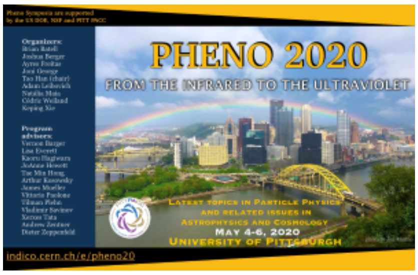

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On the general characteristics of neutrino-driven outflows

Tuesday, 5 May 2020 18:00 (15 minutes)

Neutrino signal from the next galactic supernova may carry in it imprints of the matter profile features that fall in the density range of ~10^3 g/cm^3. The features in question include discontinuities and small-scale fluctuations, which are caused by shocks and turbulent mixing. A well-discussed example is the shockwave expanding through the envelope of the star, which reaches the relevant densities a few seconds after the onset of the explosion. Here, however, we focus on the shocks and turbulent mixing occurring in the post-shock region, in the hot bubble created by neutrino-driven outflows from the surface of the proto-neutron star. Extending the traditional treatment of supersonic neutrino winds, we establish physical criteria for the formation of the termination shock, which depend on the parameters of the explosions, such as the neutrino luminosity, proton-neutron star radius and mass, and the postshock density. For realistic physical conditions, the system is found to be on the edge of shock formation, thus reconciling seemingly disparate numerical results in the literature and providing a sensitive probe of the inner workings of the supernova.

Summary

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