Nucleosynthesis Yields

Nucleosynthetic yields have been derived from models of nuclear burning in stars during their evolution and terminal core-collapse supernova. Stellar evolution includes core and shell hydrogen burning phases as main sources of ^{26}Al, and in the supernova explosion, explosive nucleosynthesis occurs, mainly, in the O/Ne shell of the pre-supernova star. The complications of stellar structure and burning shells and their dependency on stellar masses leads to the variations of ^{26}Al yields with mass, as they are reflected in current models (see solid red/green lines, the current best-evaluated models including both pre-supernova and explosive nucleosynthesis and mass loss). The comparison to models which address the stellar evolution of massive stars without the supernova ("Wolf-Rayet (WR) models") illustrates that explosive yields dominate up to at least 30 $M_\odot$; even at the highest masses (120 $M_\odot$) 50% of the ejected ^{26}Al is produced explosively[2]. Furthermore, the different WR models[1,3,4] illustrate the impact of different treatments of mass loss and of stellar rotation in the models. Nuclear-reaction uncertainties are important, in particular for the neutron capture reactions destroying ^{26}Al; these could change all these yields by factors of three. On the other hand, the treatment of stellar structure, evolutionary phases, and in particular convective mixing has been converging among different research groups, and yields agree within factors of two among different implementations of these aspects of nucleosynthesis. For reference, the often-used results by Woosley & Weaver (1995)[5] are shown as well, illustrating the effect of various advances over the last decade.

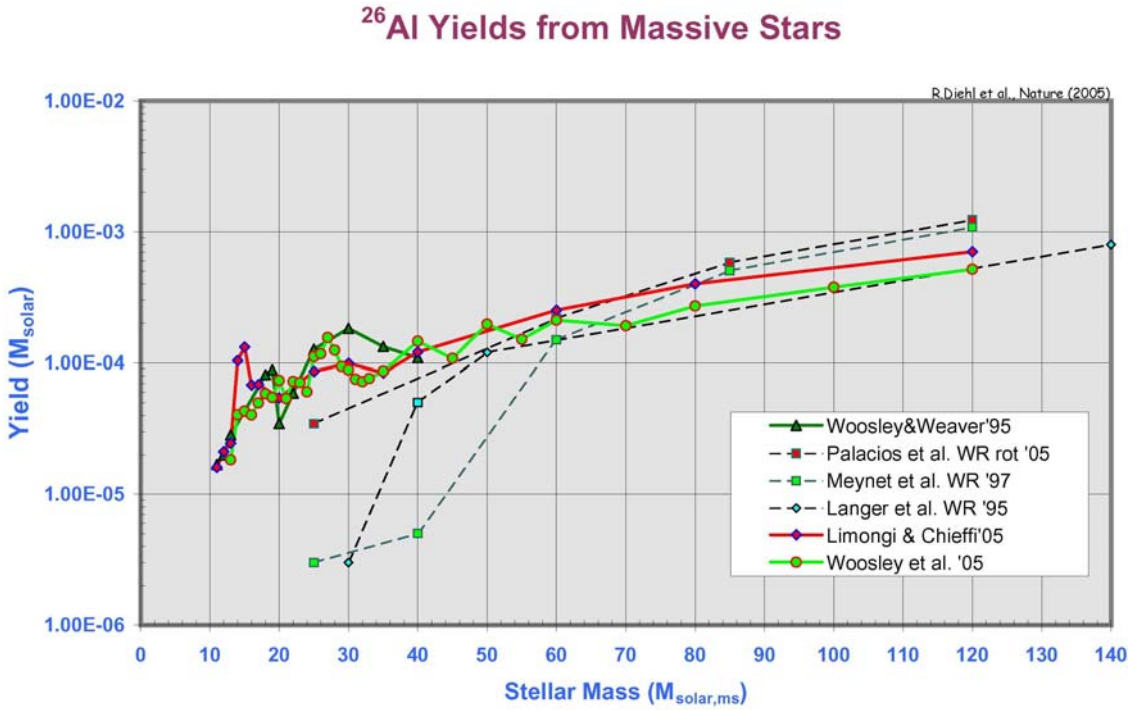

Fig. A5.1: *Nucleosynthesis yields of ^{26}Al for massive stars.*

References

1. Langer N., Braun H., Fliegner J., The production of circumstellar ^{26}Al by massive stars. Astr. & Sp.Sci., 224, 275-278 (1995)
2. Limongi M., Chieffi A., *in preparation for A&A.* (2005)
3. Meynet, G., Arnould, M., Prantzos, N., Paulus, G., Contribution of Wolf Rayet stars to the synthesis of ^{26}Al. *A&A*, **320**, 460-468 (1997)
4. Palacios, A., Meynet, G., Vuissoz, C., *et al.*, New estimates of the contribution of Wolf Rayet stellar winds to the Galactic ^{26}Al. A&A, **429**, 613-624 (2005)
5. Woosley, S.E., Weaver, T.A, The evolution and explosion of massive stars. *ApJS*, **101**, 181-235 (1995)
6. Woosley, S. E., Heger, A., Hoffman, R. D., *in preparation for ApJ.* (2005)