IN CONFIDENCE
Minutes of the 36th Experimenters’ Meeting
The Cosener’s House, Abingdon, Tuesday 19th July 2005

Present:
Miss Kirsty Adam\(^1\) (KA)
Dr Ivan Astin\(^2\) (IA)
Miss Helen Clark\(^3\) (HAC)
Dr Ian Glover\(^2\) (IAG)
Dr David Hooper\(^4\) (DAH) Secretary
Dr Lin Kay\(^1\) (LK)
Dr John Nash\(^5\) (JN)
Miss Emily Norton\(^6\) (EGN)
Mr Tim Oakley\(^5\) (TO)
Mr Tony Olewicz\(^4\) (ZAKO)
Mr Graham Parton\(^6\) (GAP)
Dr Sam Pepler\(^4,7\) (SJP)
Mr Hugo Ricketts\(^6\) (HR)
Dr Andrew Russell\(^6\) (AR)
Dr Nandini Sengupta\(^2\) (NS)
Prof Geraint Vaughan\(^6\) (GV) Chair
Dr Richard Worthington\(^3\) (RMW)

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\(^6\)University of Manchester (UofM)
\(^7\)British Atmospheric Data Centre (BADC)

1. Minutes of the previous meeting
The minutes of the 35th Experimenters’ meeting were accepted without correction.

2. Matters arising

**ACTION ITEM 35.2.1:** SJP to investigate the possibility of renting the UofWA huts at Frongoch in order to ensure the continued facility for sonde launches.

ONGOING

SJP reported that he had sent a mail to Keith Lewis, at the UofWA, but that he was still waiting for a reply. He added that he would only go ahead with the proposed rental if it proved to be both low-cost and easy to arrange.
ACTION ITEM 34.6.1: DAH and SJP to check on the status of the Aberystwyth MST radar within the peace time frequency allocation table.

ONGOING

DAH reported that he had been in touch with Ofcom and that they had recommended he apply for a Test and Development license, which must be renewed on a yearly basis. JN pointed out that it should be possible to obtain a permanent license, such as the MO have the South Uist radar, since they (the MO) had already ensured that there was provision for the use of wind profilers at 46.5 MHz in the Frequency Allocation Table. He explained that the new licensing system had only come into effect in the late 1990s, which explained why the Aberystwyth radar did not have a license previously.

GV asked if there was any further information regarding the possible impacts of the forthcoming Galileo global positioning system (which will use the 1260-1300 MHz band) on UHF wind profilers. TO reported that it was highly probable that wind profilers would suffer interference. There will eventually be in excess of 30 satellites and the first is due for launch in 2007. Moreover, it is thought that both India and China may want to have their own independent systems, further increasing demands on the band. This will be a particular problem in Europe where many of the wind profilers rely on this band. One possible solution is to shift wind profilers to the 915 MHz band, as used by the MO instrument currently in operation on the Isle of Man. Although this band is primarily used for mobile phone services, the MO have permission to use it since their instrument is more than a quarter of a mile from the nearest road. There have been no reports of problems for either the wind profiler or mobile phone users under this arrangement.

ACTION ITEM 35.3.1: DAH and SJP to introduce a frequently-updated weblog to report changes in instrument status.

ONGOING

SJP reported that he had already made a prototype system, but that he hoped to back-populate it with information from ZAKO’s log books before making it live. The person charged with working through the books, and inputting the information into the system, had made little progress so far. LK enquired as to whether the books could not simply be scanned as PDF documents. However, SJP pointed out that this would not allow the possibility of conducting electronic searches of the database, which will eventually be linked to the data files themselves. GV suggested that SJP should not wait for the historical information but should implement the system as soon as possible for on-going information. SJP pointed out that the log books are very comprehensive and record everything from grass cutting, through changes to the radar observation format and work carried out on hardware, to the threat of lightning strikes. TO pointed out that access to the times and reasons for the radar being out of action would be very useful for the MO.

ACTION ITEM 35.3.2: DAH, SJP and ZAKO to investigate the potential cost of replacement transmitters.

ONGOING

DAH reported that he had already received a quote from ATRAD for the replacement of 5 transmitters (in the range £200k - £400k depending on exact requirements) and that he was waiting for a reply from Genesis Software. LK recommended that a bid for £50k a year of capital investment over 5 years was more likely to be funded than a single bid for £250k. JN recommended that DAH also contact Vaisala. Their interest in the 50 MHz market had increased after seeing the success of the South Uist radar, which uses hardware manufactured by ATRAD. JN thought that they might now be building their own transmitters.
### ACTION ITEM 35.3.3: SJP and ZAKO to order a spare high-voltage transformer.

**ONGOING**

ZAKO reported that there were many firms capable of making such a unit. He was still hoping to find a direct replacement, in terms of size, since the unit he had been looking at was one inch bigger in each dimension, and so would not fit within the existing mounting. It was recommended that a spare be purchased since the cost was likely to be only £500.

### ACTION ITEM 35.4.1: SJP and ZAKO to arrange for disposal of junk items, for the renovation of the large shed, and for the installation of a car-port in place of the small shed.

**ONGOING**

This is reported on in Section 4.

### ACTION ITEM 35.8.1: SJP to arrange for the installation of a sky-pointing camera at Capel Dewi.

**ONGOING**

This is reported on in Section 5.

### 3. Site operations report - ZAKO

NERC carried out an electrical survey of the site bungalow on 15th December 2004. Recommendations for changes included replacing the existing storage heaters with gas or oil on-demand units, and possibly even recycling heat from the transmitters. The MO’s GPS water vapour receiver PC was rebooted on 17th December and again on 29th December. A fault caused the site alarm to go off at 07 UT on 24th December. Dyfed alarms changed a sensor in the lounge area.

A non-locking transmitter went down during the night of 3rd/4th January 2005. This was fixed by 09 UT on 4th January. The timber next to the smaller of the two site sheds was collected for disposal on 6th and 11th January. The new Anritsu cable testing unit arrived at the site on 12th January. TX1, the locking transmitter, failed at around 1200 UT on Friday 14th January. The problem was not spotted until the following evening (Saturday 15th). All transmitters were locked and working again by 1930 UT on 15th. A problem with the radar control PC caused observations to stop at around 08 UT on 22nd January (a Saturday). The problem was spotted by DAH first thing on the following Monday morning and normal operations resumed at around 10 UT. Some work was carried out in the field on 26th January. This did not require the radar to be shut down. A control cable to relay unit 21 developed a short circuit at around 0730 UT on 27th January. This caused the radar to malfunction until the cable was by-passed at around 0945 UT.

TX2 was repaired on 15th February. It had been out of action since 7th February, when Dave Wareing received a burn from it whilst ZAKO was on leave. The PC controlling the MO’s GPS water vapour receiver also required reboot. DAH and ZAKO attempted to remove worm infections from the Logger PC on 16th February. It appears that these infections were preventing the Sophos anti-virus software from updating. However, the infections proved hard to remove and so further action was delayed until the PC could be returned to RAL for a more thorough investigation. Katie Abbott, from NERC, visited the site on 22nd February in order to carry out a site survey. Field work was carried out on 23rd and 24th February. This did not require the radar to be powered down. UofWA fire officer visited the site on 28th February in order to carry out checks on the fire extinguishers. No problems were found.
One of the non-locking transmitters was out of action between 11:45 and 12:45 UT on 1st March to allow work be carried out on it. Work on the relays was carried out on 2nd and 3rd March. This did not require any down time. The extractor fan seized on one of the transmitters at 08:50 UT on 4th March. It was switched off between 10:45 and 11:45 UT to allow a replacement be fitted. The MST radar was down 12:45 - 18:15 UT on 9th March, and 13:00 - 15:45 UT on 10th March to allow work to be carried out on the field relays. The surface met data logging unit, tipping bucket rain gauge and (faulty) humidity sensor were sent back to Campbell Scientific for recalibration and repairs on 11th March. The fact that the pressure sensor could not be found gave the first indication that it may have been stolen. At first it was thought that it had simply developed a fault. The MST radar was down 11:30 - 15:30 on 14th March to allow the replacement of some relays. The RAL cloud radar arrived at the MST site, direct from its recent field campaign in Mauritius, on 16th March. The MST radar was down for two brief periods, around 11:30 UT and around 15:30 UT, on 17th March to allow work to be carried out on the relays. There were a number of mains fluctuations during 18th March which caused problems for the MST radar: at around 09 UT, between 12:30 and 14:30 UT, and at around 15:20 UT. The radar was shut down again, just after 16 UT, to allow repairs be carried out in the field. One of the MST radar transmitters went down at around 08:30 UT on 31st March, but was repaired by 09:15 UT. The surface met data logger, and sensors, arrived back from Campbell Scientific.

The data logger and met sensors (apart from the replacement pressure sensor) were reinstalled on 5th April. A new MST radar observation format was introduced on 6th April to allow a single vertical beam mesospheric observation to be made during each ST-mode cycle. At first an 8 µs pulse, with no pulse coding, was used. However, for some reason this caused the radar to operate in an unstable manner and so 2 µs coding was introduced on 7th. This solved the problem. DAH installed "Nero", the new WindowsXP data logging PC, on 13th April. The old PC was taken back to RAL for disinfection. The cut wires from the stolen original pressure sensor were discovered whilst DAH and ZAKO were replacing the new pressure sensor in the data logging box on 14th April. Peter Huggard and Tim Nightingale, from RAL, arrived on site on the afternoon of 14th April to set up the cloud radar. The instrument was in operation by the end of the day. The blower motor on one of the MST radar transmitters had disintegrated at some time on 16th April (a Saturday). This was discovered at 11:00 UT on 16th and the blower motor was replaced by 12:45 UT. The tipping bucket raingauge was cleaned out at 14:30 UT on 18th April. Mains interruptions caused the MST radar to stop working at around 14:00 UT on Friday 22nd April, whilst ZAKO was away on holiday. The problem was not spotted until first thing on Monday 25th April by DAH. Since the radar had come back up cleanly, DAH was able to restart data acquisition remotely at just after 08 UT.

On 4th May ZAKO returned from holiday and by 08 UT the two MST radar transmitters which had been down since the 22nd April power disruptions were restarted. On 5th May ZAKO discovered that the new pressure sensor had been stolen. This was reported to the Police who came out immediately. Dave Wareing discovered a hole in the security fence (on the stretch running parallel to the road) on 9th May. The Police re-visited the site on 10th May. The grass was cut on 12th May. A mains disruption at around 12 UT on 20th May caused an exceptional amount of damage. Two of the transmitters were out of action and a chip blew on the antenna control board. The system was restored to working order and normal operations resumed at 19 UT. Failure of the UPS unit which powered the radar acquisition systems at around 00 UT on Sunday 22nd May caused the radar to be out of action until just after 08 UT on the following morning.

One of the MST radar transmitters (a non-locking one) went down overnight on 1st June and was restarted in the morning. The UFAM boundary-layer wind-profiler was taken from the MST site on 1st June to be used in the CSIP campaign. The mobile lidar was taken on 6th June. The cloud radar was switched off at around 12:30 UT on 8th June because the temperature of the antenna unit rose too high. It was switched back on around 16:45 UT. ZAKO carried out work in the field on 10th and 14th June. There was no need to power down the MST radar. PC Pat Jalloal, a Community Safety Officer
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from Dyfed-Powys Police, visited the site on 16th June. He gave recommendations on how to improve site security. The cloud radar was stopped on 17th June and moved from where it had been in operation (immediately to the north of the bungalow). This was to allow the ground to be excavated for the new instrument platform. A digger was on site on Saturday 18th. It also excavated the ground where one of the old sheds had been. This area will have a car port built on it. A failure of a UPS unit at around 19 UT on Sunday 19th June caused MST radar data to stop being acquired. The problem was fixed at around 08 UT the following morning. ZAKO carried out work on the MST antennas on 23rd June. This did not require the radar to be powered down. The MST radar was shut down at around 17:15 UT on 28th June because of thunderstorms in the area. The thunderstorms caused extensive damage to equipment at the UofWA. The radar was switched back on at 07:30 UT the following morning.

The concrete for the new instrument platform was poured and levelled on 1st July. The concreting for the car port will be done at a later date. The cloud radar was placed on the new instrument platform and restarted around 15:45 UT on 4th July. The grass was cut on 5th July. The MST radar was stopped between 09:00 and 10:15 UT on 8th July to allow ZAKO to carry out work on the relays. Weed spraying was carried out on 9th July. The cloud radar was shut down at 11 UT because the temperature of the antenna unit was rising too high. It was switched back on on 15th July.

TO asked whether it was possible to supply a summary (on a quarterly basis) of MST radar down-time so that the principal causes could be appreciated more readily. SJP reported that this had been done for the first time in the 2004-2005 annual report to NERC. GV pointed out that JN and TO had previously used changes in performance statistics to predict failure of components in unattended MO instruments. ZAKO felt that there had been no significant changes to the MST radar transmitter performance in recent years. Although blower motor failure has been a principal contributor to down-time, ZAKO said that he now had sufficient spares. JN, noting the number of mains problems at Capel Dewi, reported that the backup generator at the South Uist site had proved useful during the storms of January 2005. He recommended UPS units as a way of filtering spurious mains supplies.

**ACTION ITEM 36.3.1:** SJP and DAH to introduce the supply of MST radar down time summaries to the Met Office on a quarterly basis.

LK noted the fact that ZAKO had often carried out repairs in the evenings and at weekends and commended him on his dedication to keeping the radar running. GV, noting the amount of damage which lightning can cause, also commended ZAKO for protecting the MST radar by shutting it down on the night of 28th June.

### 4. Facility report - SJP

**a) Site security.** The surface pressure sensor has been stolen twice from just within the radar site gate - the first time in January 2005 and the second time in April. Although the local police had shown some interest when they thought that the sensor could be used as a detonator (in a terrorist attack), they have since concluded their investigations. Ben Herman, the NERC security adviser, has provided some very useful advice, including the suggestion that vulnerable instruments are gathered together in a secure area. This is underway. A new fenced-in instrument platform has been built adjacent to the site bungalow. Security cameras will also be installed, with one directed at the secure area, and a panic alarm will be installed in the lidar hut (there is already one inside the site bungalow). There are no plans to replace the pressure sensor in the near future.

**b) Site internet upgrade.** Although this action is now a long way behind schedule (it should have been completed in September 2004), SJP reported that a Service Level Agreement is finally being put together. The work is being undertaken by the NERC networking group in conjunction with the UofWA. SJP assured TO and JN that MO-related activities do not qualify as commercial work, for which JANET connections should not be used. He pointed out that most universities were involved with contracts which were far more explicitly commercial than the work undertaken by the MO. LK said that he would
speak to the NERC networking group to see if they could speed up the upgrade. GV requested that the new link should not be behind the UofWA firewall, since this caused a problem for remotely connecting to computers using VNC software.

c) **The RAL 78 GHz FMCW radar.** This (pre-prototype) instrument has been in operation at the MST radar site since April 2005. However, it looks as though it may return to RAL as early as September 2005. It will be needed as a test unit for the development of a prototype instrument, funded by the MO. JN reported that although he, and others, had been impressed by the capabilities of the existing instrument, he needed something more reliable for further evaluation. A prototype instrument is likely to cost the order of £100k, but subsequent models are likely to cost closer to £50k. He reported that it had proved itself capable of detecting fog and that the Swiss met service, amongst others, were interested in acquiring a unit. He suggested that the MST radar facility might also like to think of purchasing one.

d) **Site sheds.** The smaller of the two sheds, which was not up to Health and Safety standards, and the piles of wood which used to surround it have now been removed. The ground has been dug out in preparation for installing a car port. The larger of the two sheds is due for renovation. The basic structure is still sound and the roof is relatively new, so the windows will be fixed/replaced before work starts on improving the interior. SJP requested ZAKO to obtain a quote for this work from the builders who are carrying out building the new instrument platform and car port base. LK suggested that this work be co-ordinated with the work that NERC has already agreed to undertake - though this is unlikely to go ahead for over a year. GV requested that work on the large shed be carried out in consultation with UofM, since the shed was used for the storage of UFAM equipment.

| ACTION ITEM 36.4.1: ZAKO to obtain a quote for renovating the large site shed. |

5. **NERC funded upgrades - SJP**

a) **Replacement of the MST radar control and data acquisition system.** Work on the first phase (to replace the WindowsNT system with a Linux-based one) is underway and due for completion in mid-September. The second phase (to recreate the functionality of the pre-processing unit in software) is due for completion by December 2005.

b) **Laser ceilometer.** Delivery of the LD-40 was due for February 2005 but was delayed until May owing to shortage of the laser units. The instrument has not yet begun measurements as the new concrete platform, onto which it needs to be bolted, has only just been built. SJP commented that some software effort will be required before the instrument is functional and so a further delay is to be expected. SJP also confirmed, for GV, that this instrument is capable of providing backscatter profiles in addition to the cloud altitude. JN commented that the instrument had a good reputation.

b) **Sky pointing camera.** Initial investigations suggested that an Axis 211 network camera, as used at the Chilbolton site, would be a suitable model. The manufacturers had been asked to check whether it could see night-time clouds using its infra-red capability. However, it could not. Ideally the same type of cameras would be used for both sky-pointing and security. TO asked whether SJP had spoken to someone at the MO to find out what they used for sky monitoring. He recommended contacting Mike Molynieux, JN’s equivalent for surface measurements. The skycams might also serve as security cameras, since they can be programmed to observe in set sequence of directions.

c) **Cable test equipment.** The Anritsu Site-Master was delivered in January and has proved useful for testing both MST radar hardware and UFAM equipment.

HAC asked whether the pressure sensor was ever likely to be replaced. HR suggested that it could perhaps be hidden within the site bungalow. SJP responded that another option is to bury it. However, pressure is the least scientifically critical of the measurements made at site and representative values can
easily be obtained from other sources. There are certainly no plans to replace it before all new security
measures have been implemented. JN commented that the only problems they had had, at one of their
sites, was with the crystal-ball shaped sunshine recorders disappearing when travellers were camped
nearby. DAH thanked ZAKO for pursuing the the arrangements for the construction of the new instru-
ment platform so actively. GV pointed out that ZAKO had not only arranged everything, he’d also laid
the concrete because the builders had failed to arrive in a timely fashion after its delivery.

6. Data processing/management - DAH
a) Reclassification of the Ken Slater format files. The original Ken Slater format files (which were
stored in directories named `power`, `radial`, `rw`, `vector`, and `vw`) are now referred to as “Version-0”
products and they have been shifted to directory:
/badc/mst/data/mst-products-v0
on the BADC. The (Cartesian and radial) data produced from DAH’s original signal processing scheme
are referred to as “version-1” data products and they are stored in directory:
/badc/mst/data/mst-products-v1.
Data produced from a slightly improved scheme, which includes complementary beam reliability flag-
ging, are referred to as “version-2” products and they are stored in directory:
/badc/mst/data/mst-products-v2.

b) Reprocessing of entire MST radar archive. The entire data archive was reprocessed between
December 2004 and March 2005 to produce full sets of both version-0 (without time-averaging) and
version-2 data products. Some version-1 data products already existed, but since they are almost iden-
tical to the version-2 products (only without the complementary beam reliability flagging), a complete
set was not produced.

c) Multi-signal-component processing (formerly referred to as multi-peak processing). Some slight
improvements have been made to the scheme presented at the last Experimenters’ meeting. DAH is
in the process of creating operational software to produce what will be referred to as version-3 data
products. JN asked about the expected time scale for completion, since he would need to appropriately
manage staff effort at the MO for testing the new data stream. DAH estimated late August. TO sug-
gested that Myles Turp, at the MO, would probably be able to supply DAH with a program for BUFR
encoding the data. Alternatively DAH could supply ASCII files which could be converted at the MO.

HAC commented that the signal powers produced from DAH’s processing were more variable, as a
function of time, than those produced from Ken Slater’s processing. DAH pointed out that Ken Slater’s
scheme used non-standard product definitions and so it was not obvious to what exactly the powers re-
ferred. He also suggested that such variations could be real, citing RMW’s observations of small scale
inhomogeneities when using the MU radar in volume-scanning mode. GV nevertheless requested DAH
to carry out a systematic comparison between the data products from the two schemes using a large
amount of data. TO pointed out that the MO would be carrying out their own verification (of wind prod-
ucts) against model data and that they intended to monitor the old and the new data streams in parallel
for several months. JN commented that convection and mountain waves were two principal causes of
wind contamination. The South Uist system appeared to be less prone to the mountain wave problem,
probably because it used 12° off-vertical beams, as opposed to 6° for the Aberystwyth radar. He added
that early MO tests at Aberystwyth had shown that the random error associated with 12° beams was
lower than that associated with 6° beams. This was despite the fact that, as GV pointed out, the hori-
zontal separation between the beams was larger at larger zenith angles. Although at present the MO do
not assimilate fine-scale detail, i.e. at intervals of less than 3 hours, it is likely that they will begin to do
so within the next 5 years.
ACTION ITEM 36.6.1: DAH to carry out a systematic comparison between version-0 and version-3 data products.

7. Science/instrument presentations

a) Statistics of inertia-gravity waves (IGWs) - RMW
The IGW parameters have been derived by ellipse-fitting to the hodographs of filtered winds. The probability of non-zero activity, at any height, is approximately 80% throughout the year. Although there is a slight reduction in this value during the mid-summer months, this is not thought to be significant. The probabilities of wave activity being present and of spectral widths being greater than 1 m s\(^{-1}\) are much larger in the heights immediately above the tropopause than in the heights below it. Although the wave activity has been compared with a large number of parameters, e.g. ageostrophic wind speed, there are no obvious correlations with anything else. This work is in the process of being written up.

b) Turbulence structure function parameters retrieved in the presence of ducting from the VHF and UHF wind profilers at Aberystwyth - NS
Negative vertical gradients of modified refractivity (typically associated with increases in temperature and/or decreases in humidity) can cause radio wave propagation to be confined within a duct. The objective of this work is to establish whether the presence of ducting conditions can be inferred from UHF and VHF radar return powers. Comparisons have been made with Aberporth radiosonde data for the summers of 2000 and 2001. Values of the turbulence structure function constant for refractivity, \(C^2_N\), have been derived from radar signal strengths. Enhanced values, for the VHF observations, have typically been found slightly below the level of negative modified refractivity gradient, whereas they are enhanced slightly below as well as at this level for the UHF observations. Owing to the different sensitivities of the two radars to hydrometeor scattering, the \(C^2_N\) values tend to show large differences under precipitation conditions. GV confirmed that sondes had been launched from Aberystwyth during May and June 2000 - the time of the Egrett campaign. He also drew attention to the fact that some differences might be expected between the variations of signal power for the two radars, since refractive index irregularities at the VHF half wavelength are thought to persist for longer than those at the UHF half wavelength.

c) Review of South Uist wind profiler system since handover to operations - JN
The radar suffered only minor damage from the storm which hit South Uist on 11th January 2005. The strong low-level winds did not appear to have descended and so JN did not think that they could be attributed to a sting jet. The radar interlaces low- and high-mode observations. The quality of the low-mode data (150 m range resolution) is very high and the profiles are able to adequately capture small scale features. However, the RMS error of the winds increases sharply above 8 km and the high-mode range resolution (500 m) is too coarse to capture sufficient details. Particularly if there is a large wind-shear, this can lead to problems when merging the data from the two modes. JN considered the quality of the Aberystwyth data to be much better at the higher altitudes. Although the radar is often able to meet the target of 90% data availability to 12 km, it fails to do so in some months. Most of the errors can be attributed to just two or three days in the month. The problems are not always associated with low signal strength but can be caused by interference or ground clutter. Under such conditions, the problems are often only experienced by one of the four beams. The errors can also have a geophysical origin. Very strong winds (> 90 m s\(^{-1}\)) can cause the signals to fill the entire width of the spectra and velocity aliasing occurs. GV commented that the Degreanne system can automatically increase the Nyquist velocity under such conditions. The signal processing can also have problems locking on to the appropriate signal component at the melting layer (often around 2 km). Future challenges include enhancing remote monitoring (the site is only visited once a year) and introducing improved software to increase the availability of upper air data and to refine the multi-peak selection criteria.
The 915 MHz wind-profiler, which was moved from South Uist to the Isle of Man, has not yet been handed over to operations. Its performance was very poor when it was first moved, but this improved considerably once TO was advised to remove a metal plate from the bottom of the instrument. The Camborne profiler is being upgraded with plans for the Dunkeswell and Wattisham profilers to follow. The MO’s autosonde stations are scheduled to be in operation for approximately the next eight years. The plan is to eventually replace them with wind-profilers and radiometers (for measuring temperature). Ground-based temperature measurements only need to made up to an altitude of 3 km, since satellite measurements are considered to good enough for higher altitudes. For the Convective Storm Initiation Project (CSIP), a radiometer is being used to measure the coarse temperature structure. Fine-scale structures are being inferred from the UHF radar returns.

d) First intercomparison between MST radar and cloud radar observations - DAH

Although the cloud radar has been in operation at the MST Radar site since 14th April 2005, the data have not yet been made available through the BADC. However, the Millimetre Wave Technology (MMT) group at RAL have now confirmed that they are happy for the data to be made available to users registered for access to the MST radar dataset. Nevertheless, they are looking for commercial customers for an improved prototype instrument, which they hope to begin building soon. They are consequently reluctant to have the limitations of the existing pre-prototype instrument publicised on the MST website. Those interested in the data should therefore contact DAH for any further details.

A thin layer of radar returns from an altitude of around 8 km, and which had originally been interpreted as representing a layer of cirrus just beneath the tropopause, is now thought to be caused by an instrument problem. It disappears during the middle part of the day and similar patterns of occurrence have been seen on a number of days. JN commented that this problem had not been seen when the radar was operated on a field campaign in Mauritius, immediately prior to coming to Aberystwyth. A more well known problem is caused by heavy precipitation. This can cause high radar return power to be seen across a very broad range of heights or to be manifest in a number of bands at discrete heights. Nevertheless, it is sometimes possible to discern convincing structures within contaminated regions. A clear example can be seen on 28th April, when a “W” shaped region of strong cloud radar return power corresponds to a similarly shaped region of reduced MST radar return power. The latter is consistent with there being precipitation within this region. On 15th May, a thin layer of cloud radar returns is capped by a layer of MST radar return power. The latter is consistent with a strong negative vertical gradient of humidity. DAH warned that the instrument produces a very large amount of data - for 512 range gates at intervals of 30 s or less - and that attempts to read in all data for a single day sometimes caused Matlab to have memory problems. He recommended reading in only every second or third profile if this occurred.

e) The reintroduction of mesospheric observations - DAH

M-mode observations, covering the altitude range 56 - 94 km, were reintroduced on 6th April 2005 - for the first time since 1999. In the early years of the radar (notably from 1993 - 1995) attention was focused on the period around mid-summer (late May to early August) when the radar returns from discrete mesospheric layers (from the altitude range 80 - 90 km) are anomalously strong and commonly occurring. Such radar returns are known to be associated with the extremely cold temperatures (< 140 K) around the high-latitude summer mesopause level (85 km), which also give rise to noctilucent cloud (NLC) formation. The summer returns observed at Aberystwyth are similar in nature to the Polar Mesosphere Summer Echoes (PMSEs) observed at higher latitudes. Outside of this mid-summer period, mesospheric radar returns are much weaker, of thinner vertical extent, more sporadically occurring, and from lower altitudes (60 - 80 km). They have been almost entirely overlooked at Aberystwyth.

Mesospheric observations have never been made in a systematic way at Aberystwyth, except during the summers of 1993 - 1995 when they were made on an almost daily basis. However, even then observations were only made for only a few hours each day around noon, since echoes were not expected outside of this period. Continuous 24 hour observations have only been made on a few occasions during...
August 1990 and January 1994. The new measurements (a single vertical beam observation interlaced with the standard ST-mode observations) will be made continuously. Consequently, for the first time it will become possible to build up a full picture of the patterns of occurrence of mesospheric echoes. Already it has been found that not only can mesospheric echoes occur outside of the midday hours, but weak echoes have occasionally been seen outside of daylight hours (refractive index structures at these altitudes are caused by variations in the density of free electrons, which are produced by the photo-electric effect). Also it was previously thought that mid-summer and non-summer echoes were entirely separate phenomena. However, a couple of instances have been found for which the nature of an echo layer changes from summer-like to non-summer as the layer descends from the typical summer altitudes (80 - 90 km) to non-summer altitudes (60 - 80 km).

f) First results from CSIP 2005 - GV
The principal area of interest in CSIP from the UofM point of view concerns the influence upper-level PV anomalies on the development of convection. DAH’s quick-look MST radar plots on the BADC have been found to be very useful for getting a first order impression of conditions. A number of Intensive Observation Periods (IOPs) have now been called. 15th June showed clear convective activity prior to the tropopause descending and becoming less well defined. 19th June also shows some convection but it is much less active (this was the day when the radar was turned off for fear of lightning strikes). 24th June shows a clear precipitation signature and some convective activity. The lower stratospheric winds, on 4th July, flip by 180° in association with a streamer passing over. The tropopause is poorly defined and there is evidence of low-level convection. Although the vertical velocity activity seen on 7th July is associated with mountain waves, there is evidence of a tropopause fold associated with a streamer. An IOP was called on 13th July because of sea breezes coming in from the south coast. However, the Aberystwyth data show very quiet conditions around the tropopause.

g) An introduction to other research projects
For the benefit of KA from NERC, who has recently taken over responsibility for the MST Radar Facility, the other attendees of the meeting who had not given a science presentation were asked to give a brief introduction to their areas of interest.

IA, a lecturer from the UofB, has made use of MST radar in the past, but not for many years. He is interested in resuming work on mesospheric data. His principal areas of interest are to compare the descent rates of summer echo layers with the tidal winds derived from meteor radar, to investigate the multi-layered structure of the summer echo layers, and to begin work on non-summer echo layers. IAG, also a lecturer from the UofB, is a telecommunications engineer with a background in (satellite and mobile phone) microwave propagation. He is interested in the possibility of using radar data to detect anomalous propagation conditions. EGN is the UofM UFAM scientist. She is responsible for taking the mobile boundary-layer wind-profiler and lidar on field campaigns. AR has just started a post-doc position at the UofM and will be looking at data from the CSIP campaign. GAP is a third year PhD student at the UofM. He is investigating sting-jets - strong winds from the 2 - 4 km altitude region which can descend to the surface where they cause considerable damage. Such events can be observed because of the high time-resolution of the MST radar but are typically too short-lived to be caught by standard radiosonde ascents. HR, another PhD student at the UofM, is working with the ozone profiler. HAC, a PhD student based at the UofWA, is working on the interpretation of MST radar reflectivity. She is also working with the water vapour lidar at Aberystwyth. TO works at the MO and is involved in integrating data from all the wind-profilers operating within Europe. He commented that the Aberystwyth radar is seen as being a key UK observing system, and that the data are also used by the French and German met services. He suggested that he should talk more about quality control issues at the next meeting.

8. Any Other Business
LK commented on how impressed he was by the Facility’s real time support for programmes, such as CSIP, and by the fact that it was continuing to make new observations which were leading to new
science. He reported on the fact that NERC had had a poor spending review and that he was responsible for making savings of 5% within the Services and Facilities budget by 2008/2009. There are currently 26 facilities in the portfolio, covered by 32 contracts. Although the MST Radar Facility was not being targeted specifically, he warned that all Facilities were potentially under threat. The terms of reference for a review group are in place (it will consider each Facility’s contribution to NERC science priorities and the consequences of closing it), though the composition of the group remains to be decided. Each Facility will have the opportunity to provide input to the review. LK stated that his opinion of the MST Radar Facility had risen as a result of him attending this meeting, though ultimately he would not be the one to make the decision about its future. GV thanked LK for taking the time to attend the meeting.

DAH raised the issue of whether the minutes of previous meetings should be made publicly available, in line with the Freedom of Information Act. The consensus was that since the minutes had not been written with public access in mind, and since the minutes gave details of scientific work in progress, which should be kept confidential until those concerned had had the opportunity to write up their work, that they should not be freely available. Nevertheless, given that the minutes contained useful historical information relating to the Facility, which was not available elsewhere, it was agreed that they should be made available to those who are registered for access to the data.

GV will be away in Australia on a field campaign from November 2005 until February 2006. It was therefore agreed that the next Experimenters’ meeting should be scheduled for March 2006.