NLTE modeling of lines in expanding shells of LPVs

U. Bolick, He. Richter and E. Sedlmayr

Zentrum fuer Astronomie und Astrophysik, TU Berlin, D-10623 Berlin, Germany

The dynamics of the cool, shock penetrated, expanding atmospheres of Long Period Variables (LPVs) can be studied by spectral lines of various atoms or molecules. Especially the infrared molecular line profiles of the CO molecule are excellent diagnostic tools appropriate for the overall structure of the inner, expanding circumstellar layers. Due to the high abundance of CO as well as its formation and stability at high temperatures it is dominant in the circumstellar shells of LPVs. If one focuses on the detailed shock structures in atmospheric layers close to the photosphere for example, various optical atomic lines of neutral and ionized metals (e.g. Mg I, Fe I, Fe II) are suitable diagnostic tools (see Richter & Wood 2001, A&A 369, 1027).

To model the various atomic and molecular lines of interest, a radiative transfer code (static, spherical symmetric, co-moving frame, accelerated lambda iteration) has been developed to handle the especially awkward conditions of cool LPV's atmospheres. Here we present and discuss in detail results of the infrared CO-line calculations and give a brief outlook on work in progress for optical metal line calculations.