**Activities in last 6 months**

We’ve been continuing to work on two (somewhat separate) fronts: Climatology of geomagnetic variations and forecasting.

Mike Lockwood has been leading the climatology work, characterising the day-of-year and time-of-day trends in the recently homogenised aa index. That work is largely completed and described in a series of four papers submitted to Space Weather and Space Climate:

* Semi-annual, annual and Universal Time variations in the magnetosphere and in geomagnetic activity: 4. Cluster observations in the near-Earth tail, M. Lockwood, J. Coxon, C.E. Watt, M.J. Owens, L.A. Barnard, C.J. Scott and K.A. McWilliams, submitted to Space Weather and Space Climate, 2019
* Semi-annual, annual and Universal Time variations in the magnetosphere and in geomagnetic activity: 3. Modelling, M. Lockwood, M.J. Owens, L.A. Barnard, C.E. Watt, C.J. Scott, J. Coxon and K.A. McWilliams, submitted to Space Weather and Space Climate, 2019
* Semi-annual, annual and Universal Time variations in the magnetosphere and in geomagnetic activity: 2. The effect of solar wind variations, M. Lockwood, K.A. McWilliams, M.J. Owens, L.A. Barnard, C.E. Watt, C.J. Scott, A. Macneill and J. Coxon, submitted to Space Weather and Space Climate, 2019
* Semi-annual, annual and Universal Time variations in the magnetosphere and in geomagnetic activity: 1. Geomagnetic data, M. Lockwood, M.J. Owens, L.A. Barnard, C. Haines, C.J. Scott, K.A. McWilliams and J. Coxon, submitted to Space Weather and Space Climate, 2019

On the forecasting side, SWIGS PDRA Luke Barnard and my PhD student Carl Haines (funded via our NERC DTP, but working on a project aligned with SWIGS) have been looking at the relation between storm duration and intensity, which is something EDF Energy are interested in. This is summarised in:

* The variation of geomagnetic storm duration with intensity, C. Haines, M.J. Owens, L.A. Barnard, M. Lockwood and A. Ruffenach, Sol. Phys., 294: 154, Doi:10.1007/s11207-019-1546-z, 2019

We are following up with a more machine-learning based approach. Submission of this article has been delayed by Carl undertaking a 6-month secondment to EDF Energy.

**Plans for the future**

There are no immediate plans to extend the climatology work further.

For the next 6 months, we plan to focus on the issue of downscaling: Statistically relating global, low frequency (~ hours) geomagnetic variations to local, high frequency (~ seconds) which are more directly related to GICs. We intend to use the SuperMAG data and have discussed possible approaches with the Lancaster group. Ultimately, the downscaling scheme would be used in conjunction with a magnetospheric model, such as GORGON, but that stage is likely to be post-SWIGS.