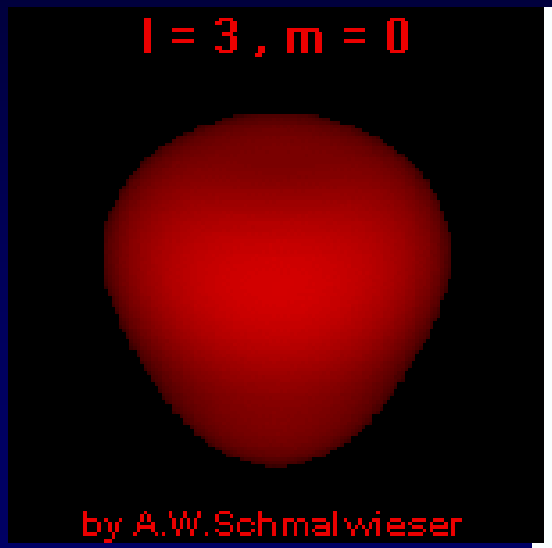


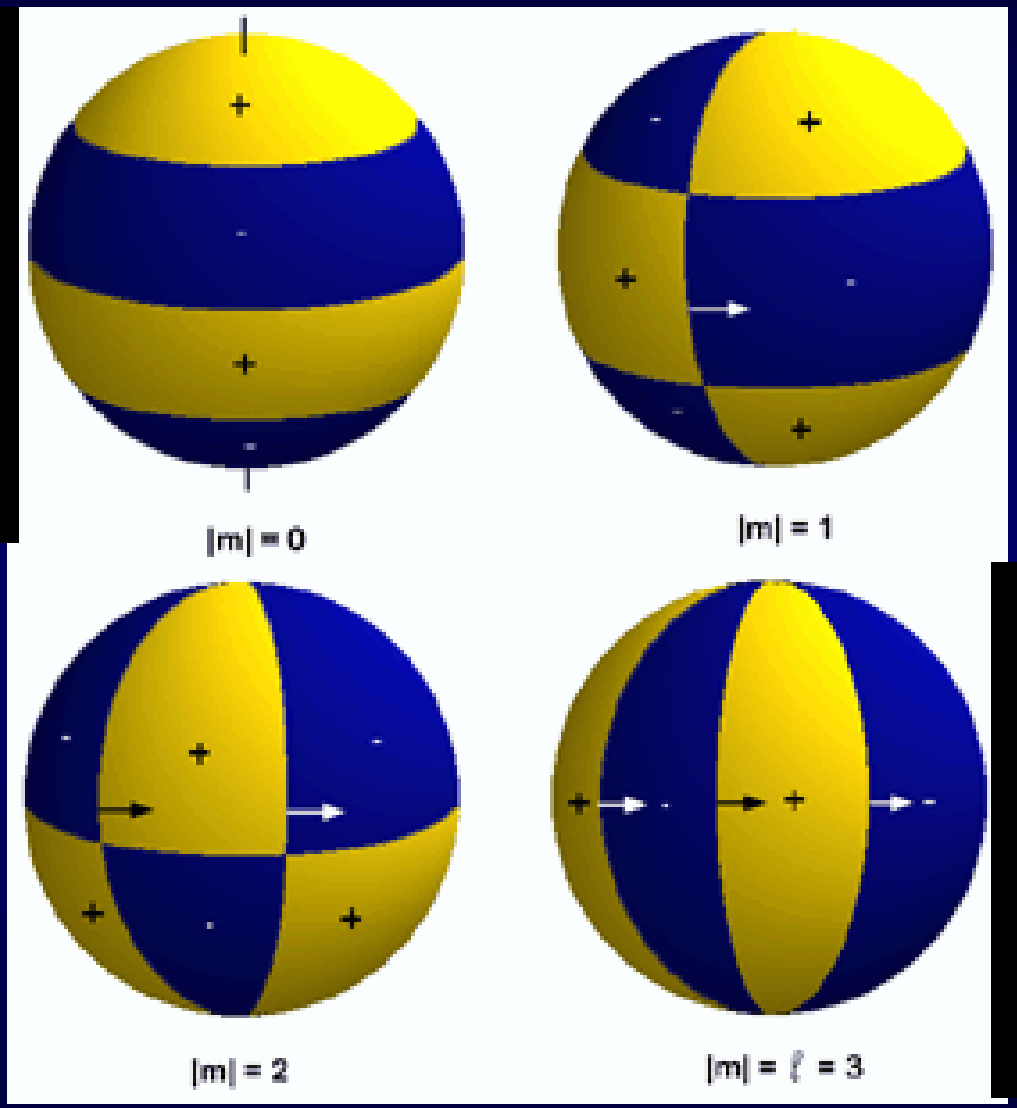


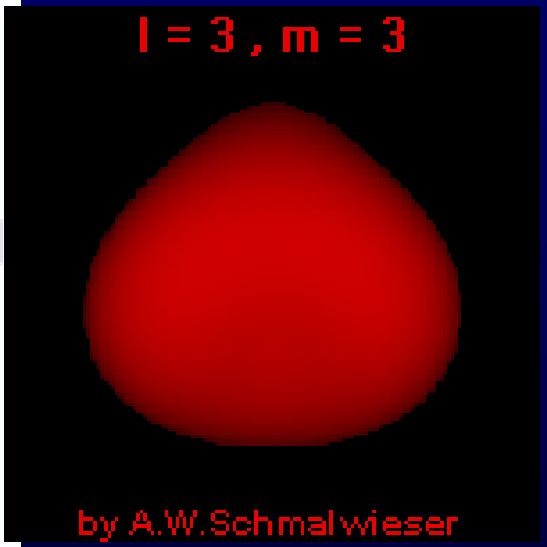
Effetto Blazkho



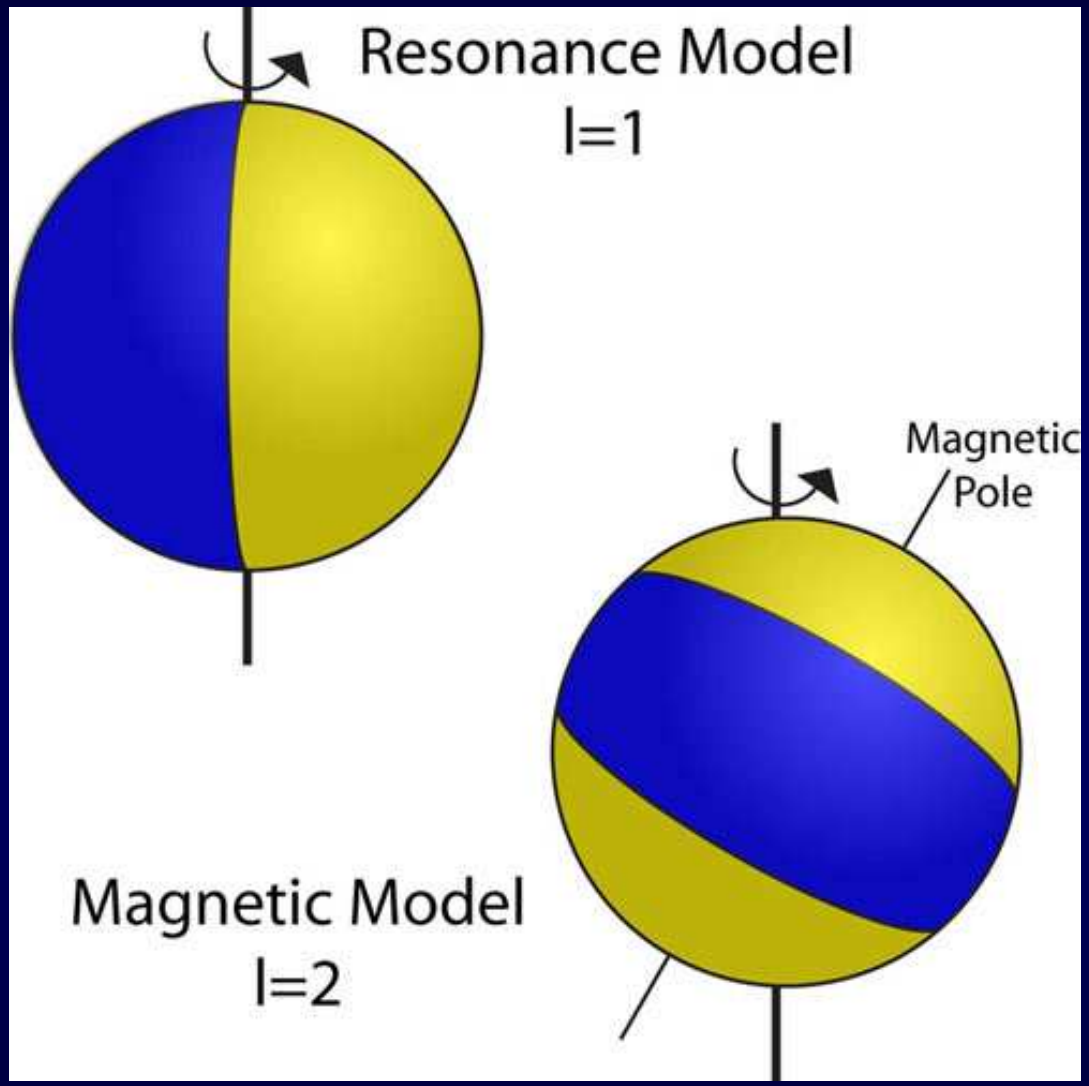
Effetto Blazkho







Effetto Blazkho: 2 modelli plausibili



Alcuni link interessanti

http://www.univie.ac.at/tops/blazhko/Generalities.html

http://www.univie.ac.at/tops/dsn/texts/nonradialpuls.html

http://www.aavso.org/vstar/vsots/0802.shtml

http://www.aavso.org/vstar/vsots/spring06.shtml

http://www.univie.ac.at/tops/blazhko/Generalities.html

Bibliografia

Horace A. Smith, RR Lyrae stars, Cambridge University Press

Leonida Rosino, Le stelle variabili, Curcio Editore

Hoffmeister, Variable stars, Springer Verlag