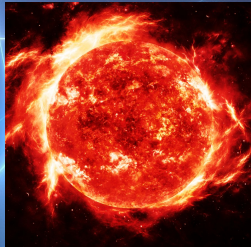


# Role of supergiants in the formation of globular clusters

***Dorottya Szécsi***

University of Birmingham  
*soon: Humboldt Fellow  
at the University of Cologne*



University of Surrey  
29th November 2018

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*Say cheese!*



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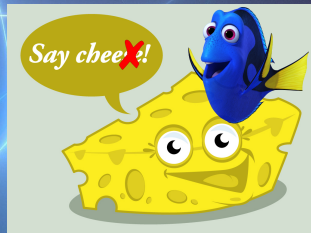


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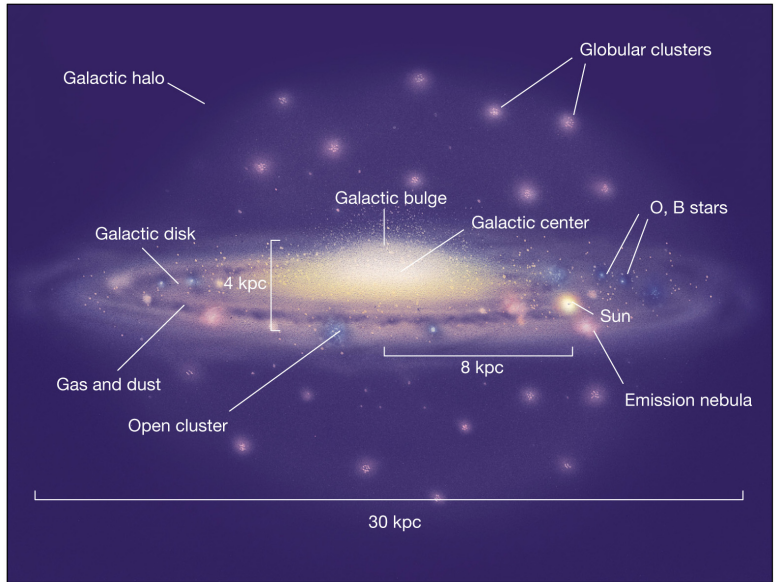
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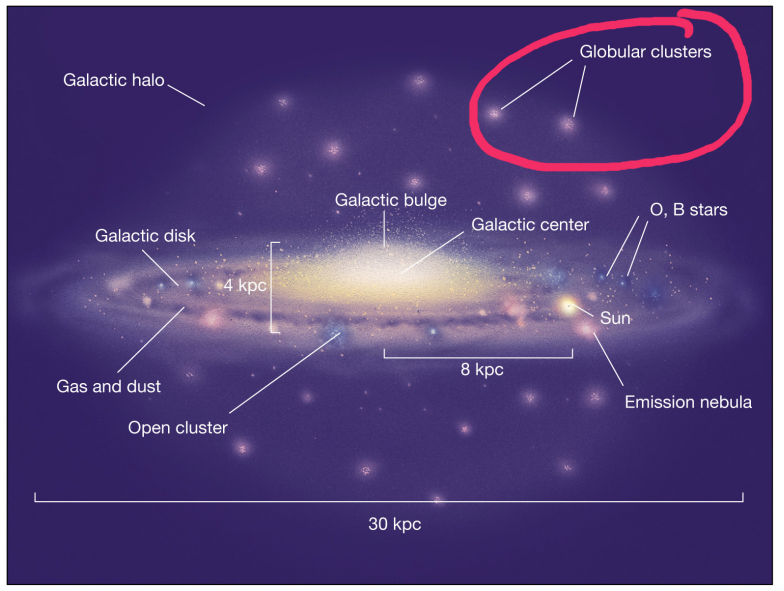
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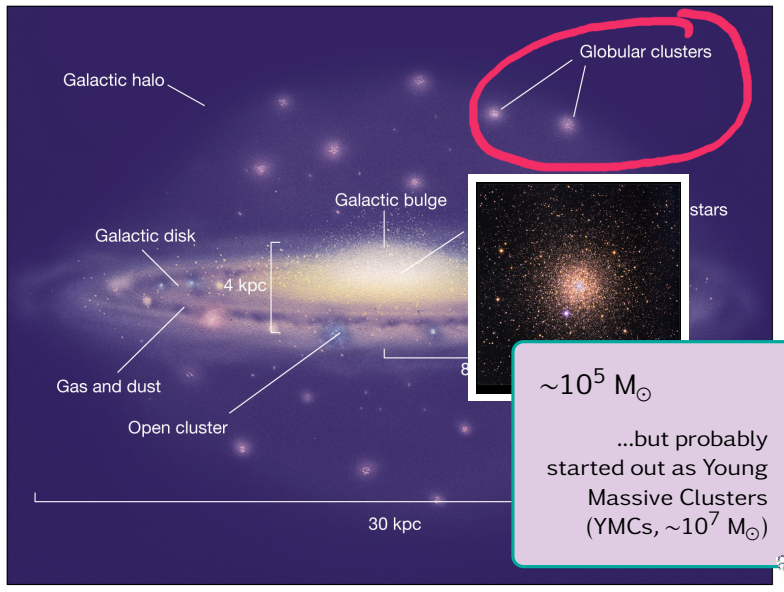
# The problem with globular clusters



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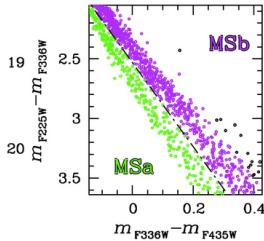
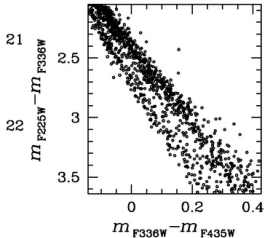


# The problem with globular clusters



# The problem with globular clusters

## Main-sequence split



(Credit: Milone+11)

Globular clusters

stars

30 kpc

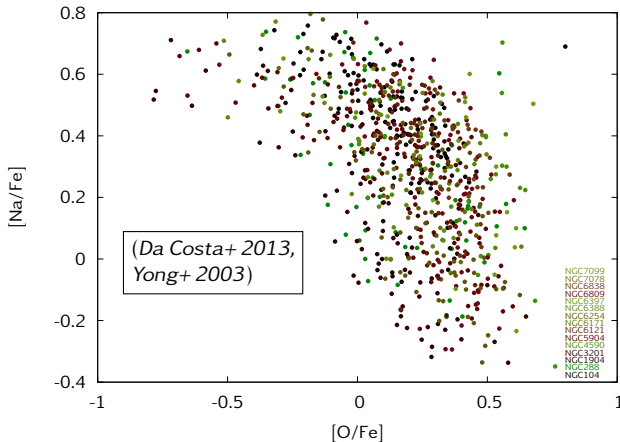
... but probably  
... as Young  
... ve Clusters  
(YMCs,  $\sim 10^7 M_{\odot}$ )





# The problem with globular clusters

## O - Na anticorrelation



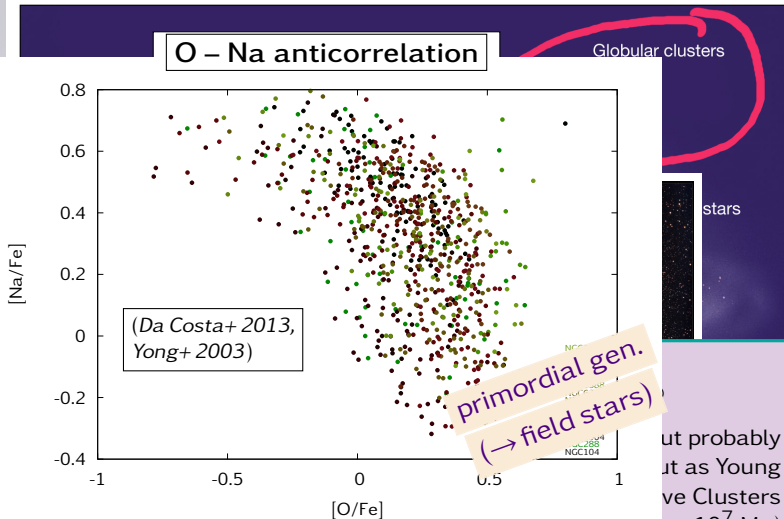
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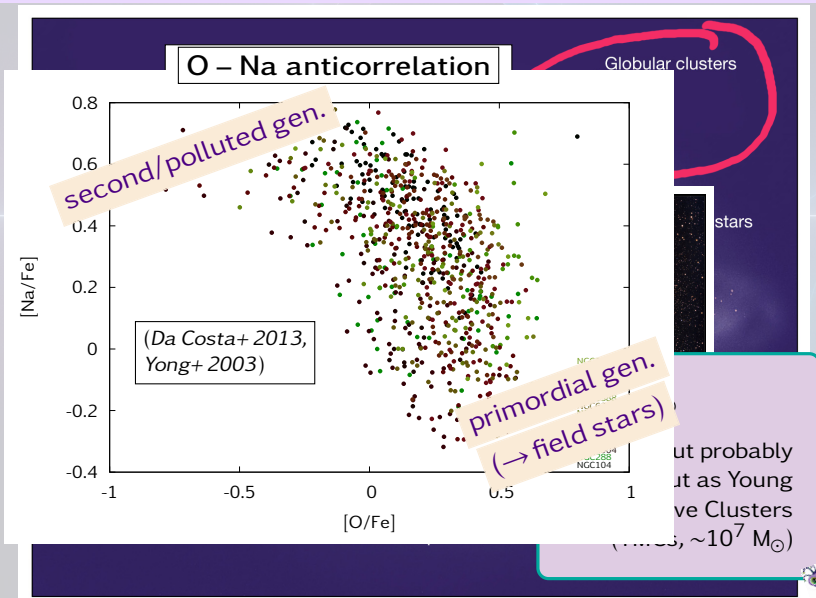
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O – Na anticorrelation

Globular clusters

- second generation: **polluted** by hot-hydrogen burning side products ( $\sim 80\text{--}100$  MK)

[O/Fe]

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  - please check it out!
- **But now...**

[O/Fe]

ve Clusters  
(masses,  $\sim 10^7 M_{\odot}$ )



So I went to do my 1st postdoc in Prague...



So I went to do my 1st postdoc in Prague...

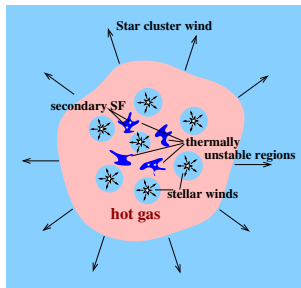


# So I went to do my 1st postdoc in Prague...

## Rapidly cooling shocked stellar winds model



- young massive clusters have winds  
stellar winds → collisions → shocked wind → outflow
- thermal instability, rapid cooling  
if the cluster is massive and compact enough
- dense warm/cold clumps are formed  
cluster gravity ⇒ clumps fall to the centre;  
accumulation ⇒ self-shielding against EUV radiation
- 2nd generation (2G) stars formed  
enriched by products of massive stars chem. evolution

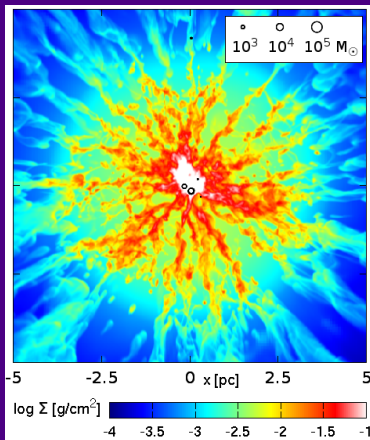


### Basic parameters:

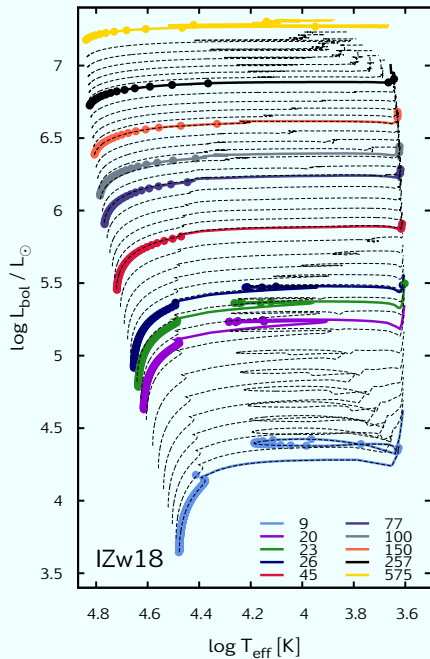
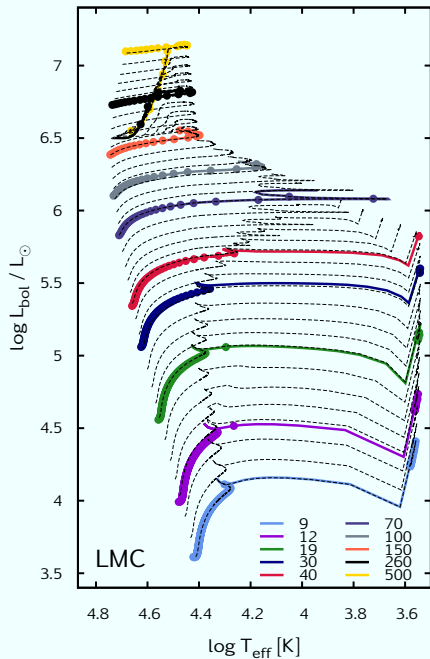
- $L_{SC}, \dot{M}_{SC} \leftarrow M_{1G}$ , stellar evolution tracks
- $R_{SC}$  + eventually radial profile ( $R_c, \beta$ )

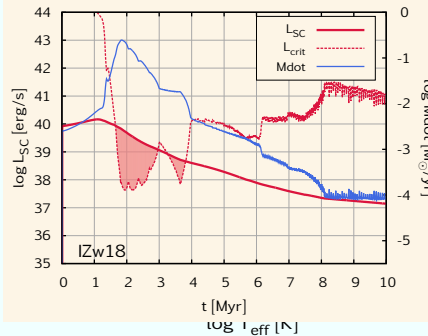
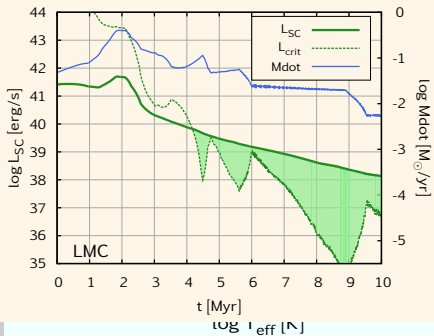
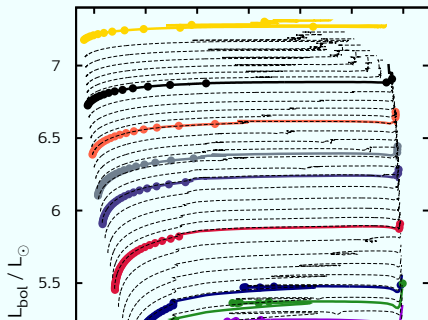
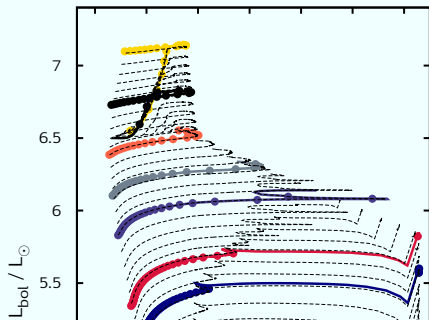
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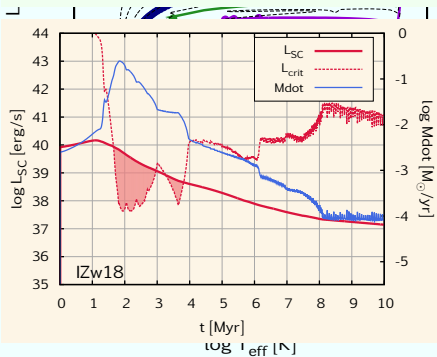
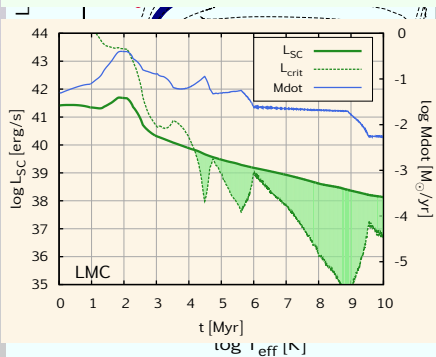
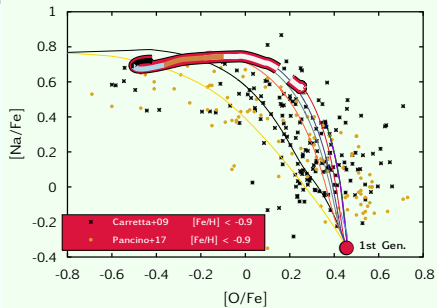
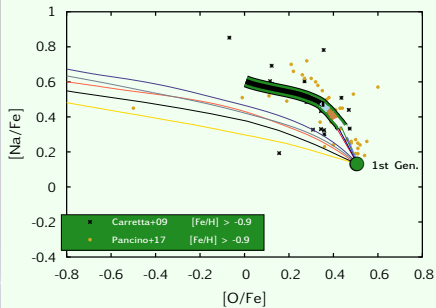
## Rapidly cooling shocked stellar winds model







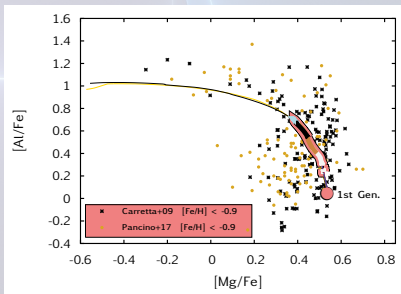
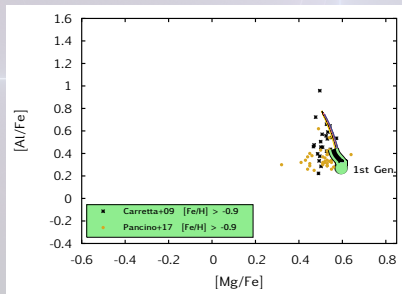




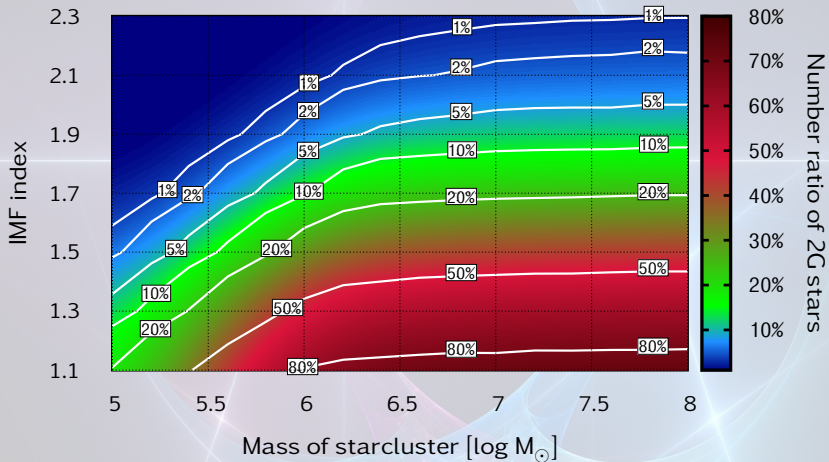
# I know you wonder...

- supernovae...
- pair-instability supernovae...
- remnants (GWs ☺)
- cooling time...
- other elements, like Mg&Al, helium
- mass loss uncertainties, existence of low-Z supergiants
- 3D simulations
- binaries... → *COMPAS binary pop.synth. group in Birmingham!* ← *I work here* ☺
- YMCs → GCs (?)
- mass budget...

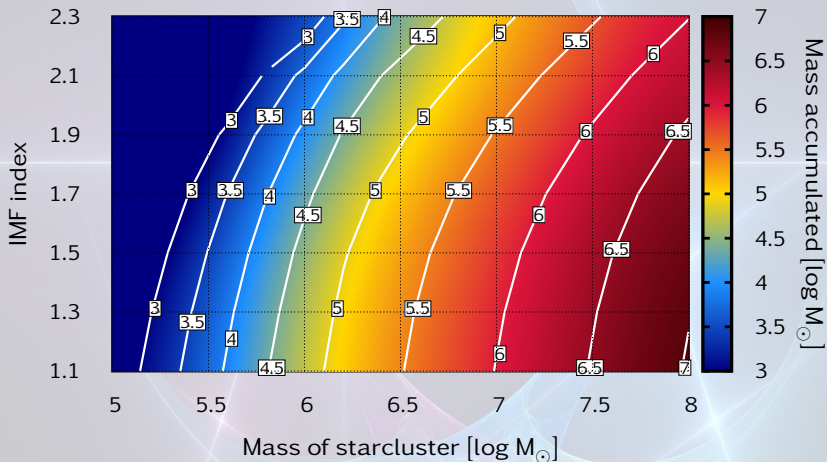
# Magnesium & Aluminium



# Mass budget



# Correlation btw. GC mass & size of 2nd gen.



That's all, folks. Thanks.

globular clusters + supergiants



+

