Title: Local ionization rates by magnetic reconnection events in TTauri disks
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Abstract:
Magnetic reconnection is one of the major particle acceleration processes in space and astrophysical plasmas. Low-energy supra-thermal particles emitted by magnetic reconnection are a source of ionization for circumstellar disks, influencing their chemical, thermal and dynamical evolution. The aim of this work is to study how energetic particles can propagate in the circumstellar disk of a TTauri star and how they affect the ionization rate of the disk plasma. To this end, we have collected experimental and theoretical data on the cross sections for the production of H+, H2+ and He+ by electrons and protons. Starting from theoretical injection spectra of protons and electrons emitted during magnetic reconnection, we have calculated the propagated spectra in the circumstellar disk considering the relevant energy loss processes. We have conducted a comparison of the ionization rates by energetic particles in different magnetic configurations considering the physical properties of the flares as observed by the Chandra satellite for a sample of sources in the Orion Nebula (COUP). We have tested the ionization rates obtained for a disk which chemical equilibrium is calculated by the chemistry PRODIMO code. We find that energetic particles could be a strong source of local ionization in the circumstellar disk close to the star.