**SWIGS Lancaster Annual Workshop 11-12 September 2018**

**Some notes on Q&A to accompany slide presentations, prepared by Alan.**

**Day 1.**

1300. Intros & local info, round table introductions, introduction to SWIGS

1315. Neil chairs session **WP1**.

1320. MF: scope of WP1 – role of substorms, how do processes change from medium to extreme forcing, importance of scale size in dH/dt. Names of researchers involved. Y Bogdanova (RAL) has left the grant (was 50% time). J Rae (MSSL) has held interviews for new PDRA. Therefore not quite at full speed yet in the WP. Mervyn comments that it would be helpful to discuss in the workshop how we interact better across WPs for mutual benefit - agreed.

1325 Task 1.1.1. (MF) See Mervyn’s slides on dH/dt probabilities.

Q’s: What’s the relative significance of substorm vs shock dB/dt is omething that needs to be considered (MC) - as shocks are in the ‘other’ category, as part of the substorm cycle so are hidden somehow.

1350 Task 1.2.1 and 1.2.2 (MH on behalf of YB). See slides on events database (1.2.1) and current systems morphology (1.2.2).

Q’s: Did you look at PCN (KW)? Yes and shown in earlier plots (MH). No follow up question.

1410. (MD) 1.3.1 See Malcolm’s slides.

Q’s: none

1430. (MF for Andrew Kavanagh). See slides on ionospheric electric field variability.

Q’s: What are AMISR (CB)? AMISR are the next generation of ISR (MF), which will enhance 3D sampling. Also SuperDARN will benefit.

1445. (MC). See slides on Scale-size and GIC.

Q’s: GIC in T6 at Halfwaybush is probably increased since T4 removed (DB). It would be necessary to look at the circuit diagram to see how you might expect the GIC to change. This will impact pre and post T4 removal harmonics. (KW) not obvious that proximity to substation is either an ionospheric or a ground conductivity effect. (MC) yes, agreed.

1535 Ciaran chairs session 2 (**WP4**).

1535 intro to WP4 (CB)

1540. Task 4.1.1 (GR). See Gemma’s slides on next generation grid model.

Q’s: (DB) for a uniform E-field it does not matter if the line is twisted, it is effectively the potential difference between the 2 end points that matter (integral of dot product of E direction and line direction). For non-uniform E-fields this would not necessarily be true though. (GR) need to determine if we are using ohms/km or total ohms as some uncertainty over scaling. (DB) do you have any info on which are autotransformers from National Grid? (GR) no, nothing.

1605. (JW) Dissolved gas analysis slides.

Q’s: Are there standard time constants for DGA to escape the transformer (DB)? (TG) the DGA change depends on the loading on the transformer and the oil refilling schedule, as well as extreme temperature changes. Filtering only delays the reappearance of the DG.

1625. (MH) Refer to Mike’s railway slides.

Q’s: (AT) The E-field directions align rather well with line direction. (MH) yes, this adds to plausibility but not conclusive. (DB) Need to discuss with industry the electrical set up of the track circuits to understand how E-fields might impact. (MH) Yes agreed – discussion on possible arrangements for typical track circuits.

1645. (GR) See Gemma’s slides.

Q’s: (DB) thickness is typically some factor of diameter. Resistivity of steel is pretty fixed, so OK. Modern coatings are more and more resistive, compared to old lines. The valve stations are isolated from the pipe but there is a jumper Between pipelines sections (electrically connected). (CB) Are there Canadian measurements? (DB) yes this was done in the 1990s.

**1700. Close.**

**Day 2**

0925. Session 3 **WP3**. Chaired by Juliane.

0925. (JW) Introductory remarks.

0935. (LB for ML\*2 talks). Series of notes and comments from the Reading group. Time has been spent since last meeting on getting a series of papers through review process: climatology and best coupling functions (in press - JSWSC); distribution of SW parameters and their shapes, depends on orientation of IMF (in review); how distributions evolve depending on time scale & scaling by annual mean (Cf Chapman paper in JSWSC in summer); paper on aa indices and SV of field is in review.

Emma did some work on extreme event stats, Mat is looking at downscaling between helio and magnetospheric scales, and went to meteo conference to learn from their experience

0945. (NR). See slides.

Q’s: (MF) On MLT dependence and directionality, transient convective vortices at low latitudes might give you large dB/dt. (NR) can’t see a clear pattern. (MH) secondary minima at low latitudes in the latitude plots – interesting for science and stakeholders (industry) in these countries. (NR) agreed. (AT) declustering – try different times? (DB) we tried 5 days declustering interval and results similar to earlier study for Europe. (AT) shape functions – does the fit degrade at higher return values? Is there a different functional form that applies for extremes – it looks like it?

1020. (LM) See slides.

Q’s: (DB) not GIC in the plot – but scaled dB/dt. (CB) Is the internal field dipolar? (LM) yes. (MH) Model the 1972 event (like Carrington but IMF was not south and magnetopause was 4Re).

1040. (PL) See slides.

Q’s: (MH) Is most of the change in dipole location in recent decades? (CB) dipole change has been largely linear, it’s the higher order terms that are more nonlinear (later plot seems to agree more with MH). (KW) How will you propagate field forward – with diffusion? (PL) Will try a range of models starting with diffusion-free. (DB) What happens when pole tilts over and starts to decrease and how about amplitude? (PL) Will take all this into account.

1115. Session 4 (**WP2**). Chaired by Kathy.

1120. Introductory remarks – improving conductivity models for GB, re-evaluating old data sets, 1D Swarm deep conductivity model, uncertainties, GIC and B-E-field measurements

1125. (FS) See slides.

Q’s: (KW) What period range do you hope to get? (FS) From 10000 (~2 hours) to 100000 (1 day) seconds and this will be added to Swarm 1D deep model for longer periods. (CB) what was the nature of the theft/vandalism? (FS) things like data logger and anything not buried, like batteries. (AT) can we do some MT near the hot spots in the E+W grid? (KW) this can’t/doesn’t give the full picture but you can get some info on local transfer functions. (PG) we have done a conductivity map of Ireland, and will do more MT measurements. (KW) this will tie into legacy data that we will also investigate.

1145. (KW) See slides.

Q’s: (FS) looking at our data so far suggests that a near surface model isn’t sufficient to characterise conductivity. (PG) we got really good MT on Christmas day and the cultural noise was really low. (MF) how far away do you need to be to minimise cultural noise (KW) at least 1 km- rule of thumb. (DB) Surely you can get that in England (KW) depends on what is buried nearby, plus permissions, plus theft/vandalism (MH) does switch from coax to fibre phones help? (JH) no its really pipelines that matter. (JH) aero measurements will not match FS’s data because of frequency and altitude. (AT) periods of interest are 10s to a few hundred seconds. (JH) so that is upper mantle and lower crust.

1205. (JH) See slides.

Q’s: (TG) Have you looked at the Torness GIC in relation to current in and out? (DB) How many Tx at Torness as it determines what you measure there? (GR) Two, and we are measuring under one, so the second site will measure at the other line so we will get a better picture of what is really happening across the Torness substation and location. (MH) Be wary of Pentyr site- not operational. (GH) we will choose locations depending on various factors.