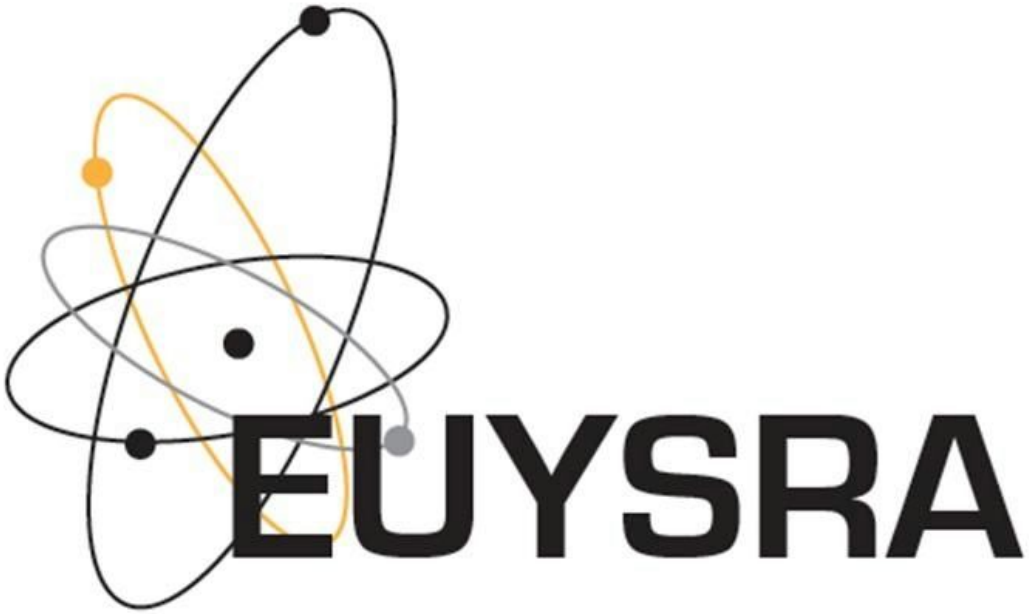

Project title: Photospheric Supergranule Pattern Modelling

Department(s): Physics

General information

List the group members (max. 6, starting with project leader). Include year of study, email address and departmental affiliation:

André Bedell: Year 1 - s1555113@ed.ac.uk - Physics and Astronomy - group leader

Farid Ibrahimov: Year 1 - s1514289@sms.ed.ac.uk - Physics and Astronomy

Guillermo Godino: Year 1 - guillesedano@hotmail.com - Mathematics

Angus Lowe: Year 1 - s1578278@sms.ed.ac.uk - Informatics

Project description

Briefly describe the scientific background of the project (max. 200 words, references do not count towards the word count):

Since 2006, the Hinode (Solar-B) satellite has been relaying high-resolution images and solar data to physicists attempting to better understand the driving mechanisms behind various processes in the photosphere. Among these is the movement of granules (plasma cells in the photosphere caused by convection) and their general tendency - or lack thereof - to drift together, indicating the existence of so-called “supergranules”.

The evidence supporting this postulation is quite overwhelming, but the torrent of data required in order to confirm it is equally so. To date, two predominant numerical methods used in handling this data to model photospheric flows are Local Correlation Tracking (LCT) - rigid translation of small image elements -, and Coherent Structure Tracking - tracking individual granules - both of which are computationally intensive (Potts et al. 2004). However, it was suggested in 2004 by Potts et al. from the University of Glasgow that a more effective computation could involve the tracing of virtual balls floating on top of a generated flow field, the momentum of which would mitigate the number of calculations required to model the photosphere or any granular structure of a similar nature, perhaps even terrestrial in origin.

We wish to continue this line of research and further explore the possible existence of supergranular trends in the sun’s photosphere.

Balltracking: An highly efficient method for tracking flow fields

H. E. Potts, R. K. BarrettH. E. Potts, R. K. Barrett and D. A. Diver

A&A, 424 1 (2004) 253-262

DOI: http://dx.doi.org/10.1051/0004-6361:20035891

Briefly describe the aims of the project (max. 100 words):

Looking for large scale patterns by analyzing the result of applying known input parameters to previously developed simulation programs. Using the methods described below we will attempt to understand and describe the behaviour of these patterns. In order to achieve this, we will learn to use MatLAB software and apply this to current real world research. We hope this experience will give us insight into modern research methods which will be likely to help us in the future.

Methods used in the project (max. 50 words):

A simple set of data will be created in order to test the computer model developed by Potts et al. This data will be created in such a way that the outcome can be predicted beforehand. Once a few sets of different simulated data have been used, real data will be introduced and interpreted. This should give us a better understanding of the computer model, without the need to dissect it in its entirety.

Applications and / or significance of the proposed research (max. 100 words):

The research we are studying is cutting edge in fields of physics not well understood, such as the study of the interior structure of the Sun and fluid dynamics. This research not only forwards our understanding of the sun, but can even have applications, such as the prediction of solar flares, that

have proven to be capable of damaging all electronic devices within a large area, and would have very negative repercussions on our modern way of life.

Practical details:

Place where the research will be performed:

Edinburgh University, and private residences

Budget breakdown:

Description	**Cost (£)**
Student MATLAB License	71.00

Total: £71.00

Proposed start date: February 10, 2016

Estimated duration: February - June

Safety assessment:

Evaluate associated risks and training required (max. 50 words):

No foreseen risks
Learning to use MatLAB

List supervisors and advisors (include contact details):

Prof. Alan Shotter
acs@ph.ed.ac.uk
+44 (0)131 650 5298

PLEASE SUBMIT THIS FORM IN THE PDF FORMAT BY 29/1/2016 TO:

Olivia Sweeney

EUYSRA Secretary and Head of Research

Email: s1212185@sms.ed.ac.uk

Good luck!