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Project title: Meteoric ions in planetary atmospheres

Interplanetary dust particles are produced by the sublimation of dust from comets, and collisions between asteroids. When these particles enter a planetary atmosphere, high velocity collisions with atmospheric molecules lead to rapid heating, melting and evaporation – a process termed meteoric ablation. The purpose of this project is to carry out a comparative study of the effects of meteoric ablation in the atmospheres of Mars, Venus and Titan. Ablation provides a source of metals such as Fe, Mg and Na, which ionize readily. The resulting layers of metallic ions have been detected recently on Mars and Venus by radio occultation measurements with orbiting spacecraft, and similar layers are expected to occur about 500 km above the surface of Titan.

The project will involve constructing a new laboratory apparatus to study the rates at which metallic molecular ions are neutralised by electrons (a type of reaction known as dissociative recombination). These reactions control the atmospheric lifetimes of metallic ions, and so their rates are essential information for modelling metal ion chemistry. The experimental results will then be input into models of the middle atmospheres of these four solar system bodies. These models will be coupled to an astronomical model of the Zodiacal Cloud and a model of meteoric ablation, in order to estimate the rates of meteoric ablation in each atmosphere. The model predictions will then be compared with satellite observations of ion layers, through collaborations with Boston University and the University of Köln (where the student will make short-term research visits).

The studentship will involve: experimental reaction kinetics of ion-molecule reactions; the option to carry out fundamental theoretical calculations on these reactions; and the development of atmospheric models of three solar system bodies. An appropriate background would be a first degree in chemistry, physics, astronomy or atmospheric science.

The student will join a large research team studying the evolution of cosmic dust from the outer solar system to the earth's surface. The team consists of 4 senior staff members, 5 post-docs and 2 PhD students at Leeds, as well as 10 remote members in the US and Germany.

Enquires to Prof. John Plane (j.m.c.plane@leeds.ac.uk)

Webpage <http://www.chem.leeds.ac.uk/JMCP/>.

Eligibility: open to applicants from throughout the EU.

Start date: 1 October 2012 (flexible)

Duration: 4 years