Stars and Structure Formation: From First Light to the Milky Way
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Gas dynamics in spiral galaxies

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Abstract The proper modelling and role of interstellar gas still present very serious difficulties, especially in spiral galaxies, where gas is clumpy and gravitationally unstable at different scales. First, observational and theoretical evidences suggest that the visible ISM is probably in a rapid dynamical state, the easily measurable HI being just a short lived phase. Second, evidences exist that stars do form in HI regions displaying no trace of CO or molecular clouds. Third, dynamical models of dark matter dominated galaxies seem to require a heavy disk component. Fourth, several circumstances suggest that the global dynamics of the ISM is better modelled with a weakly collisional or collisionless medium. A synthetic model of the ISM taking into account these constraints will be presented, in which most of the ISM mass is trapped in a very cold molecular phase behaving globally as a collisionless fluid until ambient radiation and cosmic rays evaporate it into visible HI.