^{14}N abundance in the core of young $5\,M_\odot$ stars depending on initial surface velocities

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Zusammenfassung

I study the abundance of ^{14}N in the core of young $5\,M_\odot$ stars to estimate the commonness of the CNO cycle. There is a variation in the results due to different initial surface velocities.

1 Introduction

With a period of approximately 10^{17} seconds, covering almost 96% of the overall CNO-cycle time, ^{14}N is the main indicator for the Bethe-Weizsäcker cycle. In this essay I examine the abundance of ^{14}N in young $5\,M_\odot$ stars, thus stars not older than 60 Myrs[1]. As support, a broad database with star evolution models for different chemical mixtures is provided [1].

2 Results

Plotting a band of ^{14}N abundances over time (Abbildung 1) shows, that the CNO cycle is less essential for stars with higher initial surface velocity. This is not very surprising, since the penetration of the core with elements of higher order is proceeding slower in a rotating system due to centrifugal forces.

chemical	$v_0 = 120\,\mathrm{m/s}$		$v_0 = 480\,\mathrm{m/s}$	
mixture	T=10 Myrs	T=35 Myrs	T=10 Myrs	T=35 Myrs
GAL	0.37%	0.49%	0.28%	0.45%
LMC	0.24%	0.28%	0.18%	0.27%
SMC	0.12%	0.12%	0.10%	0.12%

Tabelle 1: ^{14}N abundance in the core of $5\,M_\odot$ stars in our galaxy and in the Magellan clouds for low and high inital surface velocity v_0

[1] The typical life span of such a star is 100-120 Myrs.

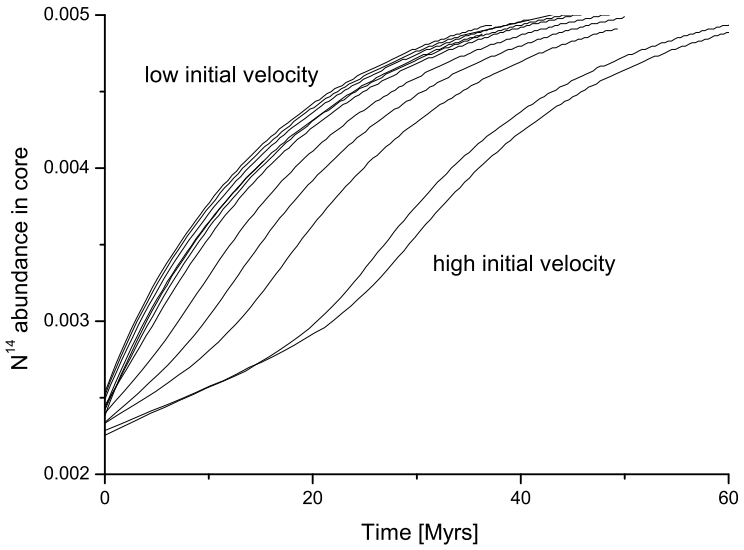

Abbildung 1: ^{14}N abundance in the core of $5\,M_{\odot}$ stars with chemical mixture of our galaxy depending on different initial surface velocities between 0 and 540 m/s

By changing the chemical mixture to that in LMC or SMC (Tabelle 1), the metallicity decreases. Since the CNO cycle is caused by Carbon, Nitrogen and Oxygen isotopes, its importance is obviously smaller.

3 Perspectives

In this article, I have only looked at ^{14}N as an catalyzer for the CNO cycle. Considering also the abundance of ^{12}C, it is possible to make more accurate predictions about the importance of the CNO cycle in the inquired class of stars. However, a first glimse reveals, that in the early stage of the star development path, there is a close relation between ^{14}N and ^{12}C, following the expected proportions.

Literatur

[1] **Homepage Ines Brott**,
`http://homepage.univie.ac.at/ines.brott/download/`