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The role of Fe and Ni for s-process nucleosynthesis and innovative nuclear technologies

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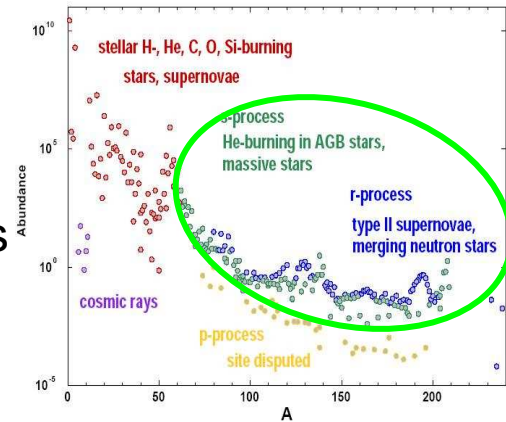
MOTIVATION

Understanding nucleosynthesis in the early universe.

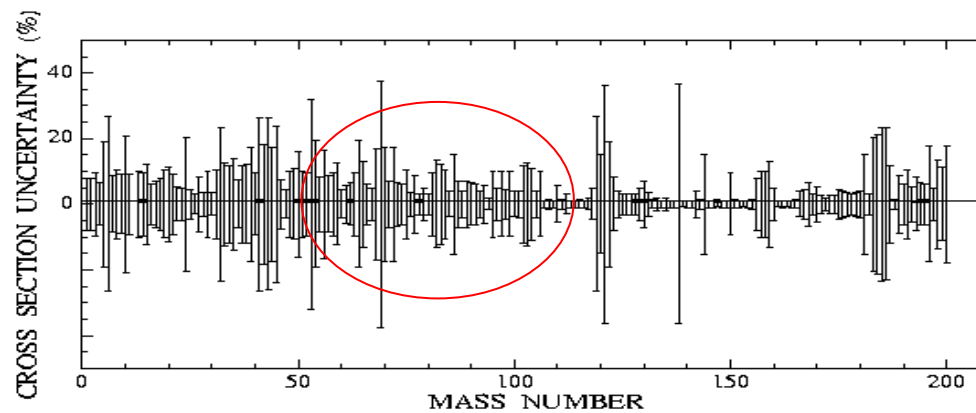
The early universe was enriched in heavy elements by massive stars via their s- and r-process contributions.

s-process n-capture along the β stability valley

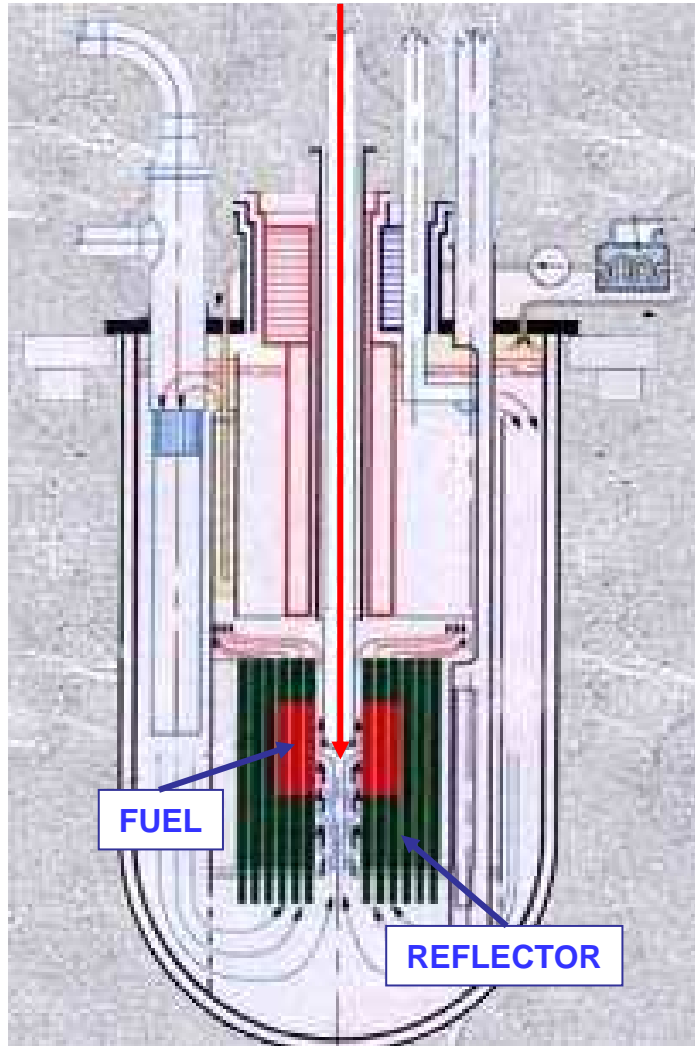
r-process abundances determined as **residuals**: $N_r = N_{\odot} - N_s$



Recent (n, γ) measurements show important discrepancies in the mass region A < 120



Motivation: nuclear data for innovative nuclear technologies

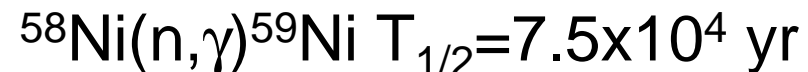


Fe and Ni are part of the fuel cladding material and reflector for ADS systems under study

Aliberti et al. NSE 146(2004)

Quoted uncertainties of σ_{CAP} for most abundant isotopes in 1-500keV range are 8-12 %, but differences largely outside the uncertainty has been found for other isotopes.

Also activation level:

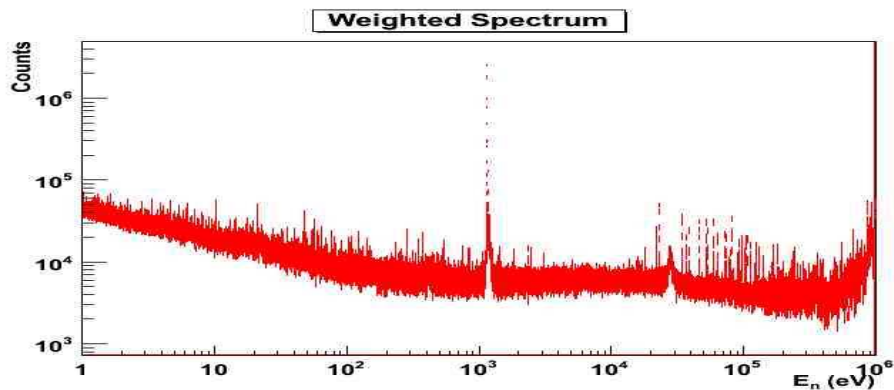


THE n_TOF FACILITY

- Neutrons are produced via spallation of 20 GeV/c protons from CERN PS on a lead target
- The 15 ns wide proton bunch with 7×10^{12} ppb produces a high instantaneous neutron flux
- A flight path of 185 m guarantees very high energy resolution
- The new lead target allows the use of borated water moderator to reduce beam γ -rays scattered background

EXPERIMENTAL DETAILS

- The measurements were performed using two low neutron sensitivity C6D6 scintillation detectors
- Detectors use carbon fiber canning for minimum neutron sensitivity (source of important systematic error)
- The Pulse Height Weighting Technique (using accurate Geant4 Monte Carlo calculated weights) is used to count properly the number of capture cascades



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