Two key reactions in AGB stars: $^{18}F(\alpha,p)^{21}Ne$ and $^{26}Al(p,\gamma)^{27}Si$

In collaboration with Karakas, Lee, Wiescher & Goerres

van Raai, Lugaro, Karakas, & Iliadis, A&A, submitted

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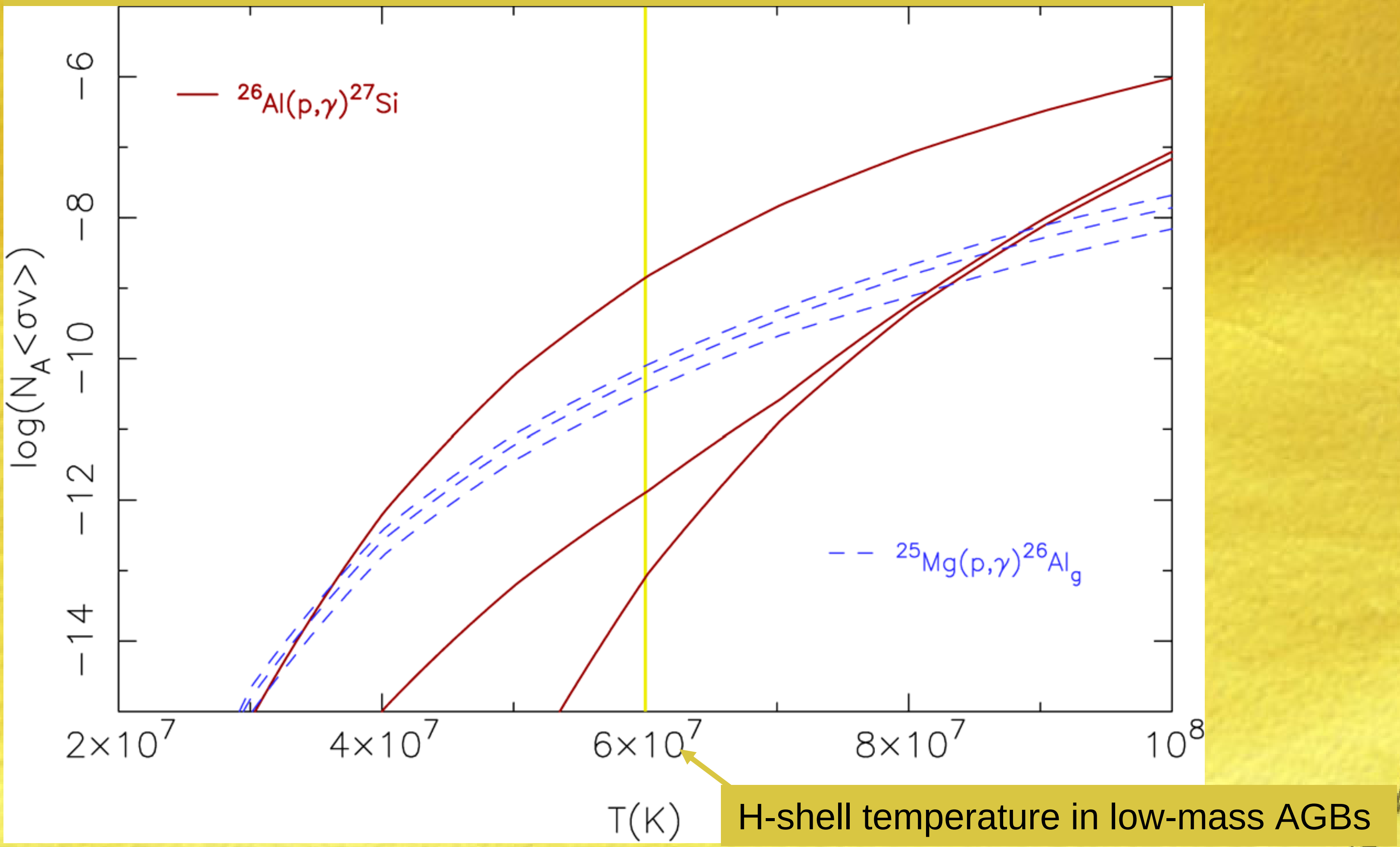
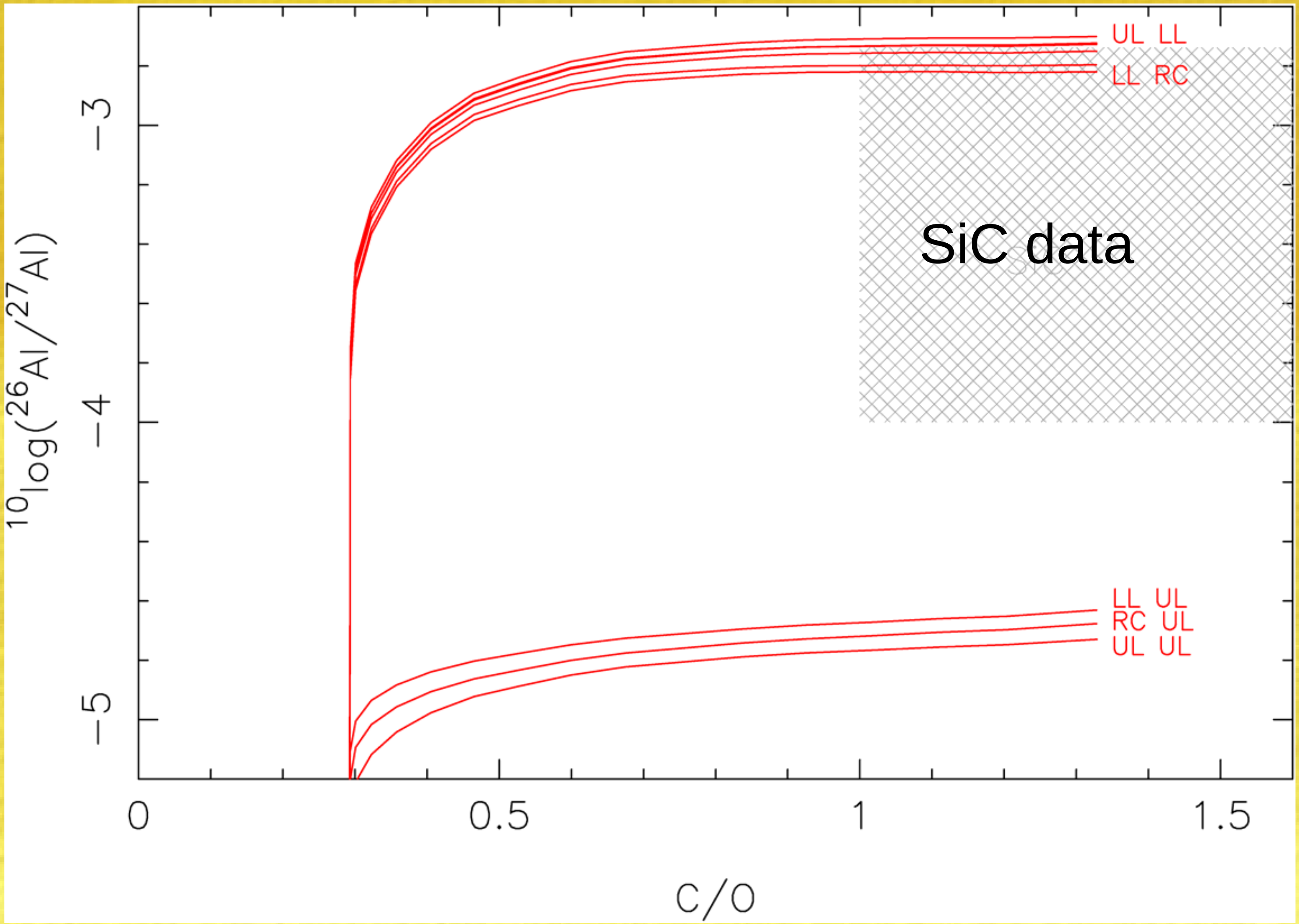
^{26}**Al** is produced in AGB stars via $^{26}Mg(p,\gamma)^{26}Al$ and destroyed via **$^{26}Al(p,\gamma)^{27}Si$** and neutron captures and is incorporated in stardust SiC grains. We check the effect of rate uncertainties on the interpretation of the SiC data.

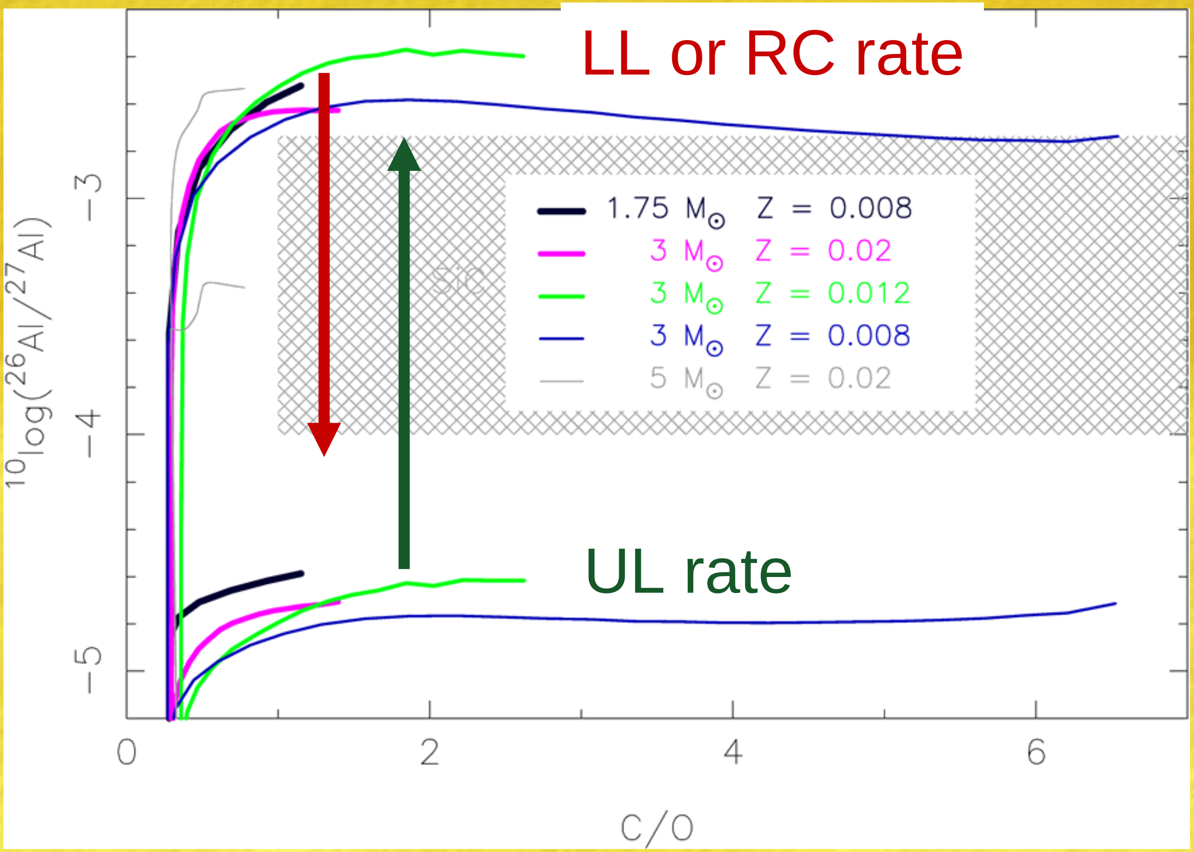


We run a 3 $M_\odot$, $Z_\odot$ model with all nine combinations of lower limit (LL), recommended (RC), and upper limit (UL) of the rates.

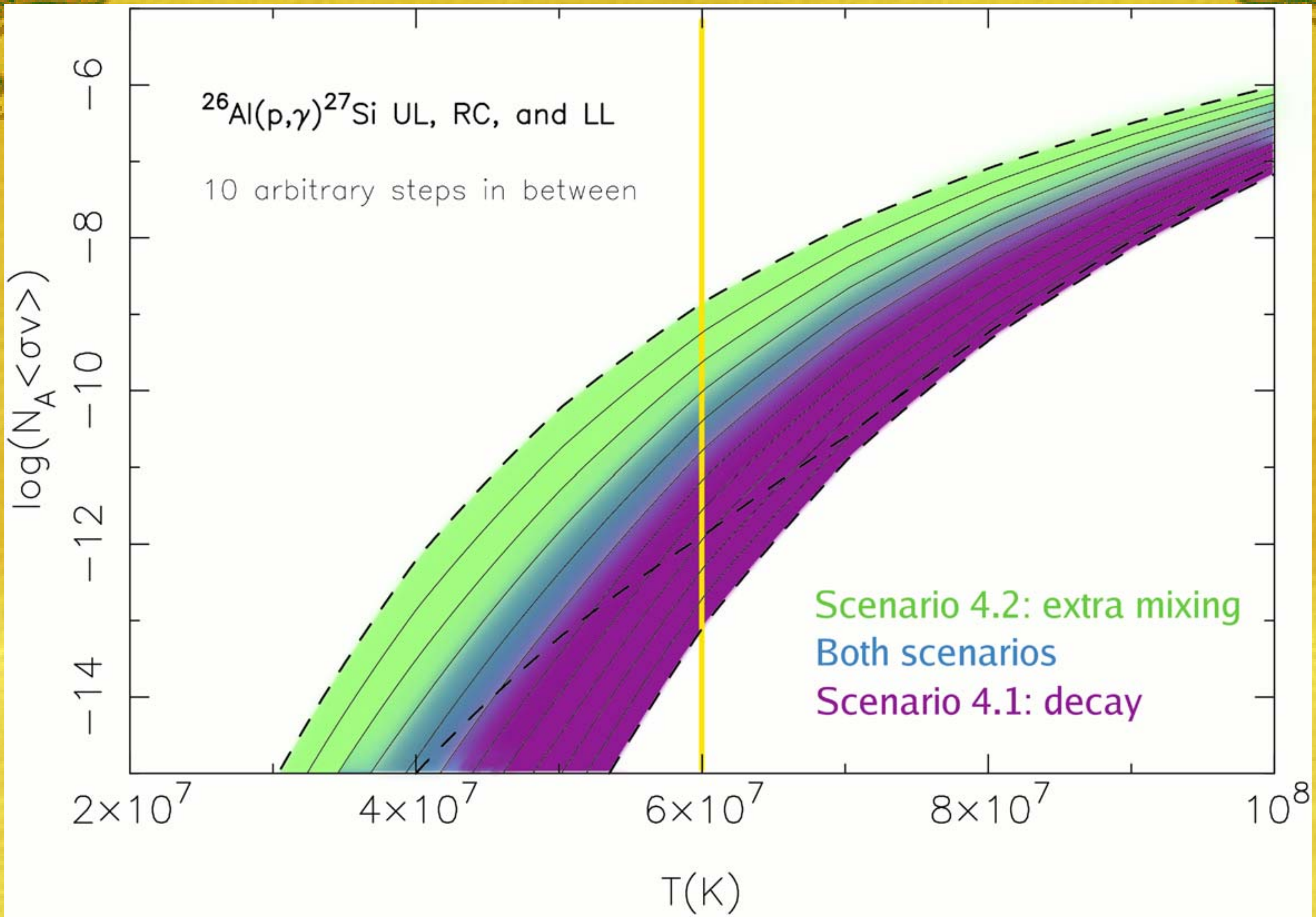


Models of different masses and metallicities show the same results, and the spread in the SiC data is not covered in any case. We propose two scenarios:

Decay of ^{26}Al before incorporation in the grains ⮙ constrains **timescale** of grain formation up to 2 Myr after ejection.



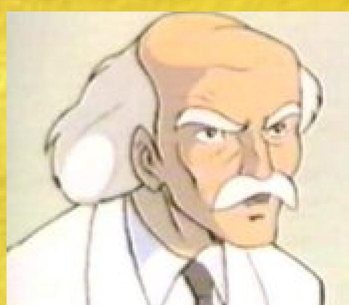
Extra-mixing processes at the base of the convective envelope. Mechanism still unknown.



Stronger conclusions on the interpretation of the Al composition of AGB SiC stardust will be possible after more information is available from nuclear experiments on the $^{26}Al(p,\gamma)^{27}Si$ reaction.

Of which element Dr. Kabuto builds the indestructible Mazinga Z?

1. Palladium
2. Japanium
3. Kryptonite



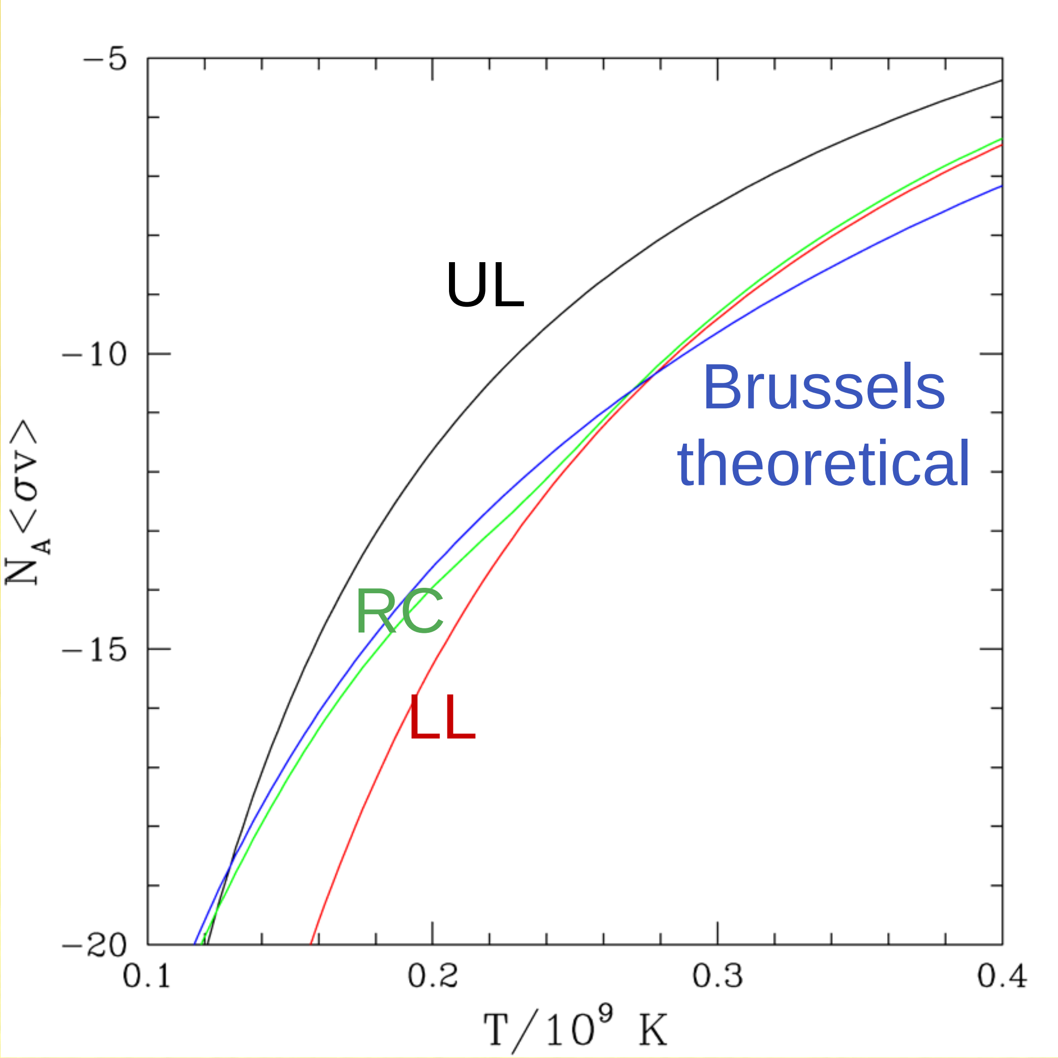
Dr Kabuto recently discovered this new element nearby the vulcano Fujiama.

Of which nationality is the evil Dr Hell, who steals the secrets of the ancient civilization of Micene to build sophisticated mechanical mosters?

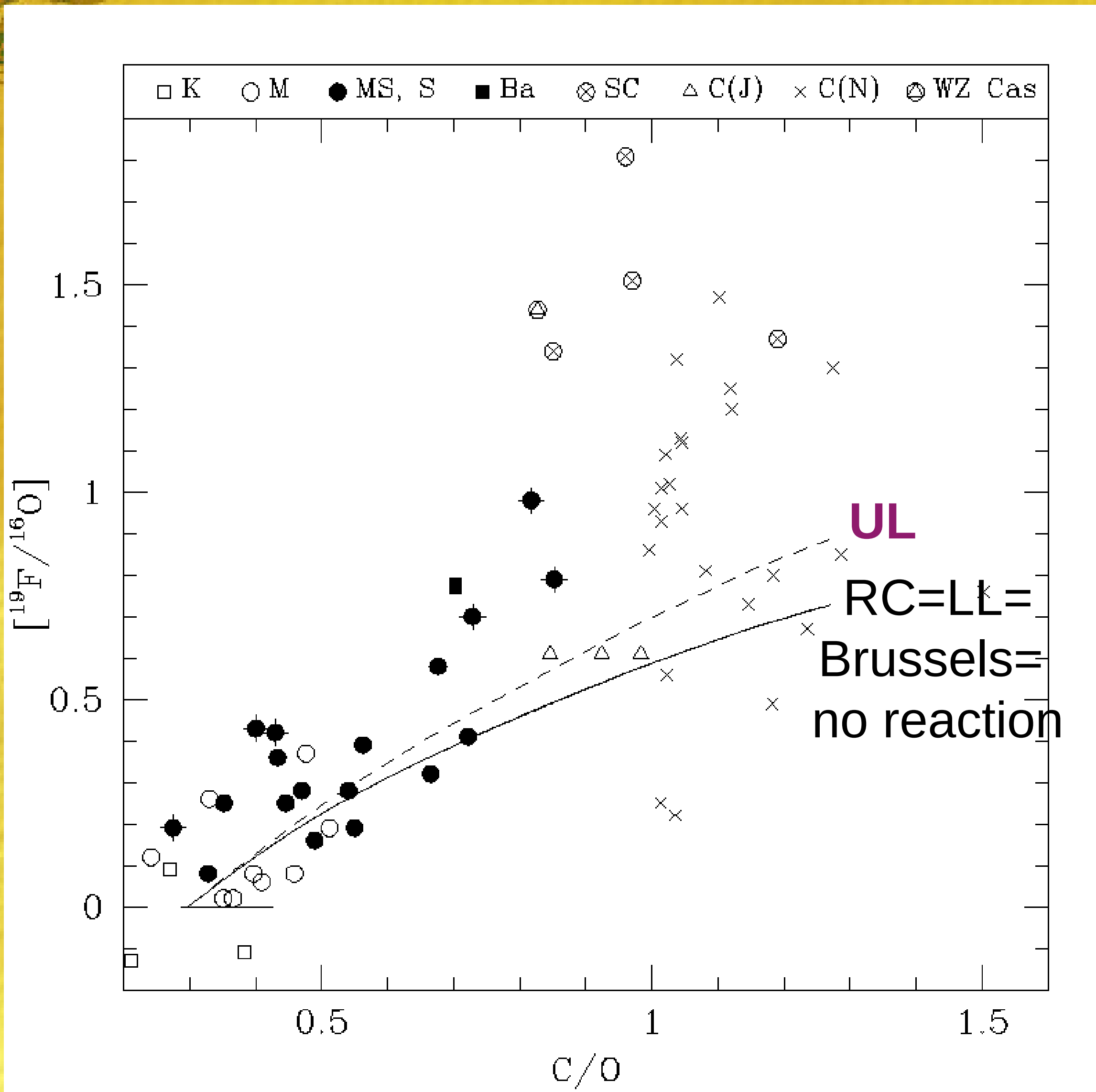
1. German
2. USA
3. Italian

$^{18}F(\alpha,p)^{21}Ne$

$T_{1/2}$=109.8 min

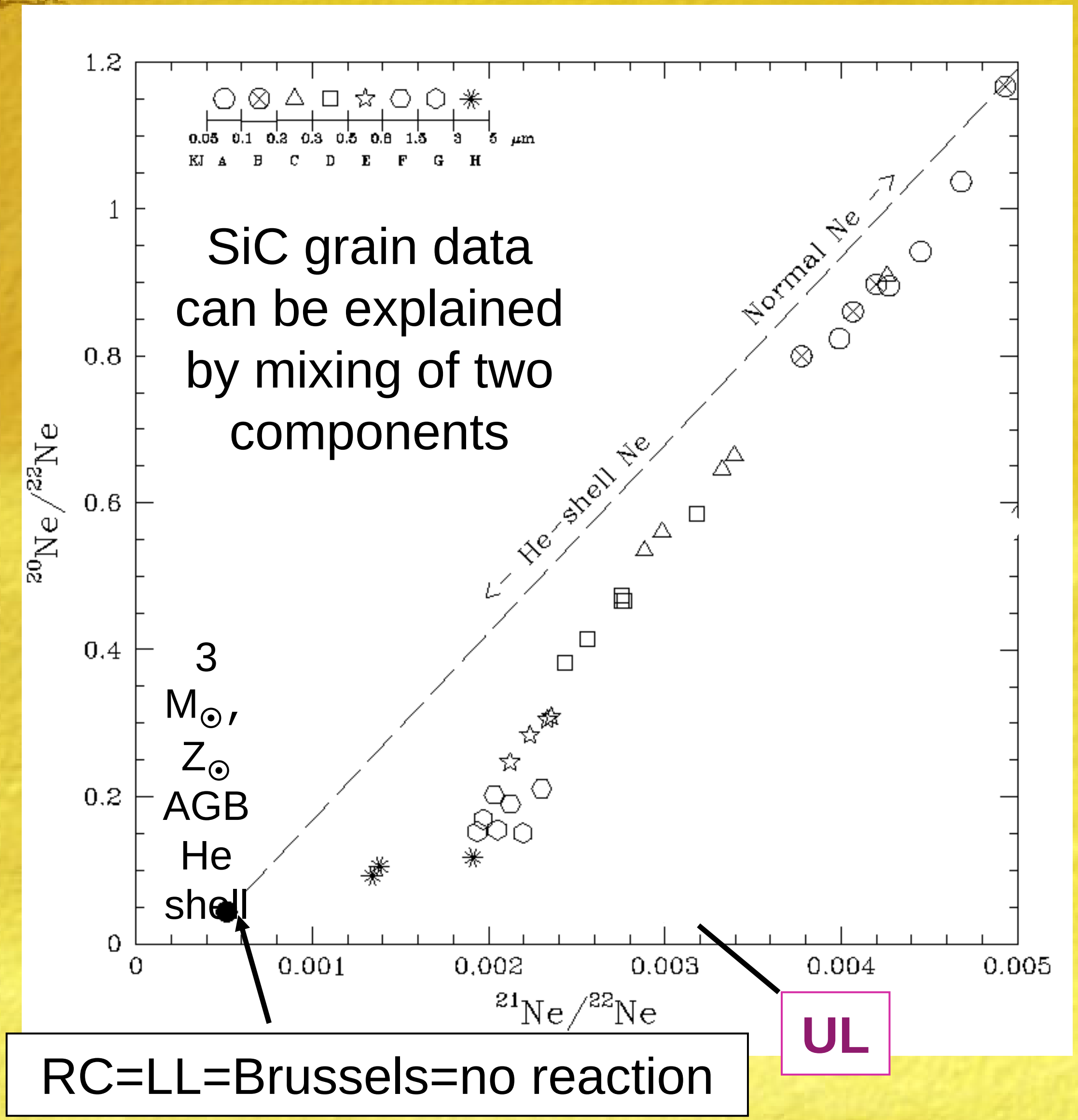


^{19}F in AGB stars



Results from a 3 $M_\odot$, $Z_\odot$ model: the UL produces **50% more fluorine** from AGB stars!

^{21}Ne in AGB stars



More evidence for a higher $^{18}F(\alpha,p)^{21}Ne$ come from ^{21}Ne in stardust SiC grains from AGB stars.

In fact, he is King Vega, who plans to conquer the whole Galaxy!

Goldrake must fight against these two bad guys who want to conquer the Earth. From which star do they come from?

1. Sirus

2. Betelgeuse

3. Vega

Production of fluorine in AGB stars

We need ^{18}O and *p* at the same time:

$^{13}C(\alpha,n)^{16}O$ 15%

$^{14}N(n,p)^{14}C$

In the ^{13}C pocket: $^{14}C(\alpha,\gamma)^{18}O$ 23%

In the pulse: $^{14}N(\alpha,\gamma)^{18}F$

$^{18}F(\beta^+,\nu)^{18}O$

$^{18}F(\alpha,p)^{21}Ne$ 44%

New evaluation by Lee, Wiescher, et al. 2007: UL = 1000 x RC

No uncertainties based on NACRE rates, but currently under revision with the THM

$^{15}N(p,\alpha)^{12}C$

$^{18}O(p,\alpha)^{15}N$

$^{18}O(\alpha,\gamma)^{22}Ne$

$^{15}N(\alpha,\gamma)^{19}F$

23%

$^{19}F(\alpha,p)^{22}Ne$

$(^{19}F(n,\gamma)^{20}F)$

new n_TOF rate +2%

$^{26}Al(p,\gamma)^{27}Si$

- ^{26}Al is radioactive, with half life 0.7 Myr,
- ^{26}Al is produced in AGB stars, WR stars, novae and and in Sne,
- ^{26}Al is observed live in the Galaxy, live at the time of the Early Solar System, and live at the time of formation in meteoritic stardust grains.
- We focus on ^{26}Al production in low-mass AGB stars, the effect of the $^{26}Al(p,\gamma)^{27}Si$ uncertainties and comparison to stardust SiC grains.

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^{26}Al production in low-mass AGB stars, the effect of the $^{26}Al(p,\gamma)^{27}Si$ uncertainties, and comparison to stardust SiC grains.

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