

Ionisation processes and electric break-down in ultra-cool, cloud-forming atmospheres

Helling, Christiane¹, Jardine, Moira¹, Declan, Diver², Stark, Craig¹ and Rimmer, Paul¹

¹University of St Andrews, UK

²University of Glasgow, UK

The steady increase of the sample of known extrasolar planets broadens our knowledge and at the same time, reveals our lack of understanding. The habitability of a planet depends, amongst other things, on how much radiation reached the ground, how clouds form and which effect clouds have on the composition and on the electric state of the ambient gas from which they form.

We have studied the formation of mineral clouds on planetary atmospheres by a kinetic approach which allows us to predict the size distribution and material composition of the cloud particles. These results have been used to study if such clouds can be charged and under which conditions an electric field breakdown, such as lightning or other transient luminous events, may occur. Our results suggest that different intra-cloud discharge processes dominate at different heights inside a cloud. We discuss the efficiency of electric field breakdowns to be expected in extrasolar atmospheres which is indirectly dependent on Cosmic Ray ionisation.