Poster: Photoionising the DIG in the Milky Way: an interesting fine-tuning problem

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Observations of line emission from the extended Milky Way disk by the Wisconsin Halpha Mapper (WHAM) instrument have shown that gas at altitudes of a few kpc above the disc is photoionised by UV light from young stellar objects in the Milky Way disk (Haffner et al., 2003). The presence of this diffuse ionised gas (DIG) can only be explained if the Milky Way disk has a non-smooth structure, in which low density channels exist that allow ionising radiation to reach high altitudes (Wood et al., 2010). However, models of galactic disks until now were unable to reproduce a disk structure that would lead to a DIG with the observed Halpha scale height, indicating that some mechanism to sufficiently 'puff up' the disk was missing (Barnes et al., 2014). Recently we were able to reproduce these scale heights by post-processing a more realistic disk model that included cosmic ray feedback (Vandenbroucke et al., 2018). However, our models showed an interesting fine-tuning issue: in order to also reproduce the observed temperature profile of the DIG (as measured from forbidden line emissions), we require an ionising luminosity that is just strong enough to ionise out to the observed Halpha scale height. This hints at some deeper connection between photoionisation and the dynamics of the disk: photoionisation feedback might be the missing ingredient that is responsible for puffing up the disk. We will explore this possibility in more detail using a dedicated set of RHD simulations in which we couple our Monte Carlo photoionisation model to a hydro code and focus on the effect of photoionisation alone.

Galactic Scale