Molecular shocks in the Interstellar Medium

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Molecular clouds are large reservoirs of gas and dust, which collapse under gravity to form dense star-forming cores. As stars form, jets and winds are produced and interact with the molecular cloud surrounding them. Shocks are then driven into the clouds sweeping up material. Observations often reveal bow-shaped structures, but the nature and structure of these shocks depends strongly on the local ionisation fraction of the gas and the magnetic field. The feedback from the outflows determines whether stars continue to form within molecular clouds.

Often SiO emission is associated with shocks propagating through molecular clouds and it has been the subject of extensive observational programs. The presence of silicon in the gas phase is attributed to sputtering of silicon from dust grains and to grain-grain interactions. We have developed a time-dependent numerical code to calculate plane-parallel shock structures and the resulting SiO emission from grain sputtering. Currently, grain-grain interactions are not included in the code. Furthermore, bow shock structures are reproduced from a superposition of one-dimensional shocks and not as a coherent, self-consistent structure.

The aim of this project is:
1. to include additional physical processes such as grain-grain collisions in the current numerical code.
2. to expand the one-dimensional shock model to a self-consistent bow shock model.
The results of the numerical studies are to be compared with observations of molecular outflows.