

# Proposal for UCL-French Embassy Workshop New Frontiers in Earth and Planetary Aurorae

## Proposed Participants

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## France

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## Abstract

The Earth's 'northern' and 'southern lights' are examples of auroral emission, light which shines from the polar regions of all magnetised planets in our Solar System. Studying the brightness and shape of this emission at the Earth and other planets has provided us with enormous scientific insight into the physics of how the atmosphere of a planet interacts with its surrounding space environment. For example, the bright 'oval' of auroral light surrounding the Earth's magnetic pole arises from the interaction between the Earth's magnetic field and the solar wind, a stream of charged particles continually emanating from our Sun. Jupiter's analogous oval, on the other hand, is mainly due to the interaction between that planet's magnetic field and the charged particles emanating not from the Sun, but from Jupiter's volcanic moon, Io. With the advent of space missions about to re-visit the Jovian system (e.g. NASA's JUNO, arriving in July 2016; and ESA's JUICE, planned for launch in 2022), now is a critical time for experts in both auroral observation and image analysis and processing to congregate and plan the provision of useful data analysis tools and algorithms for the scientific communities involved in these projects. This workshop will bring together auroral experts, many of whom are involved with JUNO and / or JUICE, for this specific purpose. Dr. Patrick Guio, the Lead Participant, has developed a software tool for auroral image analysis known as VOISE and one of the workshop's main aims will be to plan raising awareness of VOISE in the planetary community, and to incorporate this tool into the APIS database maintained and developed by the second lead participant, Dr. Laurent Lamy. The scientific challenge which we are aiming to meet is multi-fold: how to improve the current techniques in order to unambiguously detect weak auroral emissions and characterise the limit of auroral brightness detection, and explore data mining techniques available in the armoury of medical imaging to classify and analyse auroral forms and features.

## Aims and Objectives

The primary aims of this workshop are to make imaging experts from different communities – auroral science, medicine and applied mathematics/computer science aware of each other and each other's work, and investigate the possibility of collaboration and transfer of knowledge between communities.

Specific objectives of this workshop are:

- Agreement on a set of resources / tools which would be useful for the relevant communities, and how to 'pool' these resources into a common 'repository' or location.
- Agreement on how to raise awareness of specific tools (e.g. VOISE) among the potential community of users. Note that the VOISE tool was considered an eminently suitable choice by the European Planetary Network (EuroPlaNet) project for adaptation into an online form for that community of researchers. EuroPlaNet is a project funded by the European Commission with UCL Physics and Astronomy as a partner.
- A basic strategy for incorporating these specific tools into Dr. Lamy's APIS database.
- Determination of the limiting auroral brightness and resolution which may be detectable using a representative set of image processing tools and algorithms; determination of what these observational limits imply for studies of the physical origin of auroral emissions.