

# $^{60}\text{Fe}$ from massive stars

## Population synthesis

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with

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# $^{60}\text{Fe}$ production in massive stars

Neutron capture on  $^{59}\text{Fe}$

Needs:

high density

( $n > 3 \cdot 10^{10} \text{ cm}^{-3}$  for  $\log T < 8.7$ )  
as it competes with decay of  $^{59}\text{Fe}$

$\log T < 9$

(due to photodisintegration)

Therefore  
produced in:

Shell He, C  
burning

SN explosion

(when blast wave  
passes region with  
 $T = 2.2 \cdot 10^9 \text{ K}$ )

# Problem

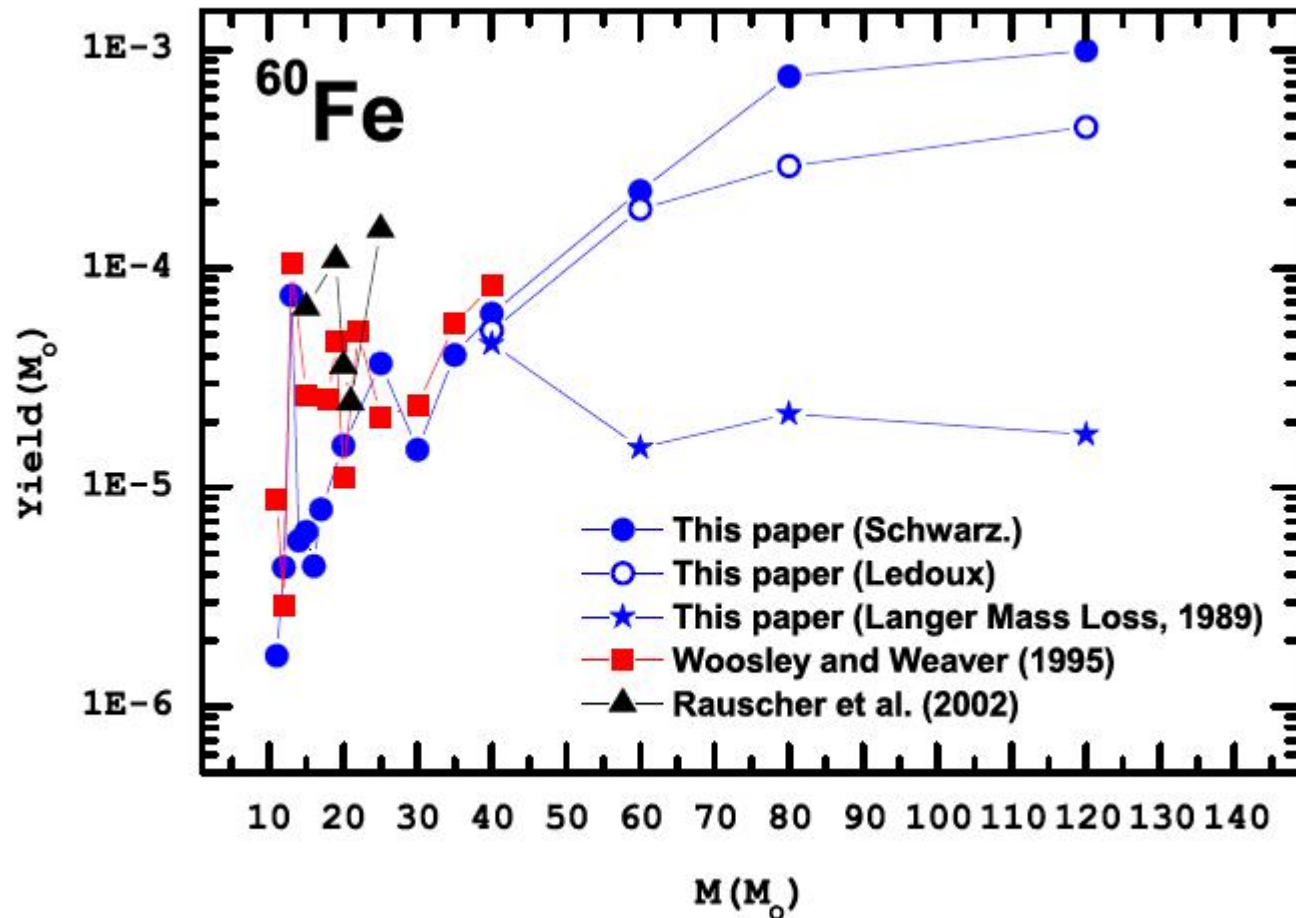
Almost all studies have only followed evolution of stars  $>40 M_{\text{sol}}$  through hydrogen and helium burning (e.g. Maeder & Meynet)

Below this limit, results are in agreement with the observed flux ratio

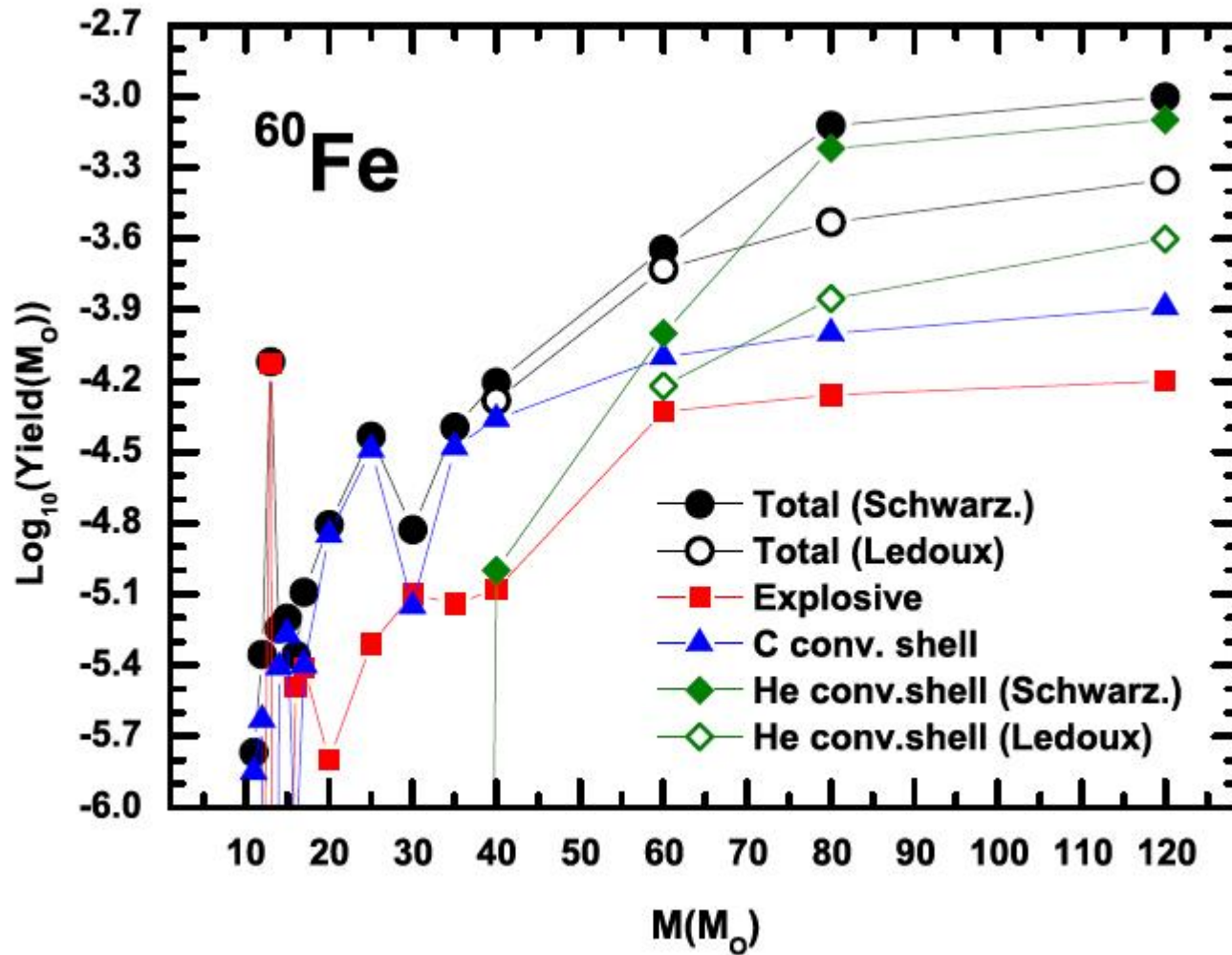
$${}^{60}\text{Fe}/{}^{26}\text{Al} = 0.17 \pm 0.05 / 0.11 \pm 0.03$$

(RHESSI/INTEGRAL)

# Limongi & Chieffi (2006)

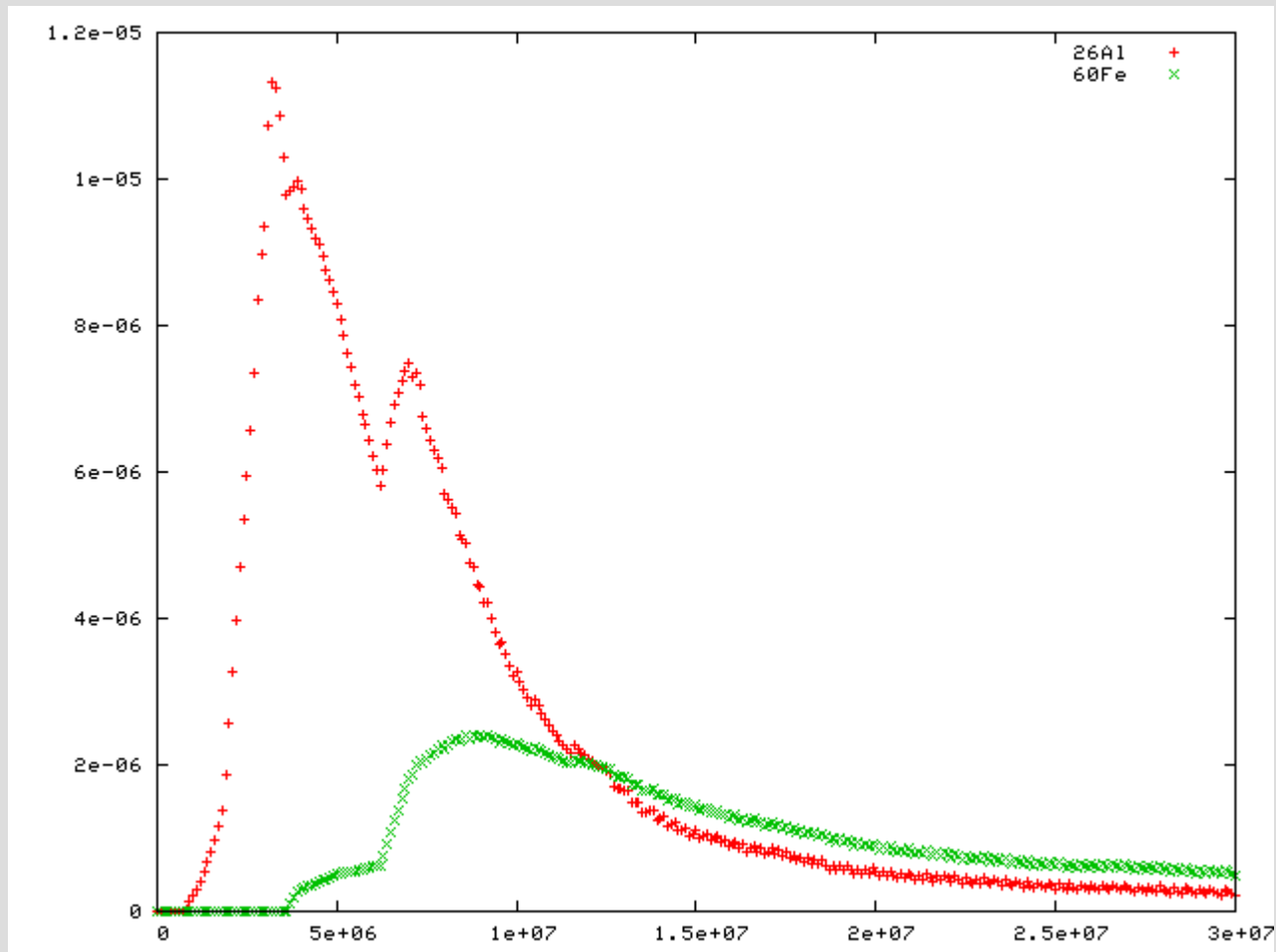


# Limongi & Chieffi (2006)



# Population Synthesis

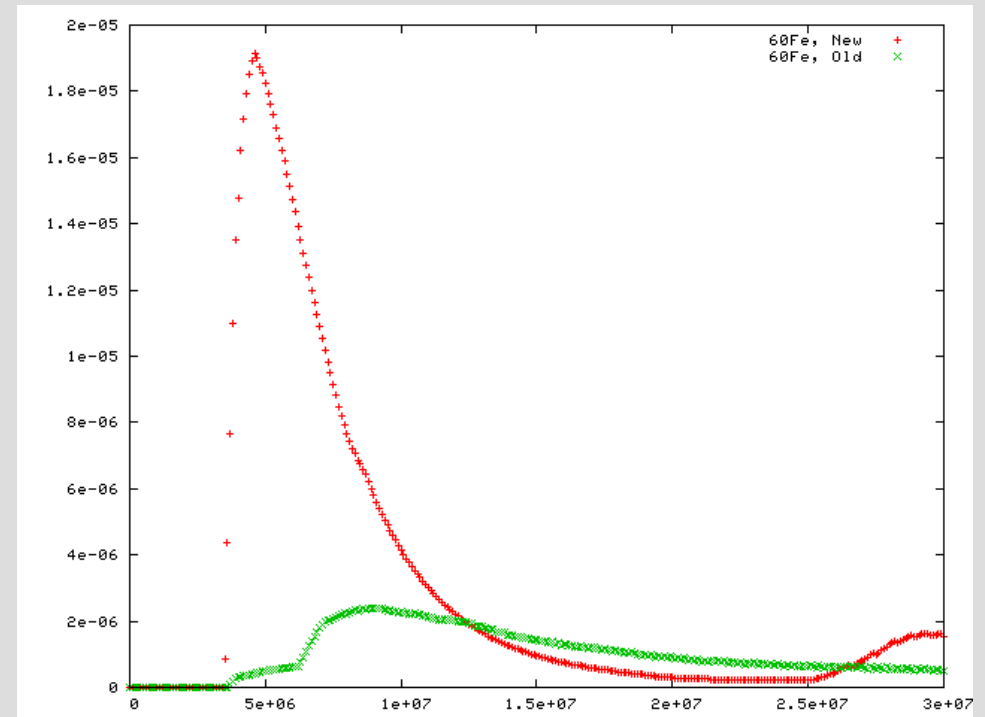
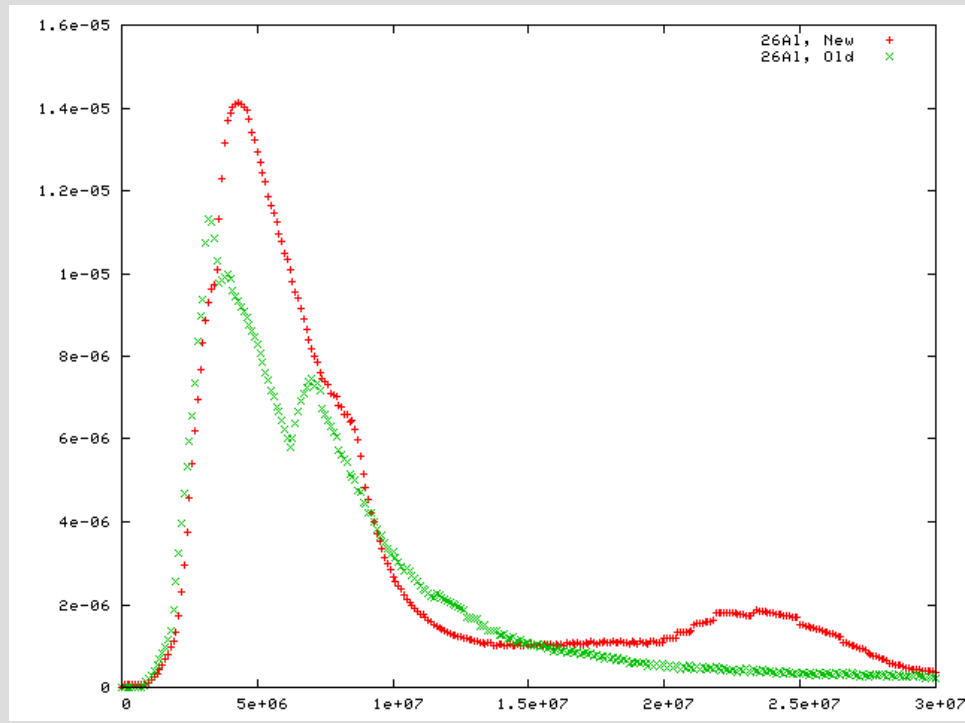
Plueschke (2000,2001)



# Population Synthesis

Update: Rotating stars  
(Palacios et al. 2005)

Update: SN yields  
(Limongi & Chieffi 2006)

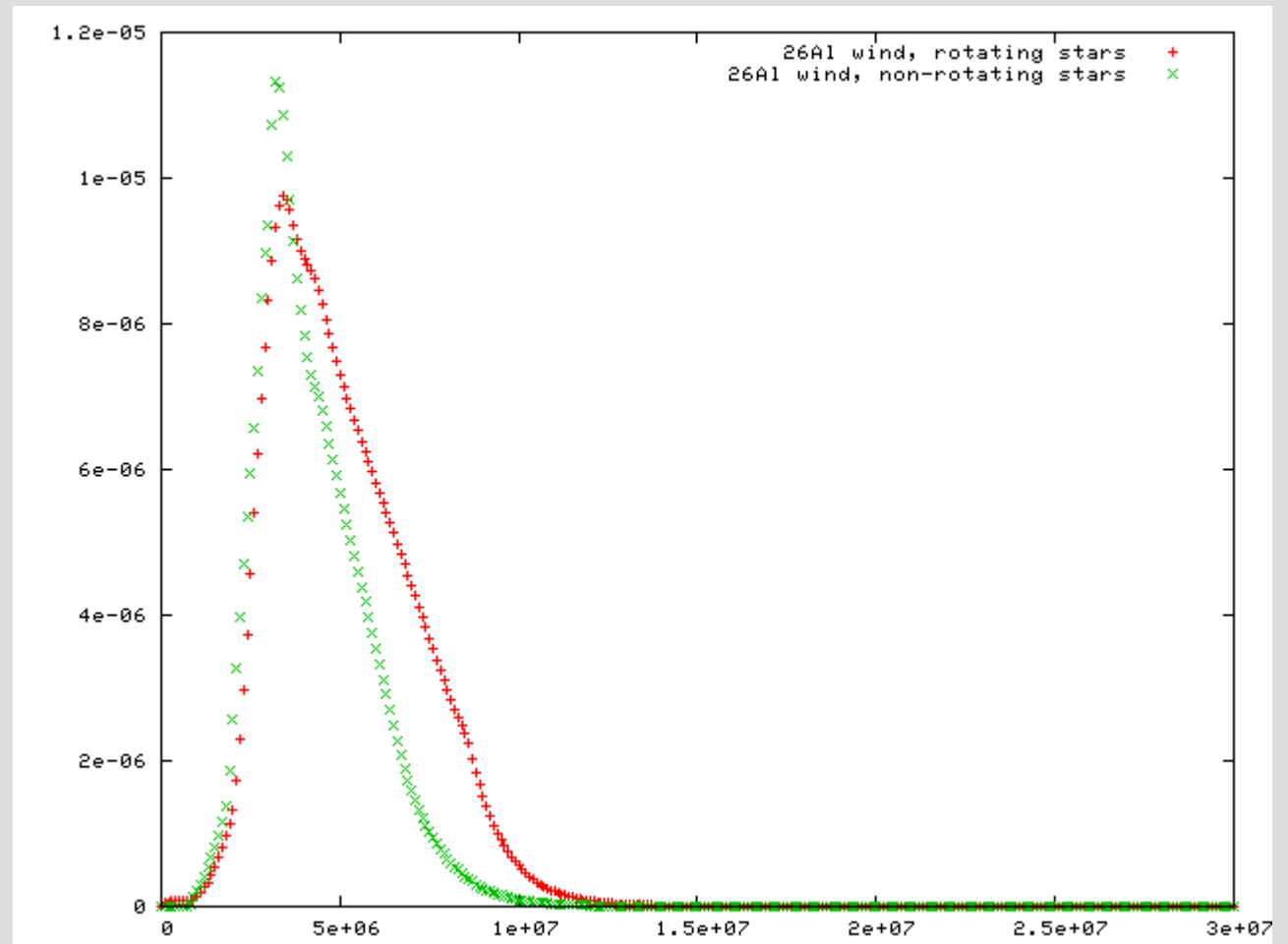


# Population Synthesis

Update: Rotating stars  
(Palacios et al. 2005)

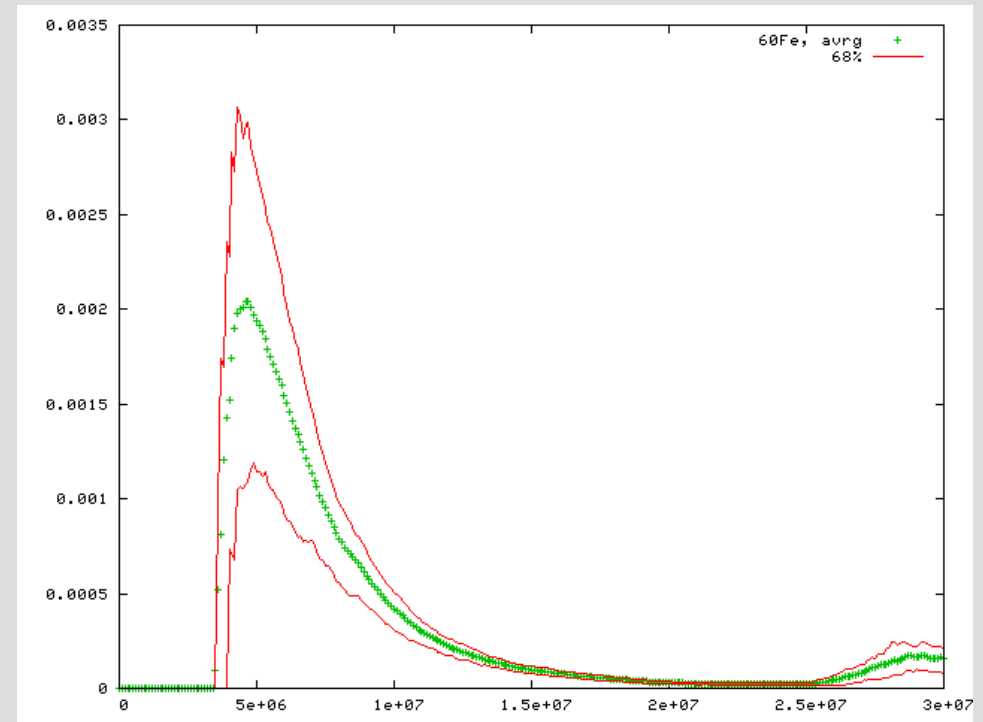
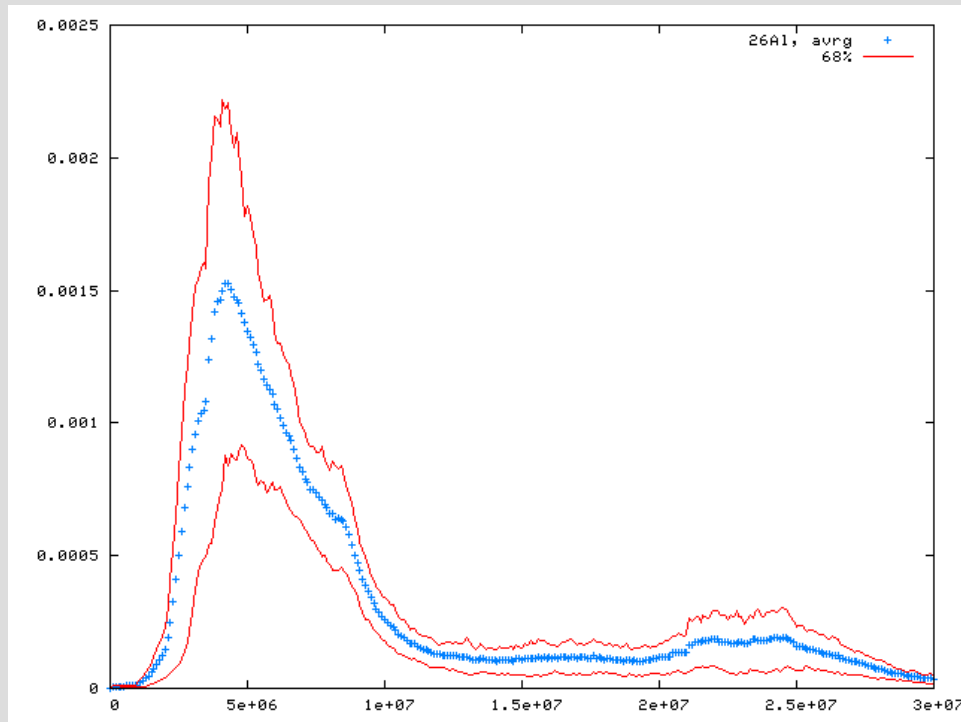
Update: SN yields  
(Limongi & Chieffi 2006)

Wind  $^{26}\text{Al}$   
contribution not  
significantly  
changed



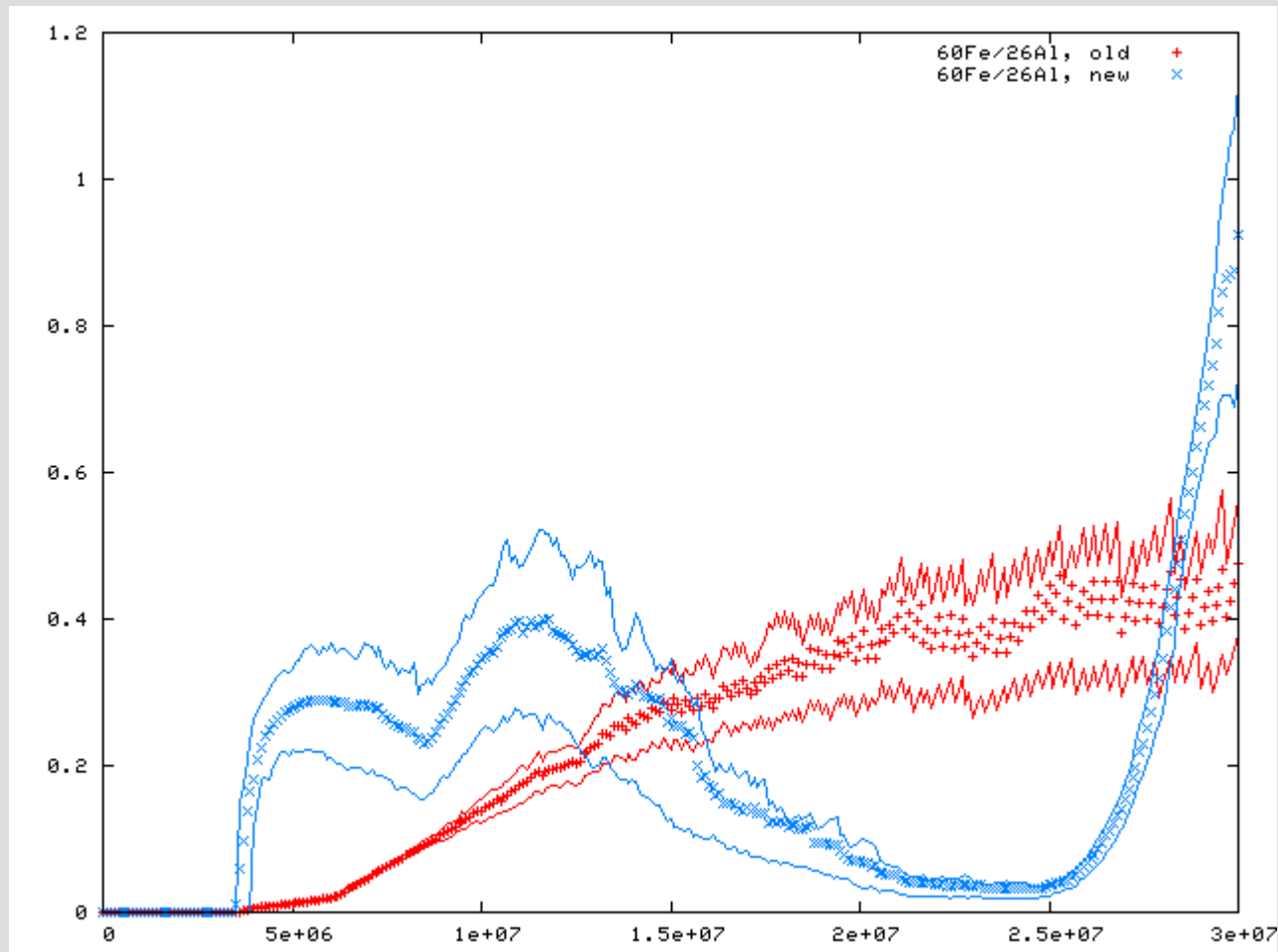
# Population Synthesis

## Monte Carlo simulations



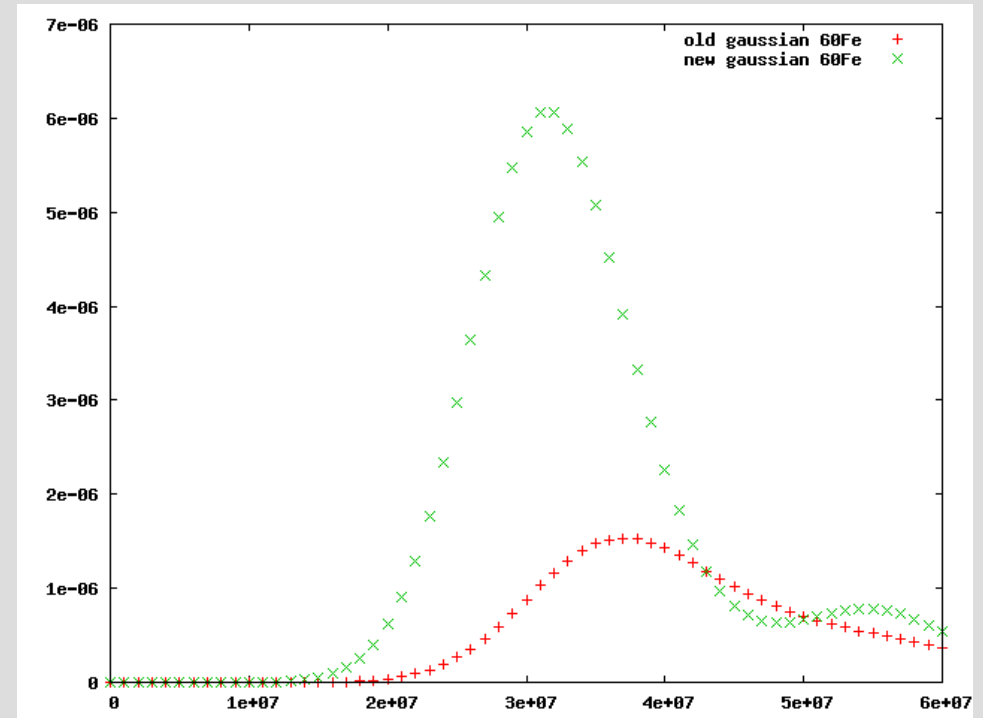
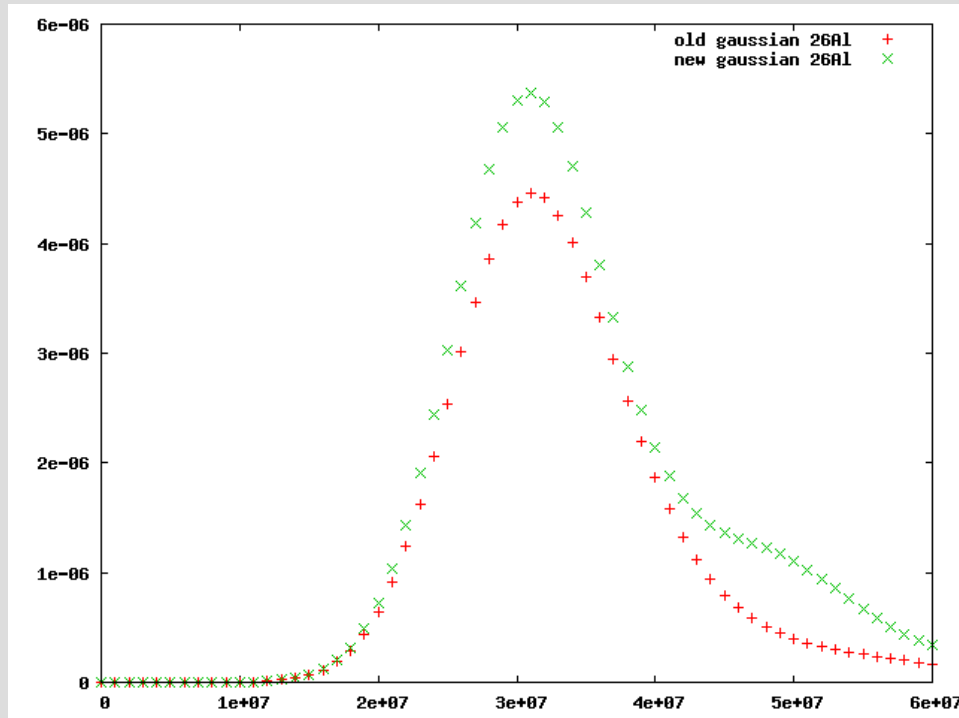
# Population Synthesis

$^{60}\text{Fe}/^{26}\text{Al}$



# Population Synthesis

## Gaussian Star Formation $\sigma=5$ Myr



# Population Synthesis

Gaussian Star Formation  
 $\sigma=5$  Myr

