The GEMstone

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NOTES FROM THE NSF PROGRAM DIRECTOR

The transition from the old GEM campaign structure to the new Focus Group structure is now essentially complete, and from my viewpoint at least, the transition has been relatively painless. The GEM mini-workshop that preceded the Fall AGU meeting was well attended and we heard five proposals for new Focus Groups. The GEM steering committee met following the mini-workshop and gave the proposals a very thorough discussion, with the result that two new FGs will be added, both of them related to THEMIS activities (I presume there will be more information on the two new FGs elsewhere in this issue of the GEMstone). Some people have wondered why an NSF created program like GEM would be interested in pursuing THEMIS related science, but the fact is that at NSF we are driven by science and not by missions. So we are perfectly happy to fund research that uses data provided by NASA missions, as long as it fits into the goals of GEM. Of course, I very much hope that the GEM research will also make use of NSF funded facilities such as the incoherent scatter radars (especially PFISR), SuperDARN (my own pet project) and the many NSF supported ground-based magnetometers. And I hope the community will remember that NSF supports a wide range of space science related instrumentation in the Antarctic that will allow us to compare observations in both hemispheres.

The GEM mini-workshop that just passed also marked another transition for us – the change in the organization and operation of the GEM workshops. I'm sure I speak for all of us who have participated in GEM in the past several years in thanking Frank Toffoletto and Umbe Cantu for all the hard work they've put into making the GEM workshops so successful. We now look forward to having Bob Clauer running the show with the assistance of Scott Weimer. Frank will, of course, continue to participate in the GEM workshops and we don't have to quite say good-bye to Umbe because she's helping to organize the SHINE workshops. And, since SHINE and GEM are meeting jointly this summer we'll still have Umbe's enthusiastic help in making the meeting run smoothly.

Having brought up the fact that GEM and SHINE are meeting together at the Zermatt resort in Utah this summer, I'd like to remind everyone that the CEDAR meeting will also be at Zermatt and will run from Tuesday to Saturday the week before the GEM/SHINE meeting. This will give everyone

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GEM Homepage URL

http://www-ssc.igpp.ucla.edu/gem/

the rare chance to see what's going on in the entire space physics domain, from the sun to the magnetosphere to the ionosphere, thermosphere, and mesosphere.

We are also planning a small workshop for the Sunday prior to the formal GEM/SHINE meeting to discuss community space weather models. As most of you know, NSF has been funding the Center for Integrated Space weather Modeling (CISM). The funding for this Science and Technology Center will end in 2011 and we need to think about what follow-on activities are needed when the dedicated CISM funding comes to an end. The lower atmosphere community has put a great deal of effort into creating community models, such as the Weather Research Forecast (WRF) model and the Community Climate System Model (CCSM). Should NSF be looking toward the development of community space weather models? If so, how should these activities be organized? Where would the models reside and who would be responsible for maintaining them? These are some of the issues that will be discussed at the Sunday workshop.

Now for the grim news. As I write this, the budget situation at NSF is still unknown. Rumors (and all they are is rumors at the moment) suggest that NSF will receive no increase in funding this year. When we take inflation into account that means an effective cut in funding that will necessarily affect all NSF programs. It will certainly mean that the success rate for GEM and space weather proposals for this fiscal year will be low. I hope that the situation will be better than that, but at the moment I have to plan on a very lean fiscal year. But no matter whether the funding is lean and mean or fat and happy, GEM is alive and will survive and I look forward to a very productive year with exciting new results.

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Notes from the Chair

By design, GEM has always been a program in transition. During the past year, however, GEM has been a bit more transitional than usual. The old structure of (more or less) time limited campaigns with working groups has been replaced by standing research areas with focus groups that renew periodically. Thus, GEM has become more similar to its siblings CEDAR and SHINE, while keeping a distinct structure. The main purpose for this renewal is to make GEM more flexible and to avoid having to terminate campaigns that were working well. The 2007 summer workshop put the new structure to its first test, and while only the future will tell how effective it is, at least it was not a disaster. A few of the old working groups terminated, a few others continued as Focus Groups, and 3 new Focus Groups got started. In fact, the structure of the workshop changed very little, with the usual mix of plenary and breakout sessions, and the change of location was probably more noticeable.

Since the 2007 summer workshop another transition has occurred. Bob Clauer has taken over from Frank Toffoletto and Umbe Cantu as the GEM organizer. In the name of the Steering Committee I would like to thank Frank and Umbe for their many years of selfless service (nobody seems to remember when they started, which is testament to their organization skills, because mistakes are usually remembered.) Bob has some big shoes to fill, but I hear he is already starting well.

The last meeting place, the Zermatt resort in Midway/UT was probably not everyone's cup of tea. Unfortunately, Snowmass and some other places the SC looked at were not feasible alternatives for a variety of reasons. Even so, in 2008 we will return to Midway, and this time we will meet jointly with SHINE. A small committee has been formed, chaired by Joe Borovsky, to identify the overlap between SHINE and GEM and to organize the joint sessions. Based on the experience from the last joint meeting we expect that roughly half of the plenary and breakout sessions will be held jointly, while the other half will be separate sessions. CEDAR will also meet at Zermatt, in the week prior to us (The place can't be all that bad!). This opens up the opportunity to have yet another joint meeting, between all 3 programs, which shall not be passed up. Thus, on Sunday, June 22, 2008, between CEDAR and GEM/SHINE, we will have a one day meeting on "Community Modeling", which is now being organized by a committee chaired by Terry Onsager.

As I am writing this, in the week before the Fall AGU meeting, the GEM Steering Committee has not yet decided on new Focus Groups. However, 5 proposals for new Focus Groups are in and will be considered at the upcoming SC meeting. Surely, some of them will be selected and those new Focus Groups will start their work at the 2008 summer workshop. We are thus looking forward to see a lot of "fresh blood" at the next summer workshop. That, and together with our SHINE, and probably also some CEDAR colleagues present, promises to make it one of the best summer workshops in a long time. Of course, organizing such an endeavor takes a lot of work, and would like to thank in advance already all those put in a lot of hours, phone calls, and e-mails to make this workshop happen.

See you all in Midway

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Since I wrote this column the steering committee has met and selected three proposals for new focus groups from the five that had been submitted. First, the FG proposal "Plasmaspheric Plumes" submitted by Jerry Goldstein was selected. This FG will study the circulation of plasmaspeheric material in the magnetosphere and its effects on magnetospheric dynamics. Second, the proposal "Expansion Onset: The First 10 Minutes", submitted by Angelopoulos, Ohtani, and Shiokawa was selected, and this FG will tackle the decade-old substorm problem from new perspectives, namely the THEMIS data that will become available over next few years and improved global models that include ionosphere and inner magnetopsphere responses. Finally, the FG "Modes of Solar Wind - Magnetosphere Energy Transfer", submitted by McPherron and Kepko was selected to study the relation between different response modes of geomagnetic activity such as pseudo-breakups, substorms, steady magnetospheric convection, sawtooth events, and storms. The latter two new FGs will engage a good part of the THEMIS community in GEM activities. There is good reason to expect that the combination of the new and unprecedented THEMIS data, GEM modeling expertise, and other NSF sponsored data, such as radars, new discoveries are inevitable, and maybe, just maybe, some decade-old problems will be solved.

I am looking forward to seeing you all in Midway this summer -- Jimmy Raeder

Next GEM Workshop
June 22-27, 2008
Zermatt Resort, Midway, UT

GEM can provide support for a limited number of graduate students to attend the workshop. To apply for support, visit the Website for application instructions.

Tutorial Talks

It is traditional to collect the tutorial presentations from the GEM tutorial speakers and make them available on the web. This year is no exception and you may access these presentations (generally in power point or pdf files) at

http://www-ssc.igpp.ucla.edu/gem/tutorial/index.html .

Tutorials from previous years are also available at this site.

2007 FOCUS GROUP REPORTS

The GEM GGCM Research Area

In our first year under the new structure of the GEM community the GEM MICMAC is now a research area under the direction of Dr. M. Wiltberger and Dr. S. Sazykin. Our research area is composed of two Focus Groups (FG). The Metrics and Validation FG is lead by Drs. A. Ridley and M. Kuznetsova and concentrates on the implementation of ways to assess and verify the accuracy of GGCM products. The Modules and Methods FG is lead by Drs. J Dorelli and M. Shay and focuses on the development of new physics models for inclusion in GGCMs.

1. GGCM Metrics and Validation Focus Group

The Metrics and Validation group lead by Drs. A. Ridley and Kuznetsova held a session on Monday afternoon during the GEM summer workshop which focused on an open discussion of metrics used to asses the capabilities of models by a series of skill scores. This session also included a discussion of how to deal with assessing the accuracy of patterns.

Dr. Spence began the session with a report of the validation group within the CISM program. The validation group operates independently from the model developers, although interaction with the modeling team is maintained to insure proper operation of the models is guaranteed. CISM has identified a series of operational and scientific metrics for numerous regions throughout the coupled space weather environment. These metrics provide a baseline method to track the progress and development of models over time. They provide a single number and do not tell everything about the model. As part of this process they have identified a two month interval of time that is used as initial baseline for computing these metrics within geospace. Discussion within the focus group highlighted the utility of identify periods which can be used by all the GGCM groups.

Dr. Weimer presented results from his work on developing models for polar cap convection patterns and field aligned current maps. He made it quite clear that using RMS error alone is dangerous since highly penalizes phase errors in signals like magnetometers. This point was also made in the presentation by Ms. Yu which presented results from using the SWMF framework in conjunction with a Biot-Savart integration algorithm to compute the normalized RMS error metric for 150 magnetometer stations during 7 different storm intervals. Discussion within the focus group concentrated on the need to develop tools for detail analysis of the models and their physical short comings in detail as well as quick methods for monitoring progress over time.

Results from the Inner Magnetosphere campaign challenge event where presented by Ms. Ilie from the University of Michigan. As part of their assessment of the numerous models that participated in this challenge, they computed RMS errors for the entire interval as well as several sub intervals of interest, e.g. SSC and recovery phase. This technique allowed them to examine the effectiveness of the models in each phase of the storms more directly. A key result from this session was that the assessment tool utilized depends heavily on the question being addressed, particularly when comparing patterns such as those presented in spectrograms. If boundaries are important, then comparing their locations with data and simulations should be done. If magnitude is the most important factor, then comparison between the peaks in the data and results should be compared. When morphology is important comparison of the location of the minima and maxima where computed. As a final assessment tool integrated measures over time intervals should be compared to assess the accuracy of the total content of parameters within the simulation.

2. GGCM – Modules and Methods Focus Group

On Monday morning of the GEM summer meeting the Modules and Methods held a session modeling magnetic reconnection in large systems. This session focused on three main questions; 1) How well is reconnection modeled in global scale simulations, 2) What happens in kinetic modeling when the system size becomes large, and 3) Ways to embed microscale physics in global scale models.

In addressing the first question the FG heard presentations from Dr. J. Browosky, Mr. J. Ouellette. Dr. Browosky presented results that used a modified version of the BATS-R-US model deployed at CCMC it develop a solar wind - magnetosphere coupling function. They modified the BATS-R-US model to have a fixed resistive layer near the magnetopause to insure a Petshceck like reconnection rate. They noticed the strong influence of local plasma density on the reconnection rate. Through the use of their simulation runs and the R-H relationships they derived a coupling function which has correlations with geomagnetic indices comparable to that of the recently reported results by Newell et al. Mr. Ouellete used results from the LFM simulation for a variety of different IMF directions to study the location of reconnection within the simulation. They developed a measure for determining the location of reconnection based upon comparing the difference in distance for two field lines near the site of reconnection. These results show a mixture of component and anti-parallel reconnection occurring at the magnetopause.

Several presentations were made to address the second question. Dr. Dorelli presented results on behalf of Dr. Karimabadi which showed results from PIC simulations conducted with open boundary conditions. These results showed that the length of the diffusion region scaled with system size become many ion inertial lengths for large systems therefore indicting a only a loose separation of scale sizes. They also showed the period of quasi steady reconnection is interrupted by the formation of secondary islands within the diffusion region. Dr. Shay presented results from his PIC simulations if periodic boundary conditions which showed that size of the diffusion region did not scale with system size and strong separation of scales. These simulations did show a large scale electron outflow region, but that did not control the rate of reconnection. A tantalizing comparison of these results was made with observations from the Cluster spacecraft. Dr. Joe Huba presented results from his Hall MHD simulations addressing the role of boundary conditions on the reconnection rate. With free boundary conditions simulations with differing initial current sheet sizes result in conditions with same reconnection rate and dissipation scale size. In cases with imposed boundary conditions, the internal dynamics do not change instead a

wall sheath region develops to match the internal conditions to the imposed BC near the edge of the computational domain.

Two presentations where made about effort beginning to be made addressing the embedding of microscale physics in global scale simulations. Dr. Ridley presented initial results from the SWMF with the Hall term enabled and applied the environment near titan. He also presented initial results of a two fluid model which was coupled to their polar wind module and had a dramatic effect on the location of the reconnection line. Dr. Winglee presented results from his model with Hall scale lengths under resolved, but still showing a quadrupole magnetic field structure along the day-side reconnection region.

3. Foreshock, bowshock, magnetosheath (2004-2009, N. Omidi, RA: Dayside)

No sessions convened this year.

4. Plasma Entry and Transport into and within the Magnetotail (PET) focus group 4 - Session Summary

Core topic*:* Is local or specific entropy a good discriminator of different plasma entry processes. How does entropy of newly capture plasma influence transport within the magnetotail. Specific questions addressed: (1) Solar wind entry mechanisms and their predictions on the plasma sheet entropy during northward IMF; (2) Transport path of the newly captured magnetosheath plasma in the plasma sheet? Influence on properties of the newly captured plasma such as momentum or entropy? (3) Observations of plasma properties such as entropy for the plasma entry and in the magnetotail? (4) Dawn-dusk asymmetries in the entropy and plasma properties - theoretical explanations? Influence on transport? (5) Observations consistent with single process or are multiple processes required? (6) (Global model) predictions for the local and specific entropy change for plasma entry?

Our focus group had a lively and constructive discussion with many presentations that provided new insight into the core questions raised for the workshop. Specific relevant contributions are summarized below:

Solar wind breakout session

Regarding the transport of colder and denser plasma in the plasma sheet, Joe Borovsky discussed the potential role of plasma sheet turbulence. While statistical properties are reasonably known (typical correlation length of 1.5 RE etc) the nature and cause of this turbulence as well as the variation across the tail is not well understood. An important issue regarding the transport is the diffusion coefficient where it is not clear whether the eddy or the Bohm diffusion coefficient represents the better approximation to turbulent transport. Inertial and kinetic effects may well be important.

The transport of electrons with several 10 keV at geosynchronous and near Earth plasma sheet locations were discussed by Xinlin Li. His results demonstrate that fluxes appear correlated with solar wind velocity but not with solar wind density. Local time aspects still need to be investigated. The transport and distribution of plasma was also addressed by Chi-Ping Wang. He presented new results on the plasma sitribution in the near tail with particular emphasis on the different dynamics of ions and electrons. He discussed specifically the difference in convection for ions and electron for fast and slow solar wind speed. Here fast solar wind leads to generally lower plasma densities in the near tail.

The role and change of entropy during plasma entry and convection was discussed by Jimmy Raeder. He presented results from global MHD simulations and an animation of the plasma entry into the tail for northward IMF. The results show a smooth variation of entropy (P/n^gamma) rather

than a sharp entropy boundary during the plasma entry. The cause for the entropy variation is not clear. Katariina Nykyri presented a case of Kelvin Helmholtz activity at the flank boundaries when the IMF was strongly draped over the magnetopshere. She illustrated that for this case modes with k vectors in the equatorial plane were stable thus demonstrating that the observed waves should have had k vectors inclined with the equatorial plane and the magnetosheath flow direction. Jay Johnson investigated entropy changes resulting from kinetic Alfven waves. Here the onset of stochasticity leads to diffusion for the waves. This specifically resulted in an increase of entropy for cold particle populations. He also discussed aspects of the process as they apply to the dawn and dusk magnetospheric flanks.

A new model for magnetospheric particle dynamics and particle entry was presented by Magaret Chen. Here the geomagnetic field as well as the flow around the magnetosphere is represented by analytic models. The strength of the model is that analytic models may provide better insight into causality for processes. First comparisons with numerical models (Spreiter) are promising. The model will be used to examine proton trajectories and entry of high energy particles. Particle entry and acceleration was also discussed by Vahe Peroomian who focussed on storm time particle entry and energization. Particularly interesting is that particle entry of these strongly accelerated particles appears far from the reconnection site and particle orbits are fairly exotic. Particle entry was quantified according to location (distance along the tail, dawn vs dusk entry).

Magnetotail transport breakout session

Global density, temperature, and pressure profiles for data sorted according to substorm phase were presented by Johnson/Wing. Pressure changed from a near earth peak for growth phase to a peak at premidnight with an azimuthal gradient. In the recovery period, cold, dense plasma populated the near earth plasma sheet at postmidnight. While local entropy was conserved, total entropy/flux incurred significant loss inwards of 20 earth radii. This result shows that there is significant loss of mass content from a flux volume that moves earthward. Such a result would be consistent with the loss of plasma in a plasmoid or the loss of plasma due to a transport process that moves the field and leaves the mass behind.

Joachim Birn showed MHD simulations of tail reconnection and plasma bubbles. Entropy and mass loss occurred due to the ejection of a plasmoid (with conservation of entropy on field lines following reconnection). Plasma bubble experiments showed that depleted entropy structures develop strong earthward velocities and vortex structures which are associated with field aligned current systems. The penetration of the bubbles is deeper for more entropy depletion. Finer scale simulations show that the bubbles may break up (ballooning instability) and may lead to entropy diffusion.

The method for inferring flux tube volume was applied to GEOTAIL data for a pseudobreakup and for a substorm was presented by Gary Erickson. In the example of a pseudobreakup, high speed earthward flows were observed to be associated with low PV^{γ}. In the example of a substorm there was a single burst which was associated with a drop in total entropy per flux. However, unlike the pseudobreakup, the entropy remained reduced even though the flow reduced after the burst.

LSK simulations in conjunction with IMAGE/HENA observations were discussed by Vahe Peroomian. The LSK model gives test particle distributions based on a solar wind source of hydrogen and an ionospheric source of oxygen. The ionospheric source is governed by Strangeway's correlation study between ion outflows and field aligned current which is obtained from the MHD simulation which

provides the background fields for advancing the test particles.

Chih-Ping Wang showed that GEOTAIL data for northward IMF and found that total ion pressures did not exhibit much dawn-dusk asymmetry, but that electron pressures had a significant dawn-dusk asymmetry. When separated into hot and cold components, the cold component exhibited a dawn-dusk asymmetry for both ions and electrons consistent with the remote observations of Wing [2005] and the in situ observations of Hasegawa.

Discussion of conserved quantities relevant to tail transport was led by Mike Schulz. Although adiabatic invariants μ and J may not be conserved, phase space volume should be conserved. Assuming pitch angle scattering of a quantity of plasma on a flux tube, it was shown in what sense PV^{γ} is conserved. It was suggested that perhaps it is more exact to consider energy ranges because of the average over phase space volume. In the case where the convection electric field dominates the adiabatic pressure law is reasonable, but when energy dependent drifts dominate that the integrity of the fluid element is compromised and it would be better to consider energy ranges that share the same drift paths individually.

Lessard/Kim presented a case of "Alfvenic" aurora. A substorm that occurred on June 12, 1997 was considered with multiple spacecraft and ground observations. It was suggested that a compressional wave is launched that mode converts to an Alfven wave which is associated with electron acceleration and is associated with the auroral brightening. It is a theoretical challenge to understand how a broadband compressional wave source could lead to a highly localized Alfven wave.

5. Dayside Research Area

Chairs: D. G. Sibeck and J. Dorelli

The Dayside Research Area held two sessions, one on the dayside magnetopause (J. Berchem) and the other on the cusp (K. Trattner). Nick Omidi gave the invited tutorial at the GEM 2007 Workshop in Zermatt, Utah.

The dayside magnetopause session on Monday afternoon covered a wide range of topics.

J. Berchem described test particle simulations in MHD magnetic fields indicating that a small percent of particles can become greatly energized (up to 60 keV) during encounters with the magnetopause. Particles pick up energy by scooting along the x-line, and/or deeper in the magnetosphere. There is also some evidence for acceleration along the magnetic field. Reconnection often follows the predictions of the antiparallel models, but enhanced resistivities move reconnection to the subsolar region.

K. Trattner continued his determinations of the location of the dayside reconnection line. The survey contains now 130 events. In each case he examines the ion dispersion features seen by TIMAS on Polar. In particular, 3-D cuts of the distribution functions can be used to map back to entry points along an x-line on the magnetopause. The results are compared with the predicted locations of reconnection on the magnetopause for component merging and the anti-parallel reconnection scenario. The locations for these two models can be obtained using the Cooling model for draped magnetosheath and magnetospheric magnetic fields together with the Sibeck model for magnetopause location. Both reconnection scenarios are observed at the magnetopause depending on the IMF clock angle. In case of nearly radial or strongly southward (within 20° of the -Z axis) IMF orientations, the reconnection line is located where the merging

fields are exactly anti-parallel. For all other IMF clock angles the reconnection line follows a tilted X-line across the dayside magnetopause along a region where the shear angle reaches a maximum. However, the region of maximum magnetic shear lies off the equator due to the dipole tilt. Two specific events where selected during the last December GEM meeting for further studies with MHD simulation codes.

M. Kuznetsova used the BATS-R-US model to simulate these two events. Results are posted on the CCMC website at:

CCMC_CCMC_060607_1:1996/06/03 05:00 – 6:30

and (same) 2:1997/11/06 14:00 – 15:30

M. Kuznetsova finds that By piles up near the reconnection site. Shear angles differ from those expected qualitatively. Researchers can use the information on WWW site to make 2-D slices, 3-D topology and field-line topology, line plots, and list the data from line plots.

J. Berchem ran an MHD simulation for the stable IMF observed during the June 3, 1996 case. He found antiparallel merging on the northern pre-noon and southern post-noon magnetopause. The model predicts the line of maximum shear in the vicinity of the locations where Trattner infers merging to occur.

J. Dorelli had finished a simulation for one of the Trattner events. He reviewed what 3-d reconnection looks like [Lau and Finn, Ap. J., 350, 672, 1990]. He found the nulls and showed that different reconnection signatures occur at different points along the x-line connecting the two nulls. He demonstrated the existence of strong JxB flows at high latitudes, but the strongest electric fields occurred in the subsolar region. He therefore concluded that reconnection proceeds at the subsolar point even during periods of very strongly northward IMF, although the results of this reconnection may not be very dynamically exciting. Trattner noted the absence of any cusp signatures indicating that this can happen.

D. Sibeck showed results from G. Korotova's survey of Interball FTEs. For southward IMF they are surely generated on the dayside equatorial magnetopause. On the high latitude magnetopause, she definitely sees events for both strongly antiparallel and parallel magnetic fields. The ones observed for antiparallel magnetosheath and magnetospheric magnetic fields may be locally generated. But they are often seen at high latitudes for southward IMF orientations, which do not favor local reconnection. Perhaps better models of magnetosheath magnetic field draping would help clear up the problem. Sibeck expressed an interest in working with researchers who want to look into high latitude Prognoz-7, Hawkeye, Cluster observations.

The results of the session left some observers concerned. Reconnection had been reported as off-equatorial for southward IMF orientations, and equatorial (subsolar) for northward IMF orientations, contrary to the picture held by many. Clearly there is a need for more work on this topic.

6. Cusp

The cusp session on Tuesday afternoon was divided into two breakout sessions. The 10 scheduled speakers and a very enthusiastic audience handed out a series of action items to each other, forged collaborations, and defined the next steps in the campaign.

The breakout session addressed the following subjects.

- Energetic ions in the cusp
- Waves in the cusp (diamagnetic cavities)
- Simulations of the cusp environment to study a possible particle acceleration mechanism.
- Flux transfer event (FTE) formation and

interaction with the cusp (Hybrid and MHD simulations)
- Large scale studies employing DMSP passes in the polar region
- Finding the cusp in ground magnetometer observations of ULF waves
- Combining satellite cusp observations with SuperDARN radar ionospheric convection patterns.

T. Fritz and J. Chen presented examples of ISEE-1/2, Polar, and Cluster cusp crossings, demonstrated the appearance of energetic ions and electrons within diamagnetic cavities, and interpreted these observations as further evidence for local acceleration.

K. Trattner presented the results from a survey of 1000 Polar cusp crossings that correlated the appearance of diamagnetic cavities and energetic ions. He found that diamagnetic cavities are formed in the high altitude cusp in combination with high magnetosheath densities. No correlation between the appearance of energetic ions and diamagnetic cavities could be determined. In several case studies of cusp crossings with and without diamagnetic cavities, the appearance of energetic ions was the direct result of changes in the IMF direction, connecting the cusp region to the quasi-parallel bow show region, a well known particle accelerator.

T. Sotirelis presented a large study of precipitating particles observed by the DMSP spacecraft. The study originally focused on nightside observations in the polar region but also had dayside applications, including the possibility of deriving the average magnetopause reconnection rate .

A. Otto presented results from an MHD simulation that generated cusp diamagnetic cavities and then used test particles to investigate ion acceleration in the resulting configuration. His test particles reached about 50 keV.

N. Omidi used a 2.5D global hybrid simulation to examine the interaction of FTE's generated on the dayside magnetopause with the cusp. He showed how secondary magnetic reconnection leads to particle precipitation into the cusp. The model predicted patterns for precipitating ions as a function of magnetic latitude and time very similar to the range of poleward-moving auroral forms seen by all sky cameras and meridian scanning photometers.

M. Kuznetsova used a 3-D global MHD simulation to describe the dissipation of FTEs as they encounter the cusp.

K. Nykyri analyzed wave features in the cusp associated with boundary motions and true electromagnetic waves generated in the cusp. She determined the pointing flux associated with these waves to establish whether or not the waves carry enough energy to account for the local acceleration of energetic particles.

M. Engebretson investigated the appearance of the cusp in ground based ULF wave observations and showed that in many cases cusp turbulence prevents the waves from reaching the ground. However he did find that cusp signatures could be detected when strong FTE particle injections occur at cusp locations slightly equatorward of the ground based station.

J. Baker combined SuperDARN radar observations with Polar cusp passes to provide clear evidence for the sudden appearance of irregularities in concert with poleward moving auroral radar forms.

Omidi gave the dayside invited tutorial, summarizing the objectives of the TADMAC focus group using global hybrid and MHD simulations. Specifically, he talked about processes occurring at the bow shock, magnetic

reconnection in the magnetosheath, and reconnection at the dayside magnetopause and its consequences for plasma transport. In regards to the bow shock, the topics of solitary shocks and morphology of the ion foreshock during various IMF directions were discussed with special emphasis on foreshock waves and their impacts on the solar wind during radial IMF. Interaction of solar wind RD/TDs with the bow shock and initiation of reconnection in the magnetosheath was then discussed using results from global hybrid simulations and comparisons with Cluster observations by Phan et al. [2007]. The internal properties of the discontinuities, in particular their thicknesses, determine whether time-dependent or steady-state reconnection take place. Results from global hybrid simulations during southward IMF indicate the formation of FTEs with various sizes and their poleward transport towards the cusp. Secondary reconnection of the FTEs with mantle magnetic field lines poleward of the cusps leads to plasma injection into the cusp with signatures similar to the poleward-moving auroral forms seen in ground all-sky cameras and meridional scanning photometers. Finally, the results of global MHD simulations conducted by Berchem for strong IMF By conditions illustrated the challenges involved in determining the location of the reconnection line. Some of the tools used to identify its location are: parallel electric fields, low plasma beta, test particle calculations, and a search for acceleration in the reconnection region.

7. Focus Group Report: Magnetosphere-Ionosphere Coupling: Electrodyanamics and Transport (MICET)

The MICET focus group convened three breakout sessions as well as hosting a tutorial talk by Dr. Joe Huba from the Naval Research Laboratory entitled, "Magnetosphere/ Ionosphere Coupling Issues (from the ionosphere side)." An overarching theme of this years breakouts was how to develop meaningful parameterizations of small-scale non-MHD processes for use with global MHD codes. Some of the models discussed were either non-causal or non-unique, making their utility in Geospace Environment Modeling uncertain. Such issues will receive increasing emphasis at future meetings. The main highlights of the breakout sessions, organized topically, are summarized below.

The M-I coupling "gap" region. The 2-3 RE spatial "gap" between the upper boundary of global ionospheric-thermospheric models and the lower boundary of global magnetospheric models is an important site of collisionless plasma transport. The physical scales of gap region processes are small compared with grid sizes and time steps used in current global models. The status of several gap region models was presented, along with efforts towards validation.

Yi-Jiun Su discussed electron energization and transport in Alfvenic regions, while R.P. Sharma described nonlinear aspects of Alfven wave-particle coupling. Joshua Semeter presented evidence for shear Alfven wave dispersion in high-speed narrow-field auroral video. Andrew Wright described a model for the depletion and broadening of downward current channels, showing that current continuity dictated a characteristic time scale of ~ 1-min for E-region evalcuation. Bill Lotko also discussed bottomside plasma depletions as well as topside plasma enhancement, and ion upflows induced by ionospheric Alfven resonator modes. Peter Damiano discussed electron energization in long-period Alfven waves. A linear current-voltage relation was found (vis a vis Knight), with ~40% of field-line resonant energy lost to low-altitude electron energization. Finally, Eric Lund described a transport model for ion energization in downward-current regions embedded in quasistatic potential solution.

Energization and outflow of ionospheric ions. Ionospheric outflow, and its magnetospheric consequences, continues to be an active topic as sensors (both ground-based and space-borne) and modeling capabilities continue to improve and proliferate. Matt Zettergren described a technique for inverting ground-based photometric measurements to estimate the rate and velocity of upwelling ions. Joo Hwang presented test particle simulations of the effect of moving double layers on ion outflow in the downward current region. Alex Glocer presented initial results of parallel transport model (polar wind) coupled into BATSRUS. The model predicts that O+ causes x-line to retreat tailward. This result contradicts LFM model results, in which O+ causes x-line to move earthward. Glocer's work also highlighted the importance of flux tube time-history in predicting ion outflow rates.

Global Scale M-I Consequences. With the continued proliferation of ground-based and space-borne sensors, we have the capability to test global coupled MHD-ionosphere models in a detailed quantitative manor. David Murr highlighted the fact that, even for well controlled quiet solar conditions, the current predictive capabilities of global models with regard to electrodynamic parameters is poor. The process of "challenging" global models in this way is expected to continue. Some other global scale consequences of M-I coupling were also discussed. Kile Baker showed statistical results from SuperDARN highlighting, in particular, the influence of the neutral wind on the cross polar cap potential and Kp. Jerry Goldstein described observations of ring-current "crenulations" (i.e., irregular wavy structure), which may enable local current closure and induce EMIC waves.

Co-chairs
William Lotko(William.lotko@dartmouth.edu)
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8. Focus Group Report: Global MIC

Two breakout sessions were held as part of the Global MI Coupling focus group: "Dayside Global Ionospheric Electrodynamics under Varying Solar Illumination" and "Constraints on Reconnection Processes as Derived from Ionospheric Observations: The Expanding and Contracting Polar Cap."

The first of these breakouts was the third and likely final session of a series that were designed to fully exploit recent developments in global observational capabilities to "challenge" the current set of global MHD models. Previous sessions identified three events with similarly modest and steady IMF driving conditions (IMF Bz~By~ -4 nT), but with differing solar illumination: northern summer-like, equinox-like, and northern winter-like. This set of events was then use to test the ability of global MHD models to accurately represent global MI electrodynamic coupling as a function of varying solar illumination. Global observations were collected and analyzed from the Iridium constellation of satellites, SuperDARN radars, DSMP, ground-based magnetometers, and satellite-based imagers; providing our best estimates of the global distribution of field-aligned currents, ionospheric potential, and conductances. These observations were compared to the Weimer 2005 statistical model and the AMIE data assimilation model in addition to global MHD models from LFM/CISM, OpenGGCM, SWMF/BATS-R-US, and GUMICS.

D. Murr presented a final set of comparisons for field- aligned current, potential, and height-integrated conductance for two of the events. The comparisons between the observations, the Weimer 2005 statistical model, and the AMIE data assimilation model showed very good agreement. This was not terribly surprising due to the modest and steady solar wind driving conditions. The comparison between the

observations and the global MHD models (and inter-comparisons of the MHD models) was much less favorable. Even under modest and steady solar wind driving, the current suite of global MHD models exhibit differences in all three electrodynamic parameters by, at times, a factor of two or greater. Discussion of these results suggested that the differences in the conductance and MI coupling models used in the various global MHD models might best explain the differences. The session concluded with a suggestion that the global models simulate the same events but with as similar as possible models of the height-integrated conductances. Further, it was agreed that the session chair would organize the collective publication of the results of the effort.

Additional presentations were given on the seasonal effects of global-scale electrodynamic MI coupling by A. Ridley and V. Papitashvili. W. Lotko and M. Wiltberger then addressed how these seasonal effects control the flow and transfer of energy and how seasonal control (solar illumination) of the low-altitude plasma density may feedback on MI coupling processes. J. Baker and G. Crowley presented results from observational studies to measure these variations in energy transfer and deposition.

The second breakout session for the Global MI Coupling focus group was the first session to explore our current observational and modeling capabilities to estimate the amount of open flux in the polar cap as a function of time. Sufficiently accurate estimates of this parameter would provide a measure of the global reconnection rates on both the dayside and nightside. A. Ridley, S. Merkin, and G. Wilson presented studies of the polar cap area as present in global MHD simulations. T. Sotirelis showed the results of an empirical model of the open/closed boundary location. D. Murr and E. Donovan presented talks on current global observational capabilities, mostly via the SuperDARN network of radars and/or by ground- or space-based imaging. K. Baker and K. McWilliams showed results from more localized estimate of merging rates as measure by ground-based radars. Concluding discussions in this session explored ways to connect these investigations (and the focus group) more directly to THEMIS-driven sessions at GEM and with focus groups studying substorm and nightside processes.

Chair
David Murr (david.murr@dartmouth.edu)

9. Session Summaries for the "Near-Earth Magnetosphere: Plasma, Fields and Coupling" Focus Group at GEM 2007 Summer Workshop

The Near Earth Magnetosphere focus group had its kickoff sessions at the annual GEM Workshop in Zermatt Resort, Utah from June 17 to 22, 2007. This new focus group has as its main goals to identify the most important unsolved problems in the physics of the near-Earth magnetosphere and determine data sets/modeling advances needed to address those problems. Reaching these goals will lead to improved empirical and theoretical models that may constitute inner magnetosphere modules for GGCM. The focus group is coordinated by Sorin Zaharia, Stan Sazykin and Benoit Lavraud.

The Near Earth Magnetosphere Focus Group held three breakout sessions at the 2007 GEM, on Wednesday, June 20.

Session1. The topic of this session was the influence of plasma sheet properties on the ring current.

Benoit Lavraud showed that a cold, dense plasma sheet leads to enhanced ring current. Comparing RAM simulation results for the proton ring current with idealized boundary conditions of cold vs. hot plasma sheet (with the same energy density), he found that cold plasma sheet can penetrate much closer to Earth (due to its reduced

gradient-B drift). He also presented observations of the cold dense plasma sheet (CDPS), which show 2 distinct populations at midnight and dawn. The source and degree of participation of the dawn population to the ring current are questions that need to be answered in the future.

Chih-Ping Wang analyzed the dependence of plasma sheet properties, during northward IMF, on solar wind (SW) density, velocity and IMF Bz, using Geotail, ACE and Wind data. The data was separated into 8 bins, corresponding to low/high value combinations of the 3 driving parameters. The parameter combination of high SW density, high IMF Bz and low velocity was found to lead to a cold plasma sheet with highest density and lowest temperature. On the other hand, a low SW density, low Bz and high velocity result in a hot and tenuous plasma sheet (lowest density, but highest temperature).

Margaret Chen used Wang's two extreme plasma sheet conditions (cold/dense and hot/tenuous) from Geotail data as boundary conditions for her magnetically self-consistent ring current model. First, she traced ions with the Magnetospheric Specification Model (MSM) from Geotail orbit to geosynchronous, and then used the values there as boundary conditions. She found that the cold/dense plasma sheet leads to much stronger ring current. She concluded that accurate ring current modeling requires realistic modeling of pre-storm plasma sheet.

Colby Lemon addressed the question of how the fast initial recovery of a storm may be affected by plasma sheet density and convection strength. He showed 6 simulations performed with the RCM-E model, with different plasma sheet densities and polar cap potential drops. The results show that lower plasma sheet densities lead to faster recovery, with the fastest recovery resulting when plasma sheet density is lowest while convection is still strong.

Vahe Peroomian looked at ion access and energization by tracing particles in the fields of a global MHD storm simulation. Oxygen ions were launched from the ionosphere, with protons launched in the solar wind. While direct entry (through the plasma sheet) into the ring current was found to occur, Vahe found that ion transport from the distant tail to inner magnetosphere can be also indirect, with particles moving along dynamic field lines and ending up much closer to Earth after mirroring, thus bypassing the plasma sheet.

Liz MacDonald studied the influence of ion composition at geo. orbit on the ring current. By performing RAM simulations with various H+/O+ boundary composition ratios, she obtained very different ring current pressure, showing that ion composition plays a very significant role in the ring current. She then described the upcoming oxygen monitoring capability at geosynchronous that will be on LANL satellites, through the Advanced Miniaturized Plasma Spectrometer (AMPS), which will measure H+, O+, He++ and e-.

Jichun Zhang presented an RCM study of depleted entropy channels (bubbles) injected into the inner magnetosphere. The bubbles are imposed by reducing the PV^gamma content. He found that bubbles lead to higher plasma energy density. In particular, the electric field is increased inside depleted channels, which injects fresh particles more effectively. The violation of adiabaticity (which presumably causes the bubbles) pushes the ring current farther inward and seems to be a key element in storm physics.

Yongliang Zhang discussed the ring current aurora (RCA) – a new terminology for aurora emissions due to precipitating particles from the ring current. He showed that global FUV imagers provide insight into the RCA because they image proton precipitation. As observations of RCA provide information on loss processes in the RC,

he concluded that global auroras should be used in validating magnetospheric models.

Pontus Brandt showed a study performed with Shin Ohtani on global circulation of oxygen ions. ENA observations show strong energization of RC O+ ions during substorms, with protons less energized. CRCM simulations of a substorm coupled with test particle ions successfully reproduce the oxygen ion energization, with the take-home message being that oxygen ions make the ring current stronger.

Session 2: The topic of the second session was the self-consistent interaction between plasma and electric and magnetic fields in the inner magnetosphere.

Sorin Zaharia described the inner magnetosphere model that is developed at LANL based on his 3D magnetic field solver and Vania Jordanova's RAM code. Recently, the code has been extended to ~10 Re in the tail, with the outer plasma boundary condition there taken from observational profiles. Sorin showed that taking into account the effect of plasma on the B-field leads to very different results than if a dipole field is used. When the self-consistent simulation of a moderate storm is compared with the one using a dipole B-field, it was found that there are significant deviations of the field from dipolar even at L=4-5, lower plasma pressure, and noticeable variability in radial profiles.

Mike Liemohn addressed the question of small-scale E-field structuring in the inner magnetosphere that he finds in his ring current simulations. Mike showed a simulation of the April 22, 2001 storm, in which plasma pressure becomes structured – at the same time, small structuring is seen in the computed E-field. According to Mike's analysis, ENA images in the tens of keV energy range would not be sufficient for the IMAGE HENA instrument to resolve the structuring. Mike challenged the audience to identify data that could be used to prove or disprove his model results.

Vania Jordanova showed RAM simulations with different B-fields (dipole, empirical Tsyganenko, and self-consistent computed with the Zaharia solver) also for the 22 April 2001 storm. Vania found that results differ significantly for the different field models. In general, the empirical T04S field yields the largest gradient/curvature drift velocities. In the storm main phase, proton fluxes are smallest with T04S and total ring current density is reduced compared to the dipole case. The self-consistent B-field yields intermediate results. With non-dipolar B-fields, localized pressure peaks appear. Also, with the self-consistent B-field, strong EMIC waves are predicted at larger L.

Mark Engebretson presented EMIC wave observations, bringing up the question of why ground-based signatures of EMIC waves are not observed in the plasmapause region during the main/early recovery phase, but are in the late recovery phase. Mark showed conjunction ground based/spacecraft data (with two spacecraft, one at 4500 km altitude and the other one at geo) at L=4.5 for one storm. In the main phase, the data shows EMIC wave activity out in the magnetosphere but waves are not observed on the ground or at 4500 km. This might suggest that the waves are absorbed well above the ionosphere or are not emitted in the direction of the ground.

Frank Toffoletto showed RCM-E simulations of an idealized substorm growth phase. After running the model for ~4 hrs, the pressure and magnetic fields consistently display oscillatory structure, which could be physical instabilities. An eigenmode analysis of the RCM-E configuration with Chris Crabtree's code finds a tail region between 10 and 15 Re to be ballooning unstable when the field is very stretched. While RCM-E cannot model the instability evolution, this result may indicate that adiabaticity is

violated in the unstable region. Reducing the adiabatic invariant in an ad-hoc manner on the RCM-E boundary leads to B-field dipolarization and injection of a noticeable ring current.

Hiroshi Matsui presented an empirical model of the convection E-field in the inner magnetosphere based on Cluster E-field measurements and DE-2/radar data. The model convection patterns were organized by the interplanetary E-field. Qualitatively, the empirical patterns are similar to those computed with models such as RCM. However, standard deviations are comparable to E-field absolute values, indicating significant variability of the field; this could be due to mesoscale structuring or induction E-fields.

Pamela Puhl-Quinn described her recent work on analyzing simultaneous electric field observations of sub-auroral ion drift (SAID) events using magnetospheric (Cluster) and ionospheric (DMSP) E-field data. She showed one case study that showed quite good agreement of Cluster and DMSP observations.

Session 3: The final session started as a continuation of the self-consistent interaction discussion.

Mike Schulz gave some theoretical remarks on self-consistent interaction between plasma, electric and magnetic fields. He remarked that analytical formulations (e.g. the Dungey model) are useful for simulating realistic features. He warned against looking for causality in Maxwell's equations, i.e. what is driving what. One can only say with regard to Maxwell's equations that the right hand side equals the left hand side.

Jerry Goldstein presented an electric field model constructed from an externally driven electric field model (Volland-Stern) plus an internal SAPS model. By tracing particles in this combined model, with either observations or a plasmapause model for initialization, he obtained remarkably good correlation with MPA data of plume location.

Tim Guild showed the effects of self-consistency in electric and magnetic fields on the plasma sheet control of ring current. For the study he used RCM, which has self-consistent electric fields, but did not include the charge exchange. He analyzed a moderate storm and found that adding magnetic self-consistency lowers the effect of plasma sheet density on the ring current energy (the self-consistency in the E-field alone was already lowering it from a linear to a square root dependence on the PS density).

Yukitoshi Nishimura presented storm-time large scale electric fields obtained from 7 years of Akebono observations. The largest fields are found at dawn and dusk. He also used the field to calculate empirical convection potentials. A two-cell convection pattern is clearly observed. He further traced ions in the obtained empirical fields and found significant energization.

Jo Baker discussed SuperDARN measurements and implications for convection. He also performed a test of equipotentiality of the magnetic field lines, by analyzing conjugate SuperDARN and Cluster EDI measurements. While he found a fairly good correlation, there was also large variance, which points out to non-equipotentiality (possible reasons for it being induced electric fields and field-aligned potential drops).

Yihua Zheng looked at the influence of electric fields on the coupling between the magnetosphere and ionosphere. She showed simulations with the CRCM model, with and without trough (low density plasma region) conditions. With trough conditions, the applied low Pedersen conductance in the trough leads to large amplitude flows (sub-auroral polarization streams, or SAPS) that resemble observations. She concluded that

ionospheric changes affect the ring current through electromagnetic coupling.

Sasha Ukhorskyi looked at radiation belt radial transport due to magnetopause compression from solar wind dynamic pressure variations. He used empirical B-field models and calculated the induced E-fields that are consistent with the B-field time dependence. He then analyzed the ULF waves from solar wind pressure spectral fluctuations.

Jimmy Raeder presented work done with W. Li on the formation of super-dense plasma sheet. In an OpenGGCM simulation, he showed that after northward IMF, southward IMF turning compresses the cold dense plasma on high latitude field lines, which is subsequently pushed toward the Earth by near-tail reconnection and forms the super dense plasma sheet near geo. orbit (MHD results compatible with MPA observations).

The second half of the session was a community discussion about the future direction of the focus group. Several people mentioned the familiar GEM concept of "Community Challenge" – it would be interesting to have in the near future (1-2 years) a challenge study whereby the models would all run an idealized event, so as to compare the results.

For the next GEM, two possible breakout session topics emerged: 1). Study the effect of the added model features on model output, in order to find out which are crucial for inner magnetosphere physics modeling; quantify the relative effect of plasma sheet boundary properties, B and E self-consistency, anisotropy, losses in models; how are the new physics features verified by / improve consistency with observations? 2). Continuous improvement in empirical specification: better empirical plasma sheet models (including activity binning and ion composition), empirical E-field and plasmasphere models. These would also be the topics of a Mini-GEM session the focus group will be organizing in San Francisco the Sunday before the 2007 Fall AGU.

10. Space Radiation Climatology

At the 2007 GEM Summer workshop in Zermatt, Utah, Focus Group 9 – Space Radiation Climatology – held its inaugural sessions. Focus Group 9 chairs are Paul O'Brien and Geoff Reeves. The SRC FG will produce data-assimilative models of the magnetically trapped plasmas and radiation belts. These models will be run over an 11-year period (reanalysis) to produce a baseline space radiation climatology model for subsequent studies of long-term and statistical properties of the inner magnetosphere (climate statistics, solar wind coupling, etc.).

We began with two invited talks: one from Aaron Ridley on data assimilation and reanalysis climatology with the AMIE code, and one from Bob Schunk on space weather data assimilation in the ionosphere (GAIM). We also reviewed activities of the Next Generation Radiation Specifications Consortium, a group developing radiation belt climatology models for spacecraft design. In order to coordinate our data and model sharing activities, we heard from the Virtual Radiation Belt Observatory (ViRBO, Bob Weigel), and the Virtual Magnetospheric Observatories (VMOs, James Weygand).

The remainder of our sessions were dedicated to discussions of what data sets were available, what progress is already being made toward long-term climatology simulations, and recent advances in physical understanding of the inner magnetosphere.

Detailed agenda, notes, briefings, and follow-up material can be found on the web at our FG9 wiki: [http://virbo.org/virbo/wiki/index.php/GEM2007]. Also, a newsletter and email list have been

created for interested parties: [http://groups.google.com/group/gem-2007-space-radiation-climatology-fg9].

11. Report on June 2007 sessions of the GEM Focus Group on "Diffuse Auroral Precipitation"

This was the first year of our new focus group. An invited tutorial was presented by Eric Donovan on the "Time-evolving spatial distribution of the diffuse Aurora" ,and three separate working group sessions were held at June 2007 meeting focusing on the current status of observations, and physical modeling, and future topics to be addressed by the focus group.

The following topics were identified for study over the next four years

1) Quantification of the rate of pitch-angle scattering by different classes of plasma wave in the magnetosphere. This will require the development of global models of the power spectral intensity of each type of wave, using available satellite data, and the use of quasi-linear diffusion codes or test particle scattering codes to evaluate the rate of precipitation loss to the atmosphere.
2) Non-linear saturation of the amplitude of plasma waves responsible for particle scattering.
3) Evaluation of effective lifetimes and energy precipitation flux under different geomagnetic conditions.
4) Quantification of the rate of injection of plasma sheet particles into the inner magnetosphere, in response to solar wind forcing.
5) Influence of the plasmapause and dayside drainage plumes on the global precipitation pattern. The excitation of plasma waves is strongly influenced by properties of the thermal plasma.
6) Conductivity change in the ionosphere and its effect on global magnetospheric convection.
7) Effects of particle precipitation on the Region 2 current system.
8) Modeling of non-linear coupling between global transport and precipitation.
9) Effects of particle precipitation on the plasma populations of the magnetosphere (ion plasma sheet/ring current, electron plasma sheet, outer electron radiation belt).

Spacecraft data is critical for studies of the diffuse aurora and Tom Sotirelis, and Jacob Bortnik undertook responsibility for the collection of information on the availability of particle and wave data respectively.

Suggested breakout sessions for June 2008 GEM Meeting:

- Electron Pitch-Angle-Scattering Coefficients (theory and measurement)
- Structure in the Diffuse Aurora (what and why)
- Plasma Sheet Ion Scattering (joint with FG9)

Submitted by Co-Chairs of Focus Group
Richard Thorne, UCLA: rmt@atmos.ucla.edu
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NSF CEDAR-GEM-DASI Report

This report briefly describes the DASI break-out session at the Summer 2007 GEM workshop and the full-day DASI workshop that followed the 2007 CEDAR Workshop.

The GEM DASI break out session was held in Zermatt Utah on June 20, 2007 and was attended by about 20 GEM participants and focused on two topics: developing a science theme that requires global distributed observations to advance the science and discussing logistical issues of

funding, deploying, operating, and managing data from a large distributed array of instruments.

Kile Baker discussed some of the lessons learned by NSF from other communities especially the importance of budgeting operation costs into any planning. The oceanographic and seismographic communities have learned this hard lesson.

Another discussion was on how the Geospace science community could leverage existing infrastructure developed by other communities (GPS receivers deployed by the tectonics community, ocean buoys deployed by the oceanographic community, polar observations deployed by the climate/ice community etc. In addition, how can the DASI concept integrate with the existing space science infrastructure (ISR, HF radar etc.).

A suggested action item was to suggest to the NRC to hold a geoscience workshop during IHY/IPY/eGY to discuss shared infrastructure costs that the different geoscience communities can leverage and communicate some of the lessons learned and data sharing and management strategies employed by the different communities.

A full-day DASI (Distributed Array of Small Instrumentation) Workshop was held Saturday June 30, 2007 following the CEDAR Workshop in Santa Fe NM. Approximately 100 people were in attendance. In 2006 there was a CEDAR Session devoted to DASI science ideas. Over 30 white papers were presented on the "Frontiers of CEDAR Science" that required DASI-like efforts to tackle. Out of that effort, Jan Sojka (past CEDAR Steering Committee Chair) developed an ad hoc working group to help organize future workshops and planning for DASI science. The formal one-day workshop associated with CEDAR was the outcome of that planning process.

The Workshop was Chaired by Michael Kelley (Cornell) and focused on science themes that require global ground-based observations for advancement in our understanding of the broad ITM (Atmosphere-Mesosphere-Ionosphere-Thermosphere-Magnetosphere-Heliosphere) system. The afternoon was devoted to "Lessons Learned" from existing arrays of instrumentation in terms of data management, deployment, and data use by the community.

Jeff Thayer and Eric Donovan gave overview talks on the DASI Mission concept. Maura Hagen discussed Aeronomy Coupling to the Atmosphere Challenges and John Foster discussed Aeronomy Coupling to the Magnetosphere Challenges.

An outcome of the discussion was to continue this planning process soliciting ideas from the community on an overarching science objective that would allow the CEDAR-GEM community to actively participate to tackle global coupling issues. A list of all current and past ground instrumentation was suggested as a possible community effort to enable discussions on community needs and allow active collaboration among the disciplines.

The science theme that came out of the workshop was to think in terms of climatology and to explore ideas that refine the broad concept of "mapping/relationships between magnetospheric phenomena and ionospheric phenomena" to fully integrate the ground-based and space-based assets.

Mark Moldwin

GEM 2007 Steering Committee minutes

GEM 2007 Steering Committee Meeting Report
June 22, 2007, Zermatt Resort, Midway Utah

Friday: 4:00 - 6:00pm
PRESENT: Jimmy Raeder (chair), Yasong Ge (for Chris Russell), Dan Welling (Student Rep), Kile Baker (NSF), Robert Ergun, Vana Jordanova, Bob Clauer, Hideaki Kawano (Japan), Howard Singer (NOAA), Masha Kuznetsova (CCMC), David Sibeck, Jeff Hughes, Mike Liemohn, Michael Wiltberger, Michael Henderson, David Murr, Reiner Friedel, Mark Moldwin (DASI), Frank Toffoletto, Stan Sazykin

1. Future Workshop plans - Frank Toffoletto and Bob Clauer

The Fall 2007 AGU mini-workshop will be held as usual in San Francisco on the Sunday (9 Dec) before the Fall AGU meeting (10-14 Dec). Frank Toffoletto will coordinate the logistics for the workshop with assistance from Bob Clauer. The steering committee will meet after the workshop.

The next summer workshop will be held jointly with SHINE June 22-27 at the Zermatt resort in Midway, UT. CEDAR will meet the prior week, June 15-21, 2008 at the same place. Bob Clauer will undertake the logistics coordination for this workshop. Umbe Cantu will be coordinating the SHINE workshop so the transition to a new workshop coordinator for GEM should be eased by this.

There was some concern about the possible size of the combined workshops and the need for a room that could hold at least 350 people (150 - 160 Shine, 180 - 240 GEM). The Zermatt plenary room can hold 500 auditorium style and 300 with tables. We may need a hybrid arrangement.

2009 summer workshop location: Snowmass is still uncertain. Telluride is too expensive. Bob Clauer will collect information about different places (costs, availability) and circulate it among the steering committee for a December 2007 decision.

2. NSF has strict rules about committees that advise the government, in particular it does not like standing committees. Thus the GEM steering committee should not appear to give advice to Kile Baker at NSF. The GEM steering committee can volunteer information to Kile. However, Kile should not have power to appoint members of the GEM steering committee. Therefore, from now on the steering committee will elect the successor when a member rotates out and the committee chair will appoint the new member. The steering committee chair will be elected by the committee and will be appointed by the outgoing chair. The bylaws have been changed accordingly.

3. The rules outlined above were immediately applied to replace the outgoing committee members Vania Jordanova and Dan Weimer. Maria Spasojevic and Terry Onsger were elected new members. The committee thanks Vania and Dan for their service. (Note added: Maria and Terry have both accepted. - JR)

4. The steering committee expressed its concern that the UCLA web site is out of date. Kile noted that the Communications Coordinator grant will be competed in the near future.

5. Selection process for new focus groups: The present number of groups is rather arbitrary. There was room for more breakout sessions in the workshop this year so perhaps we could support 2 or 3 more groups. Research Area Coordinators should also prompt focus groups to have more sessions. The selection process for new focus groups will be more explicit:

Two-page proposals for new focus groups are due in October concurrent with the GEM proposal deadline, for consideration by steering committee. Proposals will be posted on the web and also be sent to the appropriate research area coordinators. A session at the Fall AGU miniworkshop will be

reserved where proposals can be presented. The steering committee will then consider proposals at Fall (AGU) steering committee meeting.

6. We need to get from all existing focus groups the following summary information:
Group Name, Leaders, Goals, Objectives - in the style of Sorin Zaharia's presentation - in order to have a clear description of what each FG does. Clauer will get Sorin's viewgraph to use as an example and will send a template out based on Sorin's viewgraph. Research area coordinators will be tasked to get this information from their focus groups. Due by the end of August.

Kile's Dear Colleague letter for the GEM competition will refer to those descriptions.

7. There should be an instruction sheet for focus group chairs. The SC would like to emphasize workshop style rather than AGU talk style. Leaders could request "Viewpoints" from participants limited to 3 to 5 slides. Research Area Coordinators should help to support this.

8. Discussed summary of focus groups at end of workshop. While many people did not attend, it is important for the steering committee to hear the
summaries. The reports were very good this year - mentioned by several committee members.

9. Technical issue regarding using multiple computers for presentations. May want to have two computers connected and use memory sticks or networked shared folders that people can load slides into.

10. Defer discussion of focus group close-outs to later meeting.

11. Participant directory and communications coordinator. It would be good to have a directory. Web site out of date, etc. Perhaps communications coordinator should be competed - solicit others to propose. Proposal is due this year. GEM newsletter, gemstone, web site, 5 or 7 year report, ... If communications goes to someone else must assure the transfer of information from existing site. Worry about listing e-mail addresses creating more opportunities for SPAM. List as .pdf files.

12. Agency Reports:

* NSF - Kile Baker: He already gave a report in the Wednesday plenary. He may have about $600K for new GEM proposals next year.

* NOAA - Howard Singer: reorganizing SEC to give more focus to models and products to the community. (1) New civil servant position to transition models. Want a scientist to be in this position. (2) GOES successfully in "on-orbit" storage. Will be called up when needed. (3) Jack Hays is new director of weather service (4) somewhat harder to get NRC fellowships to offer now that they are in the weather service, (5) Space Weather Enterprise forum in Washington DC was very successful in advertising Space Weather. (6) Space weather week (now called Space Weather Workshop) next year 4/25 - 5/2. NOAA is getting new sets of customers for space weather from the space
weather enterprise and space weather workshop meeting.

* CCMC - Masha Kuznetsova: Runs on request have been heavily used – reached 1000th run in December, for example. High resolution simulations have been run to support the cusp focus group -- the results are available to anyone via the WEB interface. CCMC has started to do model modification on request (with the developers permission and assistance. There have been a set of general purpose runs for space science education for George Siscoe and Ray Walker. The next CCMC Workshop will be in November 4-8 at Arecibo Observatory. CCMC stands ready to support GEM as needed.

* CEDAR - David Murr, Mark Moldwin: Jeff

Thayer is the new chair. 2008 CEDAR will be at Zermatt the week before GEM. CEDAR is working to develop DASI (distributed arrays of small instruments) with a workshop this year. Jan Sojka is the chair of the working group. Moldwin, Donovan and Foster are members. They are promoting the creation of a instrument testbed to facilitate the development of new instruments.

* SHINE - Yasong Ge for Chris Russell: SHINE examines the Solar, Heliospheric, and Interplanetary environment. They presently have about 20 working groups and focus on campaign events. WEB site: http/shinegroup.org/. Should form some small committees to come up with joint sessions. This committee will be established via e-mail in coordination with SHINE. Need some student sessions. (note: Katie Garcia from Boston U. replaces Dan Welling as student representative on GEM steering committee.) Shine meeting is annual. Student tutorials are a common feature of GEM and SHINE.

* ISAS - Hideaki Kawano: ISAS encourages use of Geotail data and they will help to facilitate access and use of the data via WEB site.

* ILWS - Dave Sibeck: Discussed future missions and timelines. Discussed China's plans, Canada ePOP, Cluster having review this year. It would be good to get better GEM participation from Europeans.

13. Student report - Dan Welling

Tutorials went well this year - different organization. Sixty some students this year (little fewer than last year). Changes made to tutorials (better web site established by Dan). Schedule has .pdf of the talks given and this is open to everyone. Also wanted to have tutorials of areas followed by a second tutorial focused on key questions to be addressed by GEM. Would like to have a microphone for tutorial speakers. Having students chair the plenary sessions is popular - good idea. Katie Garcia is new student representative for 2008.

For the GEM Messenger send any news items to editor @igpp.ucla.edu

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2007 GEM Structure	
GEM Steering Committee Chair: Jimmy Raeder	
Research Areas and Coordinators	**Focus Groups**
1. Dayside, including boundary layers and plasma/energy entry (Dayside) – David Sibeck and John Dorelli	**1. GGCM Metrics and Validation** – M. Kuznetsova and A.Ridley
2. Inner magnetosphere and storms (IMS) – Mike Liemohn and Rainer Friedel	**2. GGCM Modules and Methods** – M. Shay and J. Dorelli
3. Tail, including plasma sheet and substorms (tail) **–** Frank Toffoletto and Mike Henderson	**3. Foreshock, Bowshock, Magnetosheath** – N. Omidi
4. Magnetosphere – ionosphere coupling, aurora (MIC) **–** Jeff Hughes and David Murr	**4. Plasma Entry and Transport into and within the Magnetotail** **–** S. Wing, J. Johnson and A. Otto
5. GGCM **–** Mike Wiltberger and Stan Sazykin	**5. Component versus Anti-parallel Reconnection** **–** J. Berchem
	6. Cusp Physics **–** K-H Trattner
	7. MIC Electrodynamics and Transport **–** J. Semeter and B. Lotko
	8. MIC Global Coupling **–** D. Murr
	9. Near Earth Magnetosphere: plasma, fields and coupling **–** S. Zaharia, S. Sazykin, B. Lavraud
	10. Space Radiation Climatology **–** P. O'Brien and G. Reeves
	11. Diffuse Auroral Precipitation **–** R. Thorne and J. Borovsky

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