Projects update, errata and corrections to the
MPhys Projects Trinity Term 2017

****** Updated Title and project description***

AO18 **Understanding Heat flow around the Lunar surface**

Thermal infrared measurements of airless bodies such as the Moon or asteroids can tell us a huge amount of information about their surfaces including their surface temperature, composition and texture. To obtain this information the measured thermal emission from the Moon or asteroid must be compared to a computer 3D thermal model of the surface. Typically, these models combine topography and compositional data using a combination of ray tracing techniques and solutions to the 1D thermal diffusion equation. This allows the model to calculate the expected radiance at the spacecraft.

These models generally do a good job at matching the measured radiance from the e.g. the lunar surface; however, in regions where the incidence angle of the incoming solar light is low and the dominate source of heat transfer is thermal re-radiation they have significant errors. Most 3D thermal models assume that light is scattered equally in all directions - a Lambertian surface, however it is believed that this assumption is incorrect particularly at high incidence angles.

We are in the early stages of development of our own 3D thermal model here at Oxford. Currently our model (written in MATLAB) is similar to previous 3D thermal models and we have obtained similar surface temperatures. However, we would like to extended our model to induce non-Lambertian scattering. This project will involve taking our existing model and adding a new module to include non-Lambertian scattering.

Skills: Coursework covering the fundamentals of radiative transfer e.g. from Atmos or Astro major options. For the computer-based elements programming experience be useful.

Reading: Paige et al. 2010 http://science.sciencemag.org/content/330/6003/479 , LRO Diviner instrument websitehttp://www.diviner.ucla.edu

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