# Ok Then, here it is

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**ABSTRACT**
During the asymptotic giant branch (AGB) phase of stellar evolution for a $2M_\odot$ star, the periodic thermal pulses have temperatures as high as $2.9\times10^8$ K. The $^{22}$Ne$(\alpha, n)^{25}$Mg After the formation of the $^{13}$C pocket

This is a simple template for authors to write new MNRAS papers. The abstract should briefly describe the aims, methods, and main results of the paper. It should be a single paragraph not more than 250 words (200 words for Letters). No references should appear in the abstract.

**Key words:** AGB – Diffusion Coefficient – Pre-solar Grains

## 1 INTRODUCTION

* Why problem is interesting*

- Zr ratios in pre solar grains from AGB stars show isotopic signatures of material that left the star. - This is from envelope and Zr is produced in 13C pocket, then readjusted in the thermal pulse - Tracer of conditions that were in the star at that time

* what have other people done *

- battino tried varying f and how diffusion happens for effects (couldnt get ratios seen) - barzyk for xe128 ratio

* My probelm, the gap! *

- Try a different functionality of diffusion coefficient, hydro leads to this form - It contains lower diffusion at base of convection zone, less 22Ne reaction, less Zr96

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All papers should start with an Introduction section, which sets the work in context, cites relevant earlier studies in the field by **?**, and describes the problem the authors aim to solve (e.g. **?**).

## 2 METHODS AND MODELS

Normally the next section describes the techniques the authors used. It is frequently split into subsections, such as Section **??** below.

### 2.1 `MESA`Models

Only a $2M_\odot$, $Z = 0.02$, stellar evolution model was usedd. This was computed using the `MESA` (Paxton et al. 2011) stellar code and taken from the NuGrid set1ext, set1.2 models (**?**). These models were evolved from the pre-main sequence to a white dwarf. For this work, a singular thermal pulse, the 13th?, was analyzed and a Kippenhahn diagram of this particular thermal pulse can be seen in Figure 1.

For these models, the mixing lengths theory (**?**), MLT, is used for the convection zones with a mixing length, $\alpha_{\rm MLT} = 1.73$. Overshoot is implemented in `MESA`with the formula from **?** and **?**:

$$D = D_0 exp^{-2z/fH_{p0}} \tag{1}$$

Where $D_0$ and $H_{p0}$ are taken at the convective boundary.

### 2.2 $^{95}$Zr and $^{128}$I Branching

### 2.3 Diffusion Coefficient Modifications

### 2.4 `mppnp` Post Processing

### 2.5 Neutron Density and Temperature

## 3 RESULTS

Simple mathematics can be inserted into the flow of the text e.g. $2 \times 3 = 6$ or $v = 220\,\mathrm{km\,s^{-1}}$, but more complicated expressions should be entered as a numbered equation:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}. \tag{2}$$

Refer back to them as e.g. equation (2).

Another results is also good Fig. 4.

## 4 CONCLUSIONS

The last numbered section should briefly summarise what has been done, and describe the final conclusions which the authors draw from their work.

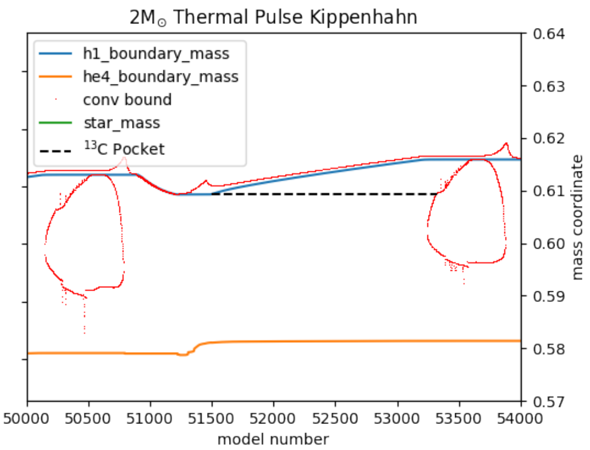


**Figure 1.** Within the He intershell region, the $^{13}$C pocket forms and isotopic ratios are set by the *s*-process (Fig. 2). It is then mixed and diluted in the He-flash pulse driven convection zone where temperatures get high enough to activate $^{22}\mathrm{Ne}(\alpha, n)^{25}\mathrm{Mg}$. This shifts the isotopic ratios to those shown in Figure 3

figs/C13_Zr.png

**Figure 2.** Within the $^{13}$C pocket there is a significant amount of $^{94}$Zr produced but almost no $^{96}$Zr. This is due to the low neutron densities not opening the $^{95}$Zr branch.

**Table 1.** This is an example table. Captions appear above each table. Remember to define the quantities, symbols and units used.

| A | B | C | D |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| 2 | 4 | 6 | 8 |
| 3 | 5 | 7 | 9 |

figs/Pulse_Zr.png

**Figure 3.** After the $^{13}$C pocket is mixed into the He-flash pulse driven convection zone, the temperatures get high enough for the $^{22}\mathrm{Ne}(\alpha, n)^{25}\mathrm{Mg}$ reaction. This provides high enough neutron densities to open the $^{95}$Zr branch and boost the $^{96}$Zr.

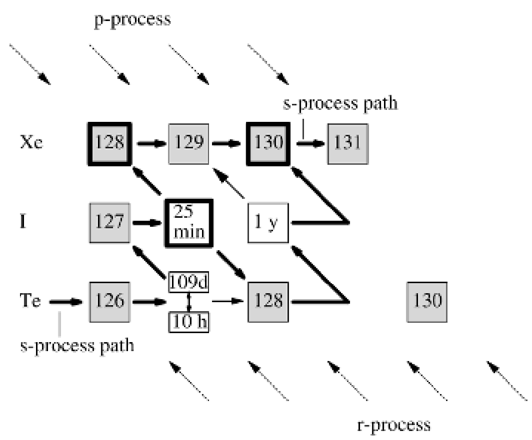


**Figure 4.** Another figure.

## ACKNOWLEDGEMENTS

The Acknowledgements section is not numbered. Here you can thank helpful colleagues, acknowledge funding agencies, telescopes and facilities used etc. Try to keep it short.

## REFERENCES

Battino U., et al., 2016, ApJ, 827, 30
Paxton B., Bildsten L., Dotter A., Herwig F., Lesaffre P., Timmes F., 2011, ApJS, 192, 3

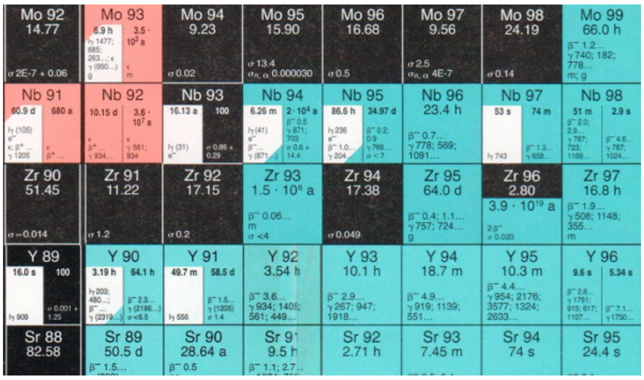


**Figure 5.** Another figure.

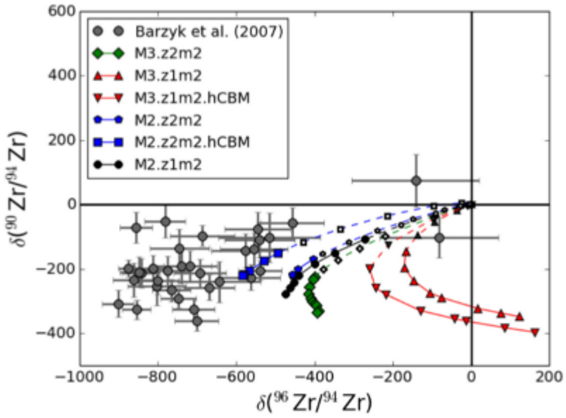


**Figure 6.** This is the Zr94 mil plot Battino et al. (2016).

## APPENDIX A: SOME EXTRA MATERIAL

If you want to present additional material which would interrupt the flow of the main paper, it can be placed in an Appendix which appears after the list of references.

This paper has been typeset from a TEX/LATEX file prepared by the author.

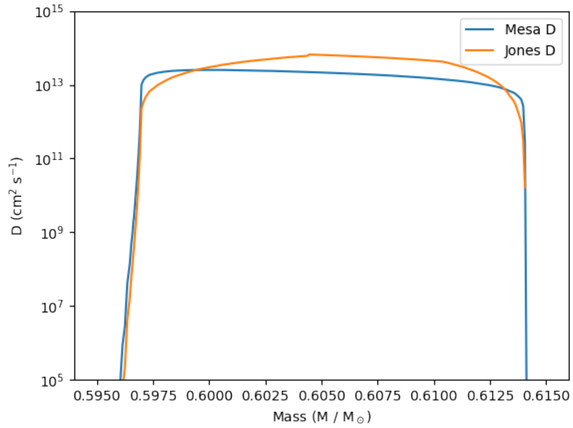


**Figure 7.** This is a comparison between the diffusion coefficients

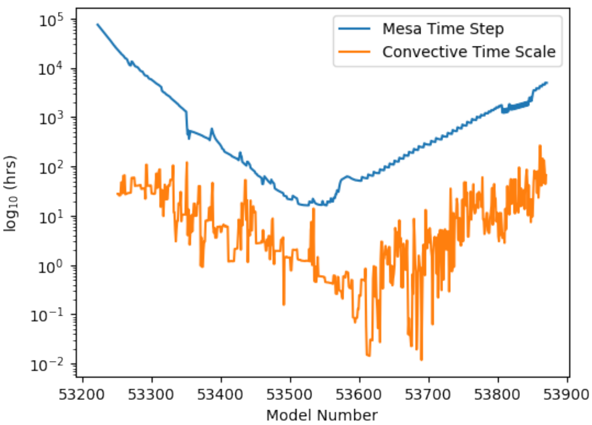


**Figure 8.** This is the time scale plot

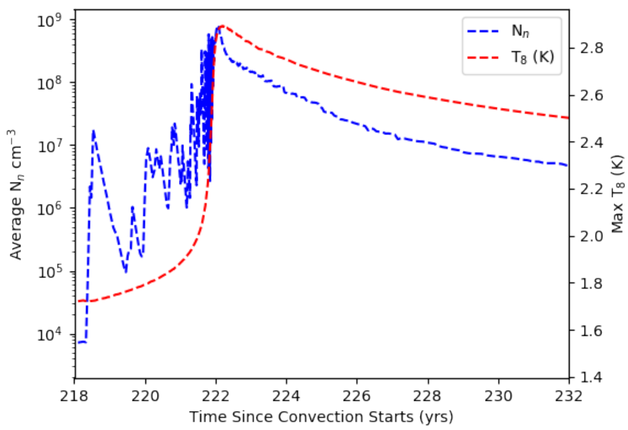


**Figure 9.** This is the neutron density as a function of time

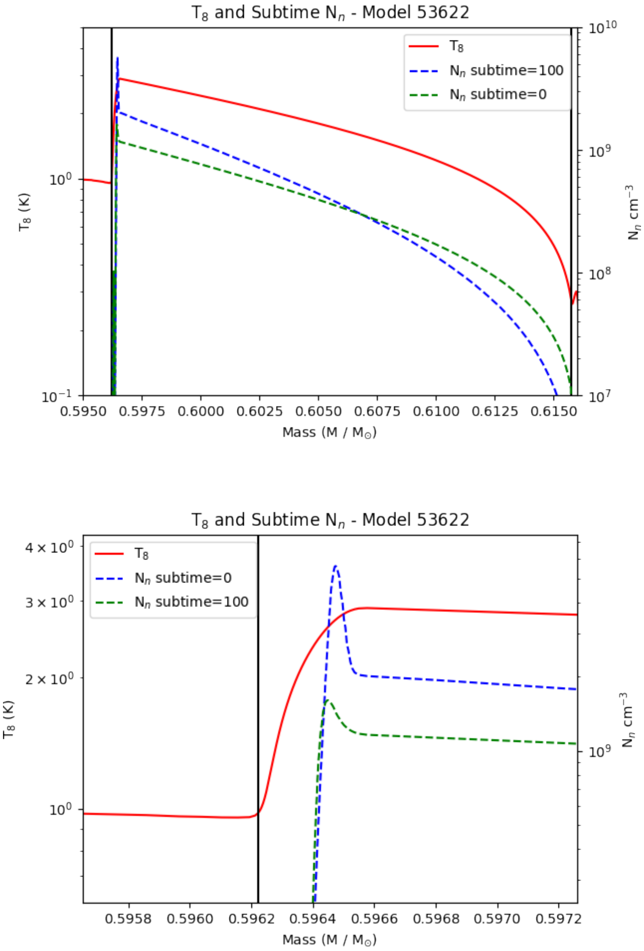


**Figure 11.** Testing