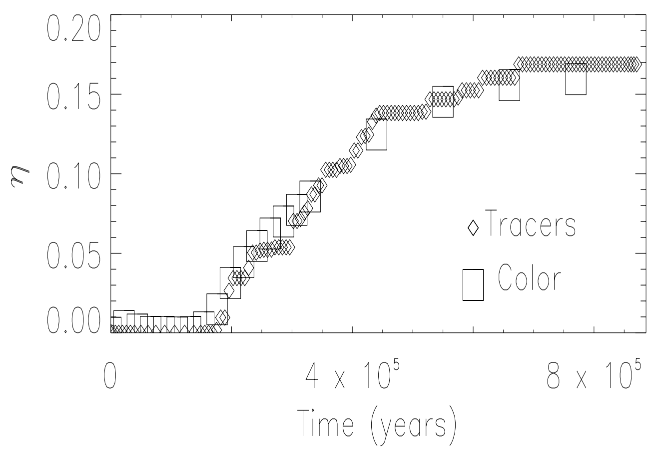
**INJECTION OF RADIOACTIVE NUCLIDES FROM THE STELLAR SOURCE THAT TRIGGERED THE COLLAPSE OF THE PRESOLAR CLOUD CORE.** P. N. Foster & A. P. Boss, DTM, Carnegie Institution of Washington, Washington, DC 20015-1305, USA, boss@dtm.ciw.edu.

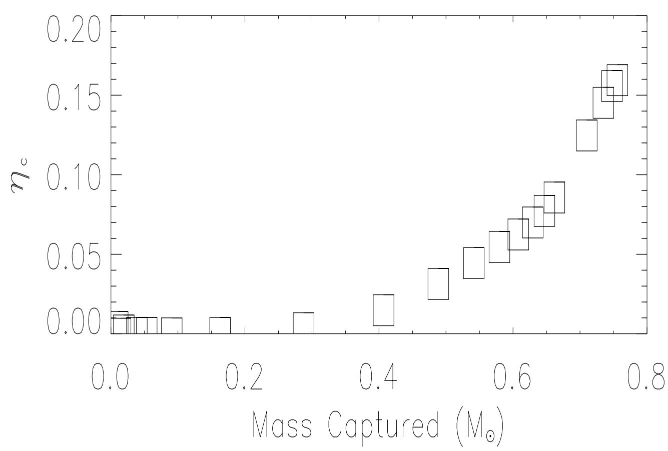
In our previous work we have shown how shock waves from distant supernovae or nearby red giant stars could have triggered the collapse of the presolar cloud. We now turn to the question of injecting matter from the shock wave into the collapsing cloud, motivated by a desire to explain the evidence for freshly-synthesized short-lived radioactivities in primitive meteorites.

We examine the gravitational capture of shock wave gas and dust as it impacts and triggers the collapse of a molecular cloud core. We use two complementary techniques to follow the shock wave material: (1) a set of tracer particles, which allows us to calculate trajectories for specific particles, and (2) a color field, much like a dye, which is treated in the same manner as the hydrodynamic density variable. The two techniques produce very similar results and serve as valuable checks on each other.

We have calculated a number of axisymmetric hydrodynamical models with different assumptions about the stellar trigger, including both isothermal and hot shocks. In both cases we find that roughly 20% of the shock material with an initial impact parameter less than the cloud core's initial radius is injected into the cloud. This is considerably less than the 100% capture estimate often used to constrain the distance to possible stellar sources of radioactive isotopes, and hence will require these stars to be closer than would otherwise be the case. We find that Rayleigh-Taylor instabilities regularly occur and aid in the mixing of the shock material with the target cloud; Kelvin-Helmholtz instabilities play only a minor role.

The shock wave material rains down on the collapsing presolar nebula after the initial collapse is completed, roughly one free-fall time (200,000 years) after the first contact of the shock wave with the cloud. The radioactive rain continues for approximately 400,000 years more. This time interval is short given the mean life of the radioactive nuclide of primary interest, $1.1 \times 10^6$ years for $^{26}$Al. Other than this delay, the shock material does not appear to injected heterogeneously in time (i.e., we see no evidence for sudden spikes in time). The delay does mean that the outer layers of the cloud will be preferentially enriched in shock wave material. The implications of our large-scale models for isotopic heterogeneity on the scale of the presolar nebula remain to be investigated.




Top: Time evolution of capture efficiencies ($\eta$).

Bottom: Shock matter is injected primarily into outer layers of presolar cloud.

Next page: Density (thin) and color (thick) contours in time for shocked presolar cloud. Shock material (color) mixes with the cloud through Rayleigh-Taylor fingers, injecting material into the presolar nebula.

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