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# Ionisation in ultra-cool, cloud forming extrasolar planetary atmospheres

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Transit spectroscopy provides evidence that extrasolare planets are covered in clouds, a finding that has been forecast by cloud model simulations 15 years ago. Atmospheres are strongly affected by clouds through their large opacity and their chemical activity. Cloud formation models allow to predict cloud particle sizes, their chemical composition and the composition of the remaining atmospheric gas (Woitke & Helling 2004, A&A 414; Helling & Woitke 2006, A&A 455), for example, as input for radiative transfer codes like Drift-Phoenix (Witte et al. 2009; A&A 506). These cloud particles are charged and can discharge, for example in form of lighting (Helling et al. 2013, ApJ 767; Bailey et al. 2014, ApJ 784). Earth observations demonstrate that lighting effects not only the local chemistry but also the electron budget of the atmosphere.

This talk will present our work on cloud formation modelling and ionisation processes in cloud forming atmospheres. An hierarchy of ionisation processes leads to a vertically inhomogenously ionised atmosphere which has implications for planetary mass loss and global circulation pattern of planetary atmospheres. Processes involved, like Cosmic Ray ionisation, do also activate the local chemistry such that large hydrocarbon molecules form (Rimmer et al. 2014, IJAsB 13).