

IMPORTANT QUESTIONS IN THE FIELD OF MASSIVE STAR CLUSTER OUTFLOWS

S. White

University of Maryland

Department of Astronomy

College Park, MD 20742

WHITE@ASTRO.UMD.EDU

Abstract

Sometimes the most important step toward making scientific progress is figuring out the correct question to ask. Discussion leaders at the X-Ray and Radio Connections Meeting were asked to create a list of important questions in each field which, if we worked on them and met again in five years, we would have made progress on the issues presented at the meeting. Here are the important questions for massive star cluster outflows.

Massive Star Cluster Outflows

Researchers in the field need to recognize and separate massive star cluster outflows (MSCOs) into three types of outflows. These types trace cluster life: 1) jets from young stars, 2) stellar winds from adult O and evolved Wolf-Rayet stars, 3) supernovae ejecta which sweep up material from the interstellar medium. The second type of massive star cluster outflow is the most prevalent when it comes to xraydio studies. However, many outstanding issues remain which involve all three outflows to one degree or another:

- 1) Do colliding stellar winds (CWs) always produce both radio and X-ray emission? What are the details of the feedback between the two?
- 2) What is the acceleration efficiency of the shocks involved? How is the energy partitioned between ions and electrons?
- 3) What role do magnetic fields play? What is the orientation and strength of the magnetic fields in CWs?
- 4) With radiative cooling being important, how does metallicity affect the details of the shocks and subsequent emission?
- 5) Is turbulence really important in MSCOs? If so, how and where is it generated and dissipated?
- 6) Does massive star formation proceed through coalescence of low mass stars? How does the resulting mixture of gas temperatures affect MSCOs?
- 7) What is the internal structure of MSCOs? Are they clumpy or uniform? Is the emission primarily non-thermal or thermal?
- 8) How does the composition, density, and magnetic field of the interstellar medium influence MSCOs? When does diffuse interstellar medium X-ray emission dominate over point-like CWs?

Most importantly, it appears that the tripod of observation, theory, and simulation is out of balance when it comes to MSCOs, with the former being stronger than the latter two. Thus perhaps the most important question is: what should theory and simulation be addressing in order to catch up and balance our overall understanding of MSCOs?