



STSM Scientific Report Template

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Visited scientist and host institution : Dr Daphne Stam, TU Delft, Netherlands

Dates of STSM : 31/08/14 - 04/09/14

Explain briefly below how your STSM matched one of these key-points :

1. strengthen current collaborative projects
2. establish new collaborations
3. obtain necessary knowledge for the application of new techniques
4. use host infrastructures that are not available at the home institute.

The aim of the STSM was for myself and a fellow student from the Armagh Observatory to learn to use Dr Stam's radiative transfer code. The application of the code to my own PhD involves the modelling of the polarisation of light reflected from the planets and moons of the solar system, and also from extrasolar planets. The various parts of the code were explained and discussed, along with the modifications required for the application to the modelling of surface polarisation.

Describe below the activities carried out during the STSM and the main results obtained.

Different applications of the code were discussed. The first was the modelling of the polarised spectrum of Earth, and then how to combine this with the reflection properties of the lunar surface, in order to model the earthshine. The earthshine will be modelled for different Sun-Earth-Moon phase angles, and for different combinations of surface types and cloud fractions, in order to investigate how these factors influence the polarisation. Observations of the earthshine taken from the VLT will be compared to the theoretical models.

The modelling of the polarised light reflected from the surface of Mars will also be attempted, by adapting the sections of the code which model the surface and atmosphere of the planet. The modelling of any planet with any combination of surface type and cloud coverage can be modelled with Dr Stam's code. Measured values of the scattering matrices of various substances, such as snow, sand, and volcanic ash (which can be used to approximate the lunar or martian surface) are freely available online, and these can be used as inputs to the code. Also, cloud coverage and albedo data for Earth will be used as input values for the earthshine.

This modelling work is invaluable for investigating whether future exoplanet characterisation instrumentation should include polarimetry, as well as for the design of such polarimeters and for the preparation of data interpretation. Observational runs at the WHT, La Palma, are planned, with the aim to obtain spectro-polarimetric data of various objects of the solar system, with which the models can be compared.