The Newsletter on Atmospheric Electricity being sent by e-mail, those colleagues needing a paper version should contact Serge Soula: (serge.soula@aero.obs-mip.fr) or Pierre Laroche: (Pierre.Laroche@onera.fr). They will receive the Newsletter by regular mail. Those knowing anybody who needs such a paper version are also welcome to contact us. On the other hand, the easiest way to communicate being electronic mail, we would be grateful to all of those who can help us complete the "atmospheric electricity" list of email addresses already available. All issues of this Newsletter are available on the website of the International Commission on Atmospheric Electricity:

http://www.atmospheric-electricity.org/

We remind all our colleagues that the Newsletter remains also available on the website:

http://ae.atmos.uah.edu

thanks to Monte Bateman's help.

Contributions to the next issue of this Newsletter (November 2005) will be welcome and should be submitted to Serge Soula or Pierre Laroche before October 30, 2005, preferably under word attached documents. A reminder will be sent to all colleagues whose e-mail addresses are presently listed.

AWARD

Charles B. Moore of the New Mexico Institute of Mining and Technology became a Fellow of the American Geophysical Union in January 2005. He will receive this award at the Spring Meeting of the AGU in New Orleans in May, 2005.

NEW BOOK

NLSI's illustrated book *Lightning Protection for Engineers* has been revised and updated with a 2005 edition. The ISBN number is 0-975900102. See the table of contents at: www.lightningsafety.com/nlsi_bus/lp_for_eng_book.html

ICAE 2003 SPECIAL ISSUE

The Special Issue of Atmospheric Research devoted to the 2003 International Conference on Atmospheric Electricity (Versailles) is in press. It is dedicated to Marx Brook who passed away in 2002. A tribute to his life and work by Paul Krehbiel and Earle Williams will appear in this issue. The 31 accepted scientific papers are distributed as follows:

1. Fair weather electricity

Anisimov S. V., E. A. Mareev, N. M. Shikhova, A. E. Sorokin, and E. M. Dmitriev: On the electro-dynamical characteristics of the fog.

Fews A.P., N.K. Holden, P.A. Keitch, and D.L. Henshaw: A novel high resolution small ion spectrometer to study ion nucleation of aerosols in ambient indoor and outdoor air.

Harrison R. G. and W. J. Ingram: Air-earth current measurements at Kew, London, 1909-1979.

Prasad B. S. N., K. Nagaraja, M. S. Chandrashekara, L. Paramesh, and M. S. Madhava: Diurnal and seasonal variations of radioactivity and electrical conductivity near the surface for a continental location Mysore (12^{o} N, 76^{o} E), India

Tinsley B. A.: On the variability of the stratospheric column resistance in the global electric circuit.

2. Thunderstorm activity related to meteorological factors

Barthe C., G. Molinié, and J.-P. Pinty: Description and first results of an explicit electrical scheme in a 3D cloud resolving model.

Deierling W., J. Latham, W. A. Petersen, S. M. Ellis, and H. J. Christian Jr: On the relationship of thunderstorm ice hydrometeor characteristics and total lightning measurements.

Dotzek N., R. M. Rabin, L. D. Carey, D. R. MacGorman, T. L. McCormick, N. W. Demetriades, M. J. Murphy, and R. L. Holle: Lightning activity related to satellite and radar observations of the mesoscale convective system over Texas on 7~April 2002.

Fehr T., N. Dotzek, and H. Höller: Comparison of lightning activity and radar-retrieved microphysical properties in EULINOX storms.

Jungwirth P., D. Rosenfeld, and V. Buch: A possible new molecular mechanism of thundercloud electrification.

Mitzeva R. P., C. P. R. Saunders, and B. Tsenova: A modeling study of the effect of cloud saturation and particle growth rates on charge transfer in thunderstorm electrification.

Mushtak V. C., E. R. Williams, and D. J. Boccippio: Latitudinal variations of cloud base height and lightning parameters in the tropics.

Qie X., X. Kong, G. Zhang, T. Zhang, T. Yuan, Y. Zhou, Y. Zhang, and H. Wang: The possible charge structure of thunderstorm and lightning discharges in northeastern verge of Qinghai-Tibetan Plateau.

Rust W. D., D. R. MacGorman, E. C. Bruning, S. A. Weiss, P. R. Krehbiel, R. J. Thomas, W. Rison, T. Hamlin, and J. Harlin: Inverted-polarity electrical structures in thunderstorms in the Severe Thunderstorm Electrification and Precipitation Study (STEPS).

Williams E. R.: Lightning and climate: a review.

Williams E., V. Mushtak, D. Rosenfeld, S. Goodman and D. Boccippio: Thermodynamic conditions favorable to superlative thunderstorm updraft, mixed phase microphysics and lightning flash rate.

3. Physics of lightning

Aleksandrov N.L., E.M. Bazelyan, and Yu. P. Raizer: Initiation and development of first lightning leader: the effects of coronae and position of lightning origin.

Boussaton M.-P., S. Coquillat, S. Chauzy, and J.-F. Georgis: Influence of water conductivity on micro-discharges from raindrops in strong electric fields.

Khaerdinov N. S., A. S. Lidvansky, and V. B. Petkov: Cosmic rays and the electric field of thunderclouds: evidence for acceleration of particles (runaway electrons).

Kodali V., V. A. Rakov, M. A. Uman, K. J. Rambo, G. H. Schnetzer, and J. Schoene: Triggered-lightning properties inferred from measured currents and very close electric fields.

Larsson A., A. Delannoy, and P. Lalande: Voltage drop along a lightning channel during strikes to aircraft.

Mach D. M., R. J. Blakeslee, J. C. Bailey, W. M. Farrell, R. A. Goldberg, M. D. Desch, and J. G. Houser: Lightning optical pulse statistics from storm overflights during the Altus Cumulus Electrification Study.

Saba M. M. F., O. Pinto Jr., N. N. Solórzano, and A. Eybert-Bérard: Lightning current observation of an altitude-triggered flash.

Wang D., N. Takagi, T. Watanabe,V. A. Rakov, M. A. Uman, K. J. Rambo, and M. V. Stapleton: A comparison of channel-base currents and optical signals for rocket-triggered lightning strokes.

4. Lightning observation

Goodman S. J., R. Blakeslee, H. Christian, W. Koshak, J. Bailey, J. Hall, E. McCaul, D. Buechler, C. Darden, J. Burks, T. Bradshaw, and P. Gatlin: The North Alabama Lightning Mapping Array: recent severe storm observations and future prospects.

Kamogawa M., H. Ofuruton, and Y.-H. Ohtsuki: Earthquake light: 1995 Kobe earthquake in Japan.

Morimoto T., Z. Kawasaki, and T. Ushio: Lightning observations and consideration of positive charge distribution inside thunderclouds using VHF broadband digital interferometry

Murray N. D., E. P. Krider, and J. C. Willett: Multiple pulses in dE/dt and the fine-structure of E during the onset of first return strokes in cloud-to-ocean lightning.

Petitdidier M. and P. Laroche: Lightning observations with the strato-tropospheric UHF and VHF radars at Arecibo, Puerto Rico.

Pinto Jr O., I. R. C. A. Pinto, M. M. F. Saba, N. N. Solorzano, and D. Guedes: Return stroke peak current observations of negative natural and triggered lightning in Brazil.

Rakov V. A., M. A. Uman, and K. J. Rambo: A review of ten years of triggered-lightning experiments at Camp Blanding, Florida.

INFORMATION

2006: ASE PROGRAM COMMITTEE REPRESENTATIVE NEEDED (Dennis Boccopio)

This will be my last year as ASE Program Committee Representative. The Focus Group needs a new rep ... that is, we need a volunteer!

Formal ASE representation on the Fall Meeting Program Committee is one of the most important benefits of Focus Group Status. It allows us much greater control over the "fine-tuning" of ASE material in the Fall Meeting Schedule; previously we relied on the Atmospheric Science Section rep to handle our requests, and the A- section rep has a Herculean scheduling task as it is. Representation also gives us a direct voice in choosing Union Sessions, Tutorials, Themes ... all the "meta" aspects of the Fall Meeting, as well as direct feedback on how to improve its execution.

There's no hiding the fact, this position is a time commitment. The rep is expected to attend the Pre-Planning Meeting in San Francisco each June (2 days, in-kind by AGU), the Scheduling Meeting in DC in September (2-3 days, in-kind by AGU), and the entirety of the Fall Meeting itself (5 days, not in-kind). The benefits for the ASE community, however, are more than worth the effort.

To help spin-up for the task, I'd like to take next year's Rep "under wing" and keep them in the loop on this year's planning tasks, as there is a regular annual schedule which takes some getting used to.

The Program Committee Rep is responsible for the following:

(1) Ensuring a representative slate of special sessions is proposed each year
(2) Ensuring conveners are found for these sessions
(3) Training the conveners on session promotion; reminding them of critical deadlines (invited speakers, etc)
(4) Attending the two planning/scheduling meetings
(5) Identifying Section and Focus Group co-sponsorship for sessions
(6) Scheduling the actual sessions, trying as best as possible to avoid overlaps, topical conflicts between sections or focus groups, speaker scheduling conflicts, accommodating convener requests
(7) Ensuring the Named Lecture is planned and executed (a subcommittee supports this task)

(8) Securing extra / unused oral sessions at the Planning Meeting
(9) Being available during the Fall Meeting for unforeseen problems / requests

If you're interested, or want more information, please feel free to contact me, Dennis.Boccippio@nasa.gov; 256-468-3801 (cell). The level of commitment is significant, but this is a very rewarding volunteer opportunity.

2005 EGU GENERAL ASSEMBLY

The EGU (European Geosciences Union) General Assembly 2005, has been held this year in Vienna (Austria) from the 24th to the 29th of April 2005. It was the first time that a session on Lightning was included in the Natural Hazards Session.
Different topics were presented and discussed, and more specifically the use of lightning for nowcasting and forecasting applications.
Eleven abstracts were selected for Oral Presentations while 20 others were presented during the Poster Session. Confirmed and Junior Researchers as well as students who attended the Lightning Session were coming from Europe, US and Russia. The abstracts for both Oral and Poster Sessions can be found at
http://www.cosis.net/members/meetings/sessions/oral_programme.php?p_id=129&s_id=2286
http://www.cosis.net/members/meetings/sessions/poster_programme.php?p_id=129&s_id=2286
The session was considered very successful, and the EGU Committee decided to repeat the schedule of this session also in the next year.

The Conveners.

9TH SCIENTIFIC ASSEMBLY OF IAMAS

The 2005 IAMAS General Assembly will be held from 2-11 August 2005 in Beijing, China (http://www.iamas2005.com/). As part of this assembly, IAMAS and its Commissions (http://www.iamas.org/) organize a wide range of scientific meetings that are open to all scientists. Based on discussions following the meetings in Sapporo (2003), "The Fascinating Atmosphere: Changeable and Changing" has been agreed to as the scientific theme for IAMAS 2005. ICAE participates to the organization of 4 symposia :

- One symposium in the session A: GASES, AEROSOLS TO CLOUDS (NO RAIN)
"NOx from Lightning and Anthropogenic production with its transport and chemical transformation by deep convection" (ICAE, ICACGP, IOC).
Conveners:
James E. Dye, National Center for Atmospheric Research, PO Box 3000;
Boulder CO 80307, USA; Phone: 303-497-8944; FAX: 303-497-8171; dye@ucar.edu
Pierre Laroche, Atmospheric Environment Research Unit,
ONERA, 92322 Chatillon Cedex France;
Tel +33 1 46734723; Fax +33 1 46734148; laroche@onera.fr

Prof. Xiaoyan Tang at Peking University
Hajime Akimoto, President ICCl 1998-2002, Institute for Global Change Research, Frontier Research System for Global Change, 3173-25 Showa-machi, Kanazawa-ku, Yokohama 236-0001, Japan;
TEL: +81-45-778-5710; FAX: +81-45-778-2292; akimoto@jamstec.go.jp

- Three symposia in the session G: ELECTRICAL
"Precipitation and Electrification in Convective Clouds" (ICAE-ICCP)
Conveners:
Clive Saunders UMIST Physics Department, Sackville Street M60 1QD Manchester, UK.
Tel +441 612 003 909 Fax +441 612 003 941 e-mail: clive.saunders@umist.ac.uk
Tsutomu Takahashi, Obirin University, Core-Education Center, Obirin Univ. 3758 Tokiwa-cho, Machida-shi, Tokyo 194-0294, Japan
tel +81-427-97-0017 fax +81-427-97-0017 e-mail: t2@obirin.ac.jp

"Middle Atmosphere Electrical Events Associated With Tropospheric Storms"
(IAMAS/ICAE, ICMA, IOC-IAGA).
Conveners:
Colin Price Department of Geophysics and Planetary Science, Tel Aviv University
Ramat Aviv, 69978 Israel tel: 972-3-6406029 fax: 972-3-6409282 e-mail: cprice@flash.tau.ac.il
Yoav Yair The Open University of Israel 16, Klauzner Street Ramat-Aviv 61392 Tel-aviv
Tel: 972-3-6465579 fax: 972-3-6465410 e-mail: yoavya@openu.ac.il

"Global Lightning and Climate" (ICAE-ICCL).
Convenors:
E.(Earle) R. Williams, MIT 48-21118, Parsens Laboratory Cambridge, Ma 02181, USA
Tel: (+1) 617 253 2459, Fax: (+1) 617 253 6208, earlew@juliet.ll.mit.edu
Xiushu QIE, Cold and Arid Regions Environmental and Engineering Research Institute, Chinese Academy of Sciences, W. 260 Donggang Road, Lanzhou, Gansu 730000,
P. R. China, Tel: +86-931-4967686, Fax: +86-931-8274863, Email:qiex@ns.lzb.ac.cn

VIII SIPDA - INTERNATIONAL SYMPOSIUM ON LIGHTNING PROTECTION

Prof. Alexandre Piantini, Chairman of the VIII SIPDA, is very pleased to announce the **Call for Papers** of the **VIII International Symposium on Lightning Protection (VIII SIPDA)**, which will be held in São Paulo, Brazil, from 21st to 25th November 2005.

The event is organised by the Institute of Electrotechnics and Energy of the University of São Paulo (IEE/USP) and the Institute of Electrical and Electronics Engineers (IEEE - South Brazil Section).

The aim of the Symposium is to present and discuss recent developments concerning lightning modelling and measurement techniques, as well as grounding and lightning protection. The event covers all topics related to lightning and grounding, including:

1) Lightning discharges
2) Lightning detection and location systems
3) Electromagnetic compatibility and lightning induced effects
4) Modelling
5) Lightning protection of transmission lines
6) Lightning protection of distribution systems
7) Surge protective devices
8) Lightning protection of electronics and telecommunication systems
9) Lightning protection of structures and installations
10) Grounding
11) Testing and standardisation
12) Lightning-caused deaths, injuries and damages

Authors are invited to submit unpublished papers in the areas of lightning / grounding, preferably by e-mail (sipda@iee.usp.br), according to the following time schedule:

Abstract submission (min. 400 and max. 600 words): 1st March 2005

Notification of provisional acceptance: 30th April 2005

Full paper submission: 15th July 2005

Notification of final acceptance: 1st September 2005

For further information about the Symposium please visit the web site at: www.iee.usp.br/sipda or contact us through the e-mail sipda@iee.usp.br.

2005 AGU FALL MEETING

It's time again for the annual proposal of ASE special sessions for the 2005 Fall Meeting. As many of you know, the ASE portion of the Fall Meeting has been steadily growing, reaching 99 abstracts in 2003 and 114 in 2004. One of the keys to a successful meeting is the proposal of strong special sessions, promotion of those sessions by the conveners, and identification of core, topical invited speakers. The Fall Meeting session proposal submission tool is now open at http://www.agu.org. Please consider finding a colleague to co- convene a session with. ASE has traditionally had some "standard" sessions: Physics of Lightning and Thunderstorm Electrification; Lightning, Meteorology and Climate; Upper Atmospheric Processes, etc. New, topical sessions in recent years (Instrumentation and Algorithms, Lightning and Atmospheric Chemistry, Upper Atmospheric Modeling, ASE From DC to Gamma) have also had very good success, and there are surely session topics we haven't yet thought of, nor are we locked into sticking with the "old faithfuls".
Conveners are responsible for:

(1) Identifying co-conveners, and writing the session title and description
(2) Promoting the session within the community to maximize submissions
(3) Identifying and inviting Invited Presenters
(4) Identifying session chairs (can be the conveners themselves)
(5) Forwarding a proposed session oral schedule / poster arrangement to the Program Committee rep

(6) Serving, the next year, on the ASE Named Lecture Committee, which selects the Franklin Lecturer.

Please note, as usual, that until we know the final number of proposed sessions, and submitted abstracts (relative to the Fall Meeting total), we cannot guarantee that every session will receive an oral slot. Every effort will be made at the Scheduling Meeting, though, to accommodate this.

As Program Committee representative, please keep me (Dennis.Boccippio@nasa.gov) in the loop on all proposals or tentative proposals, so I can help pair up conveners.

The deadline is 10 June 2005.

2ND CONFERENCE ON THE METEOROLOGICAL APPLICATIONS OF LIGHTNING DATA

The AMS Committee on Atmospheric Electricity would like to announce the 2nd Conference on the Meteorological Applications of Lightning Data, to be held during the 2006 AMS Annual Meeting in Atlanta, Georgia, USA from January 29 – February 2, 2006 (http://www.ametsoc.org/meet/annual/). Abstracts for this meeting are due on August 1, 2005 and can be submitted electronically via the AMS web site. The first conference on Lightning Applications was held in San Diego during the 2005 Annual Meeting, had 75 papers submitted, and was a great success. The goals of the 2nd Conference on Meteorological Applications of Lightning Data are two-fold. First, we wish to facilitate discussion between researchers and operational meteorologists related to past and present applications of lightning data, including successes and failures related to those applications. Second, we wish to motivate creative thinking with regard to, and support for, the use of future advanced lightning detection systems (satellite- and ground-based, optical and RF) in *both* the operational and research communities. As such, papers for this conference are solicited on topics related to: 1) the utility of lightning data in the operational warning and decision making process including development of space vehicle launch-commit criteria; 2) Recent advances in lightning technology and transfer of that technology from research to operations; 3) Observational fusion and application of lightning data in process studies related to earth and atmospheric sciences; 4) Assimilation of lightning data into forecast models; and 5) Utility of lightning information for safety and protection-related issues. In addition to the aforementioned topics, we are also soliciting contributions for an additional joint session titled "Advances in Understanding of Lightning and Potential Economic and Societal Benefits" to be held in concert with the Forum on Environmental Risks and Impacts on Society: Successes and Challenges. For questions related to the meeting please contact the meeting Chairman, Dr. Walt Petersen via email at: walt.petersen@msfc.nasa.gov, or by phone (256) 961-7861.

2006 EMC Zurich

The 17th International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility will be held in Singapore from **Tuesday, February 28 through Friday, March 3, 2006**. For the first time, EMC-Zurich takes place outside Europe. Vlad Rakov is Chair and Farhad Rachidi is Co-Chair of the Technical Program Committee on Lightning. Papers for the Lightning Session may be submitted on the following topics.

1. Properties of the lightning discharge important for EMC
2. Lightning return-stroke models
3. Lightning EMP
4. Coupling of lightning electromagnetic fields to overhead and buried conductors
5. Lightning locating systems
6. Atmospherics
7. Lightning effects in the middle and upper atmosphere
8. Lightning protection
9. Lightning testing standards

Original, not previously published or elsewhere submitted **preliminary manuscript** (four pages in PDF format) shall be submitted electronically via the Symposium website **www.emc-zurich.org**. The submission deadline is **September 10, 2005**.

All contributions will be reviewed by the Technical Program Committee. Authors will be notified by **November 5, 2005**. Final paper submission deadline is **December 19, 2005**. If you decide to contribute, please send a copy of your paper to rakov@ece.ufl.edu.

19th ILDC (INTERNATIONAL LIGHTING DETECTION CONFERENCE 1st ILMC (INTERNATIONAL LIGHTNING METEOROLOGY CONFERENCE)

Vaisala will hold the 19th International Lightning Detection Conference (ILDC) on April 24 and 25, 2006. Vaisala also announces the 1st International Lightning Meteorology Conference (ILMC) to be held on April 26 and 27, 2006.

The ILDC will provide a unique and important forum for presentations and discussion related to advances in detection technology, network performance evaluation, and fundamentals of lightning physics and current research. The ILMC will focus on applications of lightning data related to thunderstorm nowcasting for the meteorological and aviation communities, oceanic extratropical and tropical cyclone nowcasting, and data assimilation into numerical weather prediction models.

Both events will be held in Tucson, Arizona. For more information, please send an e-mail of interest to theresa.fischer@vaisala.com.

ICLP 2006

The next ICLP (International Conference on Lightning Protection) will be held in Kanazawa, Japan, 18-22 September 2006.
The call for papers is enclosed. The deadline for submitting abstracts is 1 September 2005. Notification of acceptance will be by 15 November 2005.
The full text will be due by 1 March 2006.

Conference Office Address :
The Institute of Electrical Installation Engineers of Japan
1-12-5 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan
Tel: +81-3-5805-3375
Fax: +81-3-5805-3265
E-mail: info@iclp2006.net
URL: http://www.iclp2006.net/
Person in charge to contact: Naokata Natori, Yoshie Hiratsuka

RESEARCH ACTIVITY BY INSTITUTION

ATMOSPHERIC ELECTRICITY GROUP (ELAT) – BRAZILIAN INSTITUTE OF SPACE RESEARCH (Sao José dos Campos – Brazil)

During the period the main activities developed by the Atmospheric Electricity Group (ELAT) of the Brazilian Institute of Space Research were: one Master and one PhD. thesis were finished and two PhD. thesis are being ended. The Master thesis analyzed a large (more than 300 flashes) data sample of flashes recorded by a high speed camera in association with 19 different thunderstorms, in terms of multiplicity, forked strokes and continuing current. Two articles should be submitted in the next month to international journals. The PhD. thesis was related to the first simultaneous lightning observations with an electric field sensor and high-speed camera. About the thesis being ended, one is related to the climatological characteristics of lightning activity in Brazil and the effect of large urban areas on the lightning activity, discussing both thermal and aerosol hypothesis, and the other is related to the impact of the smoke of fires in the North region of Brazil on the cloud-to-ground and total lightning activity. A new PhD. student is beginning a PhD. thesis related to the lightning activity in severe storms in Brazil. The expansion of the Brazilian Lightning Detection Network (RINDAT) is in progress. The new network with about 50 sensors should start to operate in the second semester of this year. Six papers were published during the period:

COLORADO STATE UNIVERSITY - RADAR METEOROLOGY GROUP

Timothy Lang and *Steve Rutledge* continue to study the kinematic, microphysical, and electrical evolution of the 11 June 2000 mesoscale convective system (MCS) observed in STEPS 2000. As graupel develops in the lower portion of the storm, the lower positive charge center of the original tripole gradually becomes the dominant positive charge region of the storm (while the upper positive charge disappears), effectively inverting its electrical structure. However, negative cloud-to-ground (CG) activity continues to dominate the convective line during this period, as the lower positive charge still provides a favorable bias for negative CGs from the mid-level negative charge. We observed larger volumes of strong (> 20 m/s) updrafts during the inverted period, supporting our general hypothesis that strong, broad updrafts are producing enough liquid water to cause graupel to charge positively at these low altitudes.

Lang and *Rutledge* also are studying CG lightning polarity downwind of the Hayman forest fire in Colorado during the summer of 2002, to test the hypothesis that smoke can enhance positive CG production. There is an increase in positive CG fraction throughout northeastern Colorado, roughly collocated with increased aerosol optical depth from the MODIS Terra satellite. However, positive CG fractions remain low in the immediate vicinity of the Hayman fire. Environmental parameters from local soundings will be used to determine the possible

importance of the environment, as opposed to the smoke, as the primary cause of the increased positive CG fractions.

Steve Rutledge, Walt Petersen (UAH) and *Timothy Lang* are doing a study on CG lightning over the Gulf Stream. Active lightning periods are associated with stronger synoptic forcing and higher CAPE values compared to periods when lightning is markedly reduced. We have also found that cloud base heights are lowest during active lightning periods, consistent with high moisture contents at low levels. Active lightning periods are associated with larger aerosol optical depths compared to inactive periods based on MODIS data. We are now trying to assess the relative importance of forcing/CAPE vs. aerosols in controlling flash rates.

Sarah Tessendorf and *Stephen Nesbitt* have recently begun to investigate the hypothesized effect of aerosol on lightning flash rate (LFR) from a global and climatological view. Seasonally averaged MODIS aerosol optical depth (AOD) and TRMM LIS and PR data were compared for a number of regions across the tropics and subtropics. Several regions exhibited correlated seasonal trends in AOD and LFR, however only a few regions, the Amazon and Gulf of Mexico in particular, exhibited peaks in these variables in a non-summer season when thermodynamics possibly have less influence on LFR, revealing a potential aerosol effect. Other regions of interest were the Congo and GATE regions, both of which did not exhibit correlated trends in LFR and AOD. The GATE region in particular was unique in that it had similar rain yield (rain mass per flash) as the other oceanic regions, yet the AOD was much higher. The possible lack of aerosol effect in the Congo and GATE regions could be due to the type of aerosol in this region (predominantly Saharan dust which may better serve as ice nuclei than CCN).

LABORATORY OF LIGHTNING AND SEVERE STORM, COLD AND ARID REGIONS ENVIRONMENTAL AND ENGINEERING RESEARCH INSTITUTE, CHINESE ACADEMY OF SCIENCES, (Lanzhou, Gansu 730000, P. R. China)

Electrical characteristics of thunderstorms on the central Tibetan Plateau at an altitude of 4508 m have been studied. The evolution of surface E field and the E field changes produced by lightning flashes under the representative thunderstorms revealed a tripole charge structure with a larger-than-usual LPCC. The storms appear to begin with the lower dipole of a normal tripole structure, rather than with the upper dipole followed by the development of a weaker lower positive charge. The flash rate is quite low and the average value is usually 1 fl/min. The IC flashes were usually polarity-inverted and occurred in the lower dipole. The large LPCC did not cause positive CG flashes to occur during the whole storm lifetime, and only negative CG flashes were observed in the late stage of the storm.

The spatial and temporal distribution of cloud-to-ground(CG) lightning in MCS has been studied by using the data from lightning detection system, Doppler radar and satellite data. The results show that almost all the CG flashes are negative during the developing stage. The CG flash rate is high than $10min^{-1}$ and -CG flash predominates during the mature stage of the storm. The CG flash rate declines rapidly at the dissipating stage, but +CG lightning ratio increases. The CG flashes tend to occur in the region with cloud top bright temperature (CTBT) less than -50℃ and the region with high temperature gradient in front of MCS. There is no CG flashes in the

cloud region with CTBT higher than -30℃. Negative CG flashes cluster in the intense echo (>45dBZ) region and they coincidence with the strong convection, which suggests that the -CG flash could be used to indicate the strong convective region.

The effects of SST anomalies over Pacific ocean and Atlantic Ocean on the nearby continent lightning activities have been checked using the lightning data from LIS /OTD and NCEP/NCAR SST data via the SVD technique. It has been found that lightning activity in South America is well correlated to the SST over the East Pacific ocean, but not correlated to the SST over Atlantic Ocean. The anomalies of SST over Pacific exert also a strong influence on the lightning activities in the southeastern Asia. The SST over Indian Ocean has an important effect on the lightning activities in southeastern China and the Tibetan Plateau in the Summer time. Above analysis suggests that SST could exert profound influence on some regional continent lightning activity nearby, but not all the regions nearby or in the global scale.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY (Parsons Laboratory, Cambridge, Massachusetts 02139, USA)

Chapter write-ups for a book on sprites following the Summer School on Sprites in Corsica, France (July 2004, organized by Martin Fullekrug) are now complete. These submissions include a chapter (with Mike Valente, Bob Golka and Elizabeth Gerkin) on the use of a large laboratory glow discharge tube to understand sprite radiance and its relationship with local current density, a chapter (with Yasu Hobara, Masashi Hayakawa, Bob Boldi and Eric Downes) on the use of single-station Schumann resonance methods for studying sprite-producing lightning on a global basis, and a chapter (with Yoav Yair) on the cloud microphysical conditions pertaining to the production of sprite-producing lightning.

Ralph Markson, Stan Heckman and Earle Williams have collaborated on a study of the effect of tree growth on the long-term measurement of surface electric field. Measurements of the fair weather field in a meadow in the immediate vicinity of a forest have been used to infer the effect of tree growth with time on the nearby measurement of electric field. The results of this study cast further doubt on claims that the global electrical circuit has declined over the 20th century.

In November 2004, MIT participated in the Lightning Ground '2004 Conference in Belo-Horizonte, Brazil (hosted by Osmar Pinto and Silverio Visacro), with earlier visits to the atmospheric electricity laboratory of Prof. Rosangela Gin at FEI near Sao Paulo and to the SIMEPAR radar facility in Parana State, courtesy of Cesar Beneti. Discussions were held on the value of local measurements on thunderstorms for comparison with global measurements with Schumann resonance methods.

Earle Williams participated in the panel discussion of the February 2005 meeting at Berkeley on the RHESSI satellite results showing evidence for hard gamma production by lightning in thunderclouds worldwide. The most remarkable result was the collective evidence (S. Cummer and others) that sprite-producing lightning (characterized by large charge moment) is not the primary origin of these events. Instead, the collective evidence is showing that intracloud lightning with gamma ray origins near 15 km (J. Dwyer) is the more prevalent source. Preliminary attempts to detect events in common with RHESSI and Rhode Island Schumann resonance measurements have not been successful.

Earle Williams met with Gar Bering at MIT in March to explore the hypothesis that the resolution of the sprite polarity paradox (also under exploration by MIT student Eric Downes) is

the result of 'negative' haloes, which may not be readily seen in conventional video imagery but which are caused electrostatically by supercritical charge moments of the parent lightning.
Two papers are finally going to press after long delays through the review process:
"Response of the earth-ionosphere cavity resonator to the 11-year solar cycle in X-radiation" (with G. Satori and V. Mushtak).will soon appear in JASTP and "The Drought of the Century in the Amazon Basin: An Analysis of the Regional Variation of Rainfall in South America in 1926" (with A. Dall'Antonia, V. Dall'Antonia, J. Malthias de Almeida, F. Suarez, B. Liebmann, and A. C. M. Malhado) is scheduled for appearance in Acta Amazonica.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY (Lincoln Laboratory, Lexington, Massachusetts, USA)

Investigations are underway with Sandia National Laboratory (C. Hogg, R. Longenbaugh and R. Spalding) on long time series of lightning signals recorded with DoD satellites. These time series show a prominent periodicity in the 40-50 day range that has been tentatively attributed to the low level convergence in the Madden Julian oscillation as this tropical wave propagates around the Earth. Multiple satellite observations are being used to try to follow the wave around the world. Also intriguing in these observations is the presence of an annual variation whose phase is opposite to the variation in global lightning documented with the Lightning Imaging Sensor and the Optical Transient Detector based on higher latitude integrations.

The paper by E. Williams and S. McNutt concerned with the large water contents in volcanic eruptions, with implications for volcanic lightning, has appeared in the Proceedings of the International Conference on Volcanic Ash and Aviation Safety. Numerous additional eruptions worldwide have been documented to contain lightning since this paper was prepared. A final report has been released on the use of DoD satellite assets for detecting volcanic eruptions worldwide under the NASA ASAP (Advance Satellite Aviation Products) program.

NATIONAL LIGHTNING SAFETY INSTITUTE (NLSI) (Louisville, Colorado, USA)

(A non-profit, non-product organization providing objective information about lightning safety issues. More information at: www.lightningsafety.com)

NLSI recently has focused on encouraging and supporting the establishment of similar lightning safety organizations in countries where effects from the hazard can be mitigated with large-scale educational programs. Presently this pro bono work is active in Sri Lanka (Dr. Chandima Gomes, Prof. of Physics, Univ. of Colombo), Bangladesh (Dr. Munir Ahmed, Exec. Director, Technical Assistance for Rural Administration), and Bhutan (Dr. Parashuram Sharma, Chair Dept. Electrical Engineering, Royal Bhutan Institute of Technology). Readers of this issue of the AE Newsletter who are interested in establishing such programs are asked to contact rkithil@lightningsafety.com for details.

Richard Kithil of NLSI and Dr. Kimball Merewether of Sandia National Laboratories addressed the US Air Force Electromagnetics Environmental Effects meeting at Kirtland Air

Force Base, Albuquerque New Mexico. Kithil discussed lightning protection from a macro-perspective, including air terminals, bonding, shielding, grounding and surge protection. Dr. Merewether presented the micro view: calculated and empirical results of transfer impedance studies to conductors within earth covered structures, along with recommendations for safety standards.

A week-long NLSI site visit to two high altitude gold mines in Peru has resulted in detailed safety recommendations for fuel depots, ANFO storage, maintenance buildings, processing and laboratory buildings, and power lines. Major changes to personnel safety practices were suggested where some 6000 employees are employed. Use of ESE air terminals was widespread at the mines with a corresponding false sense of security assumed by mine management. Lightning detection equipment was inefficient and will be upgraded. The overall results of the study will allow a productivity increase of about five percent annually.

Kuala Lumpur, Malaysia and Singapore were locations where NLSI's two day technical workshop Lightning Safety for Critical High Value Facilities recently were conducted. Er. Dr Lock Kai Sing, PQR Consultants and formerly of the National University of Singapore, also participated in the lecture series. Attending engineers included members of the Singapore Defense Sciences Technical Advisory who are responsible for lightning safety issues for that nation's defense establishment.

NLSI's illustrated book Lightning Protection for Engineers has been revised and updated with a 2005 edition. The ISBN number is 0-975900102. See the table of contents at: www.lightningsafety.com/nlsi_bus/lp_for_eng_book.html

NATIONAL SEVERE STORMS LABORATORY – NOAA (Norman, Oklahoma, USA)

National Severe Storms Laboratory activities during the last six months include analyses of data from two field programs: Severe Thunderstorm Electrification and Precipitation Study (STEPS 2002) and the Thunderstorm Electrification and Lightning Experiment (TELEX 2003 and 2004). Much of the analyses is being conducted in collaboration with investigators from Oklahoma University, New Mexico Institute of Mining and Technology, South Dakota School of Mines, Colorado State University, and the University of Mississippi.

In collaboration with NOAA's Forecast Systems Laboratory, we have just begun a project to compare the performance of the cloud flash detection capability with the National Lightning Detection Network versus the Oklahoma Lightning Mapping Array and the Vaisala Lightning Detection and Ranging. This project aims to evaluate the use of cloud flash data in National Weather Services Forecast Offices.

NATIONAL SPACE SCIENCE TECHNOLOGY CENTER'S (NSSTC) - NASA/MARSHALL SPACE FLIGHT CENTER (MSFC) AND NSSTC/UNIVERSITY OF ALABAMA IN HUNTSVILLE (UAH) (Huntsville, USA)

A significant fraction of the NSSTC lightning group [**R. Blakeslee** (MSFC), **D. Mach** (UAH), **M. Bateman** (USRA), **H. Christian** (MSFC), and **D. Cecil** (UAH)] will be providing atmospheric electrical measurements from the high altitude ER-2 aircraft during the joint NASA – NOAA sponsored Tropical Cloud Systems and Processes (TCSP) experiment in Costa Rica in July. The TCSP investigations will address key questions about the origins and lifecycles of weather disturbances in the tropics, as well as improve upon numerical modeling studies of tropical cyclogenesis including wave-to-depression transition in the Western Caribbean and Eastern Pacific Oceans. Vaisala (**K. Cummins**) will support the activity by providing real time location data from their Long Range lightning detection network. In addition, the NSSTC is pursuing a longer term collaboration and scientific exchange with Costa Rica [**S. Laporte** (ICE), **P. Machado** (ICE), **J. Amador** (Univ. Costa Rica), and I. Mora (ICE)]. for lightning investigations using the 5 station Costa Rica lightning network operated by Instituto Costarricense de Electricidad (ICE).

Dennis Boccippio has updated LIS/OTD Global Lightning Climatologies**.** The combined, gridded OTD and LIS global lightning climatology products have been updated to include all data from 1995-2004 (12 satellite-years). New gridded products have also been generated including a high resolution (0.5 deg) annual cycle climatology, a monthly climatology, and a monthly time series product. For further information, contact Dennis.Boccippio@nasa.gov.

Dennis Boccippio has quantitatively demonstrated the benefit of using lightning in virtual radar satellite retrievals. The benefits of total lightning observations have been demonstrated in a new retrieval of 3D/volumetric radar reflectivity structure (and related parameters) from 2D multifrequency passive microwave observations. Over tropical oceans, the incremental improvement in retrieval performance (RMSE or Cross-Entropy) by including lightning data in the inputs has been found to be: +5% (for Vertically Integrated Liquid), +10% (for Convective/Stratiform discrimination), +13% (for 20 dBZ Echo Tops), +14% (for Severe Hail Index), +19% (for Hail Probability), +19% (for Ice Water Content). Gains over land are currently being diagnosed. For further information, contact Dennis.Boccippio@nasa.gov.

Dan Cecil's paper has just been published in Monthly Weather Review. The reference is:
Cecil, D. J., S. J. Goodman, D. J. Boccippio, E. J. Zipser and S. W. Nesbett, Three years of TRMM precipitation features. Part I: Radar, radiometric, and lightning characteristics, *Mon. Wea. Rev.*, **133**, 543-566, March 2005

Maj. Mike Gauthier (USAF-AFIT/UAH), **Walt Petersen**, **Larry Carey** (TAMU) and **Richard Orville** (TAMU) had a paper accepted to GRL that further scrutinizes the Houston "lightning anomaly" using nine years of cloud-to-ground (CG) lightning data (1995-2003). The results indicate that the local Houston CG lightning anomaly, is a persistent feature, but statistically non-unique along the Gulf Coast. Findings also suggest that although the Houston area sees an increased frequency of lightning producing storms, storms occurring further inland appear to

produce more lightning on an event basis. Although hypotheses invoking anthropogenic influences have been offered to explain the Houston flash density anomaly, it seems equally plausible that mesoscale influences along the coastline may also be important. The reference for the paper is:
Gauthier, M. L., W. A. Petersen, L. D. Carey, and R. E. Orville, 2005: Dissecting the anomaly: A closer look at the documented urban enhancement in summer-season ground flash densities in and around the Houston area. *Geophs. Res. Lett*., in press

A new Ph.D. student joined the NSSTC Lightning group last fall, Ms. **Tameca Holmes** (former M.S. student of **Phil Krider**. She is currently preparing for the UAH qualifying examination.

Bill Koshak has submitted a manuscript titled: "A Mathematical Method for Retrieving Storm Electric Fields from Aircraft Field Mill Data" (authors: **W. J. Koshak, D. M. Mach, H. J. Christian, M. F. Stewart**). The manuscript is undergoing final revisions and is scheduled to be submitted to the *Journal of Atmospheric & Oceanic Technology* in upcoming months. The paper introduces a general mathematical method based on Lagrange Multipliers to retrieve the storm electric field.

Walt Petersen, **Hugh Christian**, and **Steve Rutledge** (CSU) have submitted a paper to GRL that uses TRMM satellite lightning and radar observations to study the fundamental relationship between precipitation ice mass and lightning flash density. The results indicate 1) that the *globally-averagedl* relationship between precipitation ice water path and lightning flash density is invariant between land, ocean and coastal regimes; and 2) to first order, the physical assumptions of precipitation-based charging and mixed phase precipitation development are robust. From 2) it follows that lightning data may be a useful variable for inclusion in combined space borne algorithms to retrieve ice water content.

Walt Petersen, Justin Walters, Wiebke Deierling, and Michael Gauthier (UAH/NSSTC) are completing installation of real time hydrometeor ID and dual-Doppler algorithms for the NSSTC ARMOR dual-polarimetric radar data stream. Several cases of lightning producing thunderstorms (including severe storms) over northern Alabama have already been collected using ARMOR and the northern Alabama LMA.

Walt Petersen and **Rich Blakeslee** recently submitted a paper to J. Climate with coauthors **Rong Fu** and **Mingxuan Chen** (Georgia Tech) titled, "Intraseasonal Forcing of Convection and Lightning Activity in the Southern Amazon as Function of Cross-Equatorial Flow". In this paper the authors used TRMM-LIS and Brazilian Lightning Detection Network data to correlate intraseasonal transitions in monsoon regime over the southern Amazon to large changes convective structure, ice water path, and total lightning activity.

Wiebke Deierling, Walt Petersen, and Hugh Christian, in collaboration with **John Latham** (NCAR) and **James Dye** (NCAR), are continuing the examination of the relationship - referred to as the flux hypothesis - between lightning frequency f and the product of the down-flux p of solid precipitation and upward mass flux I of ice crystals through the body of a thundercloud using polarimetric radar data and ground based total lightning measurements. Several cases from STEPS and STERAO have been analyzed and the results show a good relationship between p, I and f.

SPACE SCIENCE AND TECHNOLOGY DEPARTMENT – RUTHERFORD APPLETON LABORATORY (Oxfordshire, UK)

Karen Aplin (k.l.aplin@rl.ac.uk)
Karen Aplin and Robert McPheat continue to investigate the infra-red properties of atmospheric small ions. Ion mobility spectrum measurements have been used to identify the hydronium ion species responsible for the IR absorption reported in the last issue (and recently published in JASTP). The charged dimer $H^+(H_2O)_2$ was probably the most common species present during the IR absorption measurements.

Further information can be found about this project at:
http://www.sstd.rl.ac.uk/Applied%20physics/Atmospheric_electricity.htm

The possible meteorological effects of atmospheric ionisation have led to investigation of other factors modulating the tropospheric ion concentration. Atmospheric processes can also affect ionisation rates, as demonstrated in a recent paper (Advances in Space Research) with Giles Harrison and Alec Bennett at The University of Reading.

Following the successful deployment of the Huygens probe, which included a relaxation probe for conductivity measurements, and a lightning sensor, atmospheric electrical data has now been obtained for another planet. Using a newly developed inversion technique at RAL, we will soon obtain the first ion mobility spectra from another planetary atmosphere.

TEXAS A&M UNIVERSITY (TAMU), DEPARTMENT OF ATMOSPHERIC SCIENCES

The Texas A&M University (TAMU) LDAR II (Lightning Detection and Ranging) network is being installed around Houston by TAMU (including Brandon Ely, Jerry Guynes, Shane Motley Jamie Smith) and Vaisala Inc via a contract that is supported by the National Science Foundation (NSF). Seven VHF lightning sensors will be operational as of June 16th 2005. Five more sensors will be added during June-July 2005 for a total of 12 TOA (time-of-arrival) sensors that will run continuously. Decimated data will be available in real time in the TAMU operations center and complete data sets for archival will be retrieved on a monthly basis. This network is part of an ongoing three year NSF funded study of convection, lightning, and pollution over Houston as led by Drs. Richard Orville and Larry Carey. The NSF project is running parallel to the 18-month long TexAQS-II (Texas Air Quality Study-II) that begins May 2005. We intend, however, to operate the network continuously with no ending date in sight.

As part of his PhD dissertation, Scott Steiger has examined total lightning characteristics of isolated, pulse thunderstorms, cells within squall line systems, and supercells. Martin Murphy and Nick Demetriades (Vaisala, Inc.) have provided the Dallas Fort Worth LDAR II data and have given insightful comments on this research. Lightning heights (i.e., 95th percentile source height) have shown utility in diagnosing updraft intensity and predicting severe weather. An increase followed by a distinct decrease in the altitude of lightning activity preceded tornado touchdown by 10 minutes in two supercells which occurred on 13 October 2001 near Dallas-Fort

Worth. With regards to isolated pulse storms, lightning flash rates increased significantly during a cell merger. Comma shapes (similar to radar reflectivity bow echoes) in total lightning density were associated with severe straight-line winds in the 13 October 2001 squall line. This research will be submitted for review in the next 6 months.

Using lightning data from the Dallas Fort Worth LDAR II network provided by Martin Murphy and Nick Demetriades of Vaisala Inc, Shane Motley examined the vertical distributions of lightning source locations throughout the lifecycle of individual ordinary convective cells as part of his MS thesis. The Warning Decision Support System – Integrated Information (WDSS-II) was employed to track individual cells and monitor their intensity through various convective updraft proxies and severe parameters (e.g. SHI, VIL, POSH, etc.). Preliminary results suggest a correlation may exist between the height of lightning sources and storm intensity in ordinary convection. This information could serve as a means to monitor brief fluctuations in storm intensity in real-time associated with pulse-type (i.e., not organized) severe storms. In his thesis, Mr. Motley plans to incorporate 3-D total lightning information into the well-known conceptual model of the life cycle of ordinary convection by looking at a large number of individual cells.

THE UNIVERSITY OF READING (Reading, UK)

Giles Harrison (r.g.harrison@reading.ac.uk)

Richard Wilding continues his experimental studies of surface ion-aerosol physics in a semi-urban environment (http://www.met.rdg.ac.uk/~swshargi/PollTrop/PollTrop.htm). Measurements of background ion production and ion concentrations are made using a combination of Geiger-counters and the University of Reading Programmable Ion Mobility Spectrometers (PIMS). Solar induced changes in surface ion production are also being monitored, using a Geiger-counter coincidence detection assembly for measuring ionisation by cosmic rays. Recent air-electrical measurements made at a coastal location, as part of the UK's Tropospheric ORganic CHemistry (TORCH) consortium, have yielded information on the r∗le of aerosol in modulating the growth of cluster ions.

Alec Bennett has designed a new instrument to measure the vertical conduction current density at the surface (the "air-earth current"), using Mukku's geometrical method to account for the displacement current, combined with the Reading design of robust picoammeter. The apparatus occupies a collecting area of approximately two square metres, but smaller designs based on the same principles will be constructed for use elsewhere.

Giles Harrison visited the Geodetic Institute of the Hungarian Academy of Sciences in Sopron, collaborating with Ferenc Märcz on observed PG changes across Europe. He has also analysed air-earth current measurements from Kew (London) coincident with ionospheric potential soundings to investigate urban columnar resistance variations.

UNIVERSITY OF FLORIDA (Gainesville, Florida, USA)

Triggered-lightning experiments will continue in Summer 2005 (for the 13th year) at the International Center for Lightning Research and Testing (ICLRT) at Camp Blanding, Florida.

These include (1) continued studies of the properties of both natural and triggered lightning using multiple-station measurements of electric and magnetic fields in conjunction with optical and thunder observations, (2) studies of the interaction of lightning with lightning protective system of a residential building, (3) measurement of the production of NOx by rocket-triggered lightning, in collaboration with Uppsala University, Sweden, (4) coordinated streak-camera, photoelectric, and image-converter-camera observations of the various lightning processes, and (5) continued studies of the energetic radiation (X-rays, gamma-rays) during natural and triggered lightning discharges, in collaboration with the Florida Institute of Technology.

Rob Olsen received an Outstanding Student Paper Award at the 2004 Fall AGU Meeting. The paper is titled "Leader/Return-Stroke-Like Processes in the Initial Stage of Rocket-Triggered Lightning"

M. Miki (CRIEPI, Japan), V.A. Rakov, T. Shindo (CRIEPI, Japan), G. Diendorfer (ALDIS, Austria), M. Mair (Technical University of Vienna, Austria), F. Heidler (University of Federal Armed Forces, Germany), W. Zischank (University of Federal Armed Forces, Germany), M.A. Uman, R. Thottappillil (Uppsala University, Sweden), and D. Wang (Gifu University, Japan) authored a paper titled "Initial stage in lightning initiated from tall objects and in rocket-triggered lightning". They examined the characteristics of the initial stage (IS) in object-initiated lightning derived from current measurements on the Gaisberg tower (100 m, Austria), the Peissenberg tower (160 m, Germany), and the Fukui chimney (200 m, Japan) and their counterparts in rocket-triggered lightning in Florida. All lightning events analyzed effectively transported negative charge to ground. The geometric mean values of the overall characteristics of the initial stage, duration, charge transfer, and average current, for rocket-triggered lightning are similar to their counterparts for the Gaisberg-tower flashes and the Peissenberg-tower flashes, while the Fukui-chimney flashes are characterized by a shorter GM IS duration, a larger average current and a larger action integral. The GM IS charge transfer for the Fukui-chimney flashes is similar to that in the other three data sets. The characteristics of pulses superimposed on the initial continuous current (ICC pulses) in object-initiated (Gaisberg, Peissenberg, and Fukui) lightning are similar within a factor of two, but differ more significantly from their counterparts in rocket-triggered lightning. Specifically, the ICC pulses in object-initiated lightning exhibit larger peaks, shorter risetimes, and shorter half-peak widths than do the ICC pulses in rocket-triggered lightning. The paper is published in the JGR-Atmospheres.

Yoshihiro Baba (Doshisha University, Japan) and Vlad Rakov authored a paper titled "On the use of lumped sources in lightning return stroke models". They considered the use of lumped voltage and current sources in engineering lightning return stroke models with emphasis on those including a tall strike object. If the model is to be used for computing remote electric and magnetic fields, they suggest a representation of the lightning channel as a transmission line energized by a lumped voltage source, with the voltage magnitude being expressed in terms of the lightning short-circuit current and equivalent impedance of the lightning channel. Such a representation assures appropriate boundary conditions (reflection and transmission coefficients) at the channel attachment point and is equivalent to a distributed-shunt-current-source representation of the lightning channel. This is in contrast with the use of series ideal current source which presents infinitely large impedance to current waves reflected from the ground and/or from discontinuities in the lightning channel, such as the moving return-stroke front or branches, and therefore is inadequate when such reflections are involved. If the model is to be used only for injecting lightning current into a grounded object or system, a Norton equivalent circuit (an ideal current source in parallel with the equivalent impedance of the lightning channel) is sufficient to represent the lightning discharge. The paper is published in the JGR-Atmospheres.

TEL AVIV UNIVERSITY (TAU), DEPARTMENT OF GEOPHYSICS AND PLANETARY SCIENCES - THE OPEN UNIVERSITY OF ISRAEL (OUI), DEPARTMENT OF LIFE AND NATURAL SCIENCES - (Tel Aviv, Israël)

Colin Price (TAU) and **Yoav Yair** (OUI) have completed the first winter campaign to study the occurrence of sprites and other TLE's above thunderstorms in the Eastern Mediterranean. The ILAN (Imaging of Lightning And Nocturnal emissions) project, funded by the Israel Science Foundation (ISF), is in its second year. Together with students **Michal Ganot, Yossi Sherz** and **Roy Yaniv**, observations were conducted from the top of the Geophysics building in the TAU campus using Watec camera and GPS time-stamping. Although 8 major storm systems were monitored west of Tel-Aviv, this first season yielded no TLEs. The team will add additional cameras, including the back-up Xybion camera, which was used in the MEIDEX on the space shuttle Columbia.

Analysis continues of the Columbia Space Shuttle MEIDEX data (Israelevich et al., GRL 2004; Yair et al., JGR 2004; Price et al., GRL 2004, Yair et al., GRL 2005). **Yoav Yair** and **Colin Price**, with co-authors, have identified an unusual transient emission in data from January 20th 2003; its horizontal displacement from the preceding flash near Madagascar was > 1000 km. The event was detected in the near-IR filter (860 nm), and the morphology of the emitting volume did not resemble any known class of TLE (i.e. sprites, ELVES or halos). This TIGER (Transient Ionospheric Glow Emission in Red) may possibly constitute a new class of TLE or else be the first detection of a conjugate sprite, caused by a lightning at the magnetic mirror point. The results were published in GRL.

Eran Greenberg, **Colin Price** and **Yoav Yair** continue to investigate the ELF data collected during the Columbia mission. A newly developed algorithm of geolocation intense ELF transients was published in JGR (Greenberg and Price, 2004) and we plan to participate in the summer 2005 US sprites campaign by monitoring ELF transients from the Negev Desert.

Lately, attempts are being made to correlate the Terrestrial Gamma Flashes detected by the RHESSI satellite with the Mitzpe-Ramon ELF data. Collaboration with **David Smith** and **Liliana Lopez** from U. Berkeley continues with hopes to find simultaneous events in the data.

Bela Federmesser and **Colin Price** have completed a study related to lightning and rainfall over the Mediterranean Sea (using TRMM data) and have found some very tight correlations between rainfall and lightning during the winter stormy months.

Olga Pechony and **Colin Price** continue working on theoretical modeling of the Schumann Resonances (Pechony and Price, 2004, Radio Science) to investigate the possible "terminator effect" in the ELF band related to the day-night asymmetry of the earth-ionosphere waveguide.

Adi Zomer and **Colin Price** have started analyzing 2-years of ultra low frequency (ULF: f<3Hz) data from a newly established field site in the south of Israel. This station is being used to study geomagnetic pulsations, and possible earthquake precursors.

VAISALA, THUNDERSORM BUSINESS UNIT (Tucson, AZ USA and Aix en Provence, FRANCE)

Vaisala has been operating a real-time Lightning Detection and Ranging (LDAR II) network in the Dallas-Fort Worth area since the summer of 2004. The data from this network is being sent to the Fort Worth National Weather Service (NWS) Weather Forecast Office (WFO) where it is integrated into their Advanced Weather Integration (AWIPS) display software. This is part of an initiative to bring total (cloud and cloud-to-ground) lightning data into NWS WFOs for operational evaluation during the thunderstorm nowcasting process. The Fort Worth WFO has found the total lightning valuable during both severe and general thunderstorm nowcasting. Forecasters are using total lightning flash rates and extent to monitor new updraft development and updraft intensification within thunderstorms. They are also using spatial patterns in the total lightning data, along with radar data, to monitor convective organization trends such as developing downbursts. Forecasters have found the rapid updates of total lightning data (every 2 minutes) to be important for monitoring both severe and non-severe thunderstorms trends that take place during time scales that are shorter than the 5-minute WSR-88D radar volume scans. Cloud lightning mapping in thunderstorm anvils and stratiform rain regions has also allowed forecasters to improve cloud-to-ground lightning threat statements.

VLF long-range lightning data are being used in several projects by Vaisala and collaborators. The NWS Aviation Weather Center routinely monitors convection with VLF data over the North Atlantic and North Pacific Oceans and Caribbean for their operations. Lightning data are being assimilated into numerical weather prediction (NWP) models such as the MM5, and improvements have been shown when the data are included in forecasts of extratropical cyclone intensity and squall line positions. Vaisala is continuing to work with the National Hurricane Center and others in the tropical cyclone research community to evaluate applications of long-range lightning data to tropical cyclone intensity forecasting and outer rainband intensity forecasting. Vaisala is also continuing to work with the National Weather Service to evaluate applications of long-range lightning data for extratropical cyclone analysis and forecasting.

2005 AMS Annual Meeting papers from Vaisala

--Mid-latitude storms: Observations of lightning in mid-latitude winter storms were summarized. Depending on the position and timing of lightning activity within the storm, the lightning activity can provide signals about effects on storm dynamics, moisture available to the storm, and the extent and intensity of the cold air mass associated with the mid- to upper-level trough (Demetriades and Holle, 2005a).

--Tropical cyclones: Lightning in the eyewalls of tropical cyclones can be an important means of diagnosing changes in storm intensity associated with periods of rapid intensification or eyewall cycles that can signal the end of intensification periods, or the start of weakening (Demetriades and Holle, 2005b).

--Warnings: Because of typically low CG lightning density and frequency, the stratiform regions of mesoscale convective systems often present a problem for automated CG lightning warning methods in which warnings expire if there has been no flash within a certain time period and distance around a particular point of interest. Any flash that occurs overhead after the expiration of a warning constitutes a failure to warn. By using total lightning information, it was shown that the rate of failures to warn in these situations can be reduced by a factor of 4. Further, when total

lightning information is combined with radar data, the increase in warning duration is only 18% relative to a warning method based on CG lightning alone. (Murphy and Holle, 2005).
--Holes: Lightning holes in a large hail-producing supercell in Texas underwent regular cyclic behavior and were found to be associated with radar structures more complex than just a bounded weak echo region. The central area of the lightning hole at middle levels was filled with reflectivity of 50-70 dBZ. It was suggested that either supercooled raindrops, which can be raised well into mid-levels in supercells, or hail in a state of wet growth could be responsible for the lack of electrification in the lightning hole (Murphy and Demetriades, 2005).
--Lightning data display and representation: The concept of "Flash Extent Density" is presented, as an improvement to Total Lightning (TL) Source Density. This data representation method employs a "branch segment" representation of high-resolution TL information, rather than the traditional "source point" representation. Various ways to simultaneously represent TL data and CG data are also presented. Cell-based data representations are compared to traditional display methods. A new interactive data exploration tool is described, facilitating the exploration of relationships between lightning and other meteorological information. Finally, two forms of storm animation tools are presented (Lojou and Cummins, 2005).

VERY LOW FREQUENCY RESEARCH GROUP OF THE SPACE, TELECOMMUNICATIONS AND RADIOSCIENCE (STAR) LABORATORY OF STANFORD UNIVERSITY (PROF. U. S. INAN)

In Summer 2004 Robert Marshall made measurements of sprites from Langmuir Laboratory using a high-speed telescopic imager, in order to quantify the temporal properties of decameter-scale features in sprites. In February he participated in the latest HAARP optical campaign, making photometric measurements of airglow induced by HAARP. These measurements will enable us to estimate the extent to which HAARP induces heating in the ionosphere. Furthermore, using Narrowband VLF measurements he is attempting to correlate sprites and sprite halos with so-called early/fast events in order to quantify the conditions under with early/fast events occur.

VLF receiver stations at Nancay, France, and Iraklion, Crete have been successfully operating for over a year now, and have inspired two papers (Haldoupis et al, 2004, and Mika et al, in review). Our receiver at Iitate, Japan, is currently being moved to a new location nearby where it will experience a better noise environment and full-time high-speed internet access so that data can be transferred to Stanford in real-time. A new receiver has been installed at Elazig, Turkey, which will help to monitor lightning-related VLF activity in the European sector.

William Peter is using data from the Holographic Array for Ionospheric and Lightning research (HAIL) to study lightning-induced electron precipitation (LEP) events. Data has shown that the occurrence rate of these events is highly variable, exhibiting a strong dependence on geomagnetic activity and magnetospheric conditions. He is also using HAIL data in conjunction with data from Palmer Station, Antarctica to examine perturbations in mid-latitude subionospheric VLF signals associated with lower ionospheric disturbances during major geomagnetic storms.

Existing HAIL Sites, ranging from southern Wyoming through Colorado to northern New Mexico are undergoing a hardware and software upgrade, and plans for deployment of additional receivers are underway.

Stanford's magnetic cross-looped VLF antenna at Palmer was successfully relocated during Jeff Chang's visit to the station at the end of April. The antenna's distance from the station was almost doubled during the move. Due to new cabling and a more remote site, this new system promises to provide extremely quiet VLF data.

Troy Wood has completed his PhD Thesis on global geo-location of lightning discharges using a combination of arrival azimuth and time-of-arrival techniques. Ryan Said is continuing this work, to develop more accurate and robust direction-finding algorithm for lightning-generated electromagnetic pulses (sferics).

RECENT PUBLICATIONS

This list of references is not exhaustive, it includes only papers published at the end of 2004 and in 2005 provided by the authors or found from an on-line research in journal websites. Some references of papers very soon published have been provided by their authors and included in the list. The papers in review process or accepted, the papers from Proceedings of Conference are not included.

Aleksandrov, N L, E M Bazelyan, F D'Alessandro, Yu P Raizer, (2005), Dependence of lightning rod efficacy on its geometric dimensions – a computer simulation, J.Phys. D: Appl.Phys., V. 38, PP 1225-1238.

Aleksandrov, N L, E M Bazelyan, Yu P Raizer, (2005), Effect of a corona discharge on a lightning attachment, Plasma Phys.Rep., V. 31, No. 1, PP 75-91.

Ando, Y., M. Hayakawa, A. V. Shvets, and A. P. Nickolaenko (2005), Finite difference analyses of Schumann resonance and reconstruction of lightning distribution, Radio Sci., 40, RS2002, doi:10.1029/2004RS003153.

Aplin K.L., Harrison R.G. and Bennett A.J., (2005), Effect of the troposphere on surface neutron counter measurements, Adv. Space Res., doi:10.1016/j.asr.2005.02.055.

Aplin K.L. and McPheat R.A., (2005), Absorption of infra-red radiation by atmospheric molecular cluster-ions, J. Atmos. Solar-Terr. Phys., 67, 8-9, 775-783 doi: 10.1016/j.jastp.2005.01.007.

Avila, E. E., C. P. R. Saunders, H. Bax-Norman, and N. E. Castellano (2005), Charge sign reversal in irregular ice particle-graupel collisions, Geophys. Res. Lett., 32, L01801, doi:10.1029/2004GL020761.

Baba, Y., and V. A. Rakov (2005), On the use of lumped sources in lightning return stroke models, J. Geophys. Res., 110, D03101, doi:10.1029/2004JD005202.

Bedard, A. J., 2005: Low-Frequency Atmospheric Acoustic Energy Associated with Vortices Produced by Thunderstorms. Monthly Weather Review: Vol. 133, No. 1, pp. 241–263.

Carey, L. D., M. J. Murphy, T. L. McCormick, and N. W. S. Demetriades (2005), Lightning location relative to storm structure in a leading-line, trailing-stratiform mesoscale convective system, J. Geophys. Res., 110, D03105, doi:10.1029/2003JD004371.

Cecil, Daniel J., Steven J. Goodman, Dennis J. Boccippio, Edward J. Zipser and Stephen W. Nesbitt. 2005: Three Years of TRMM Precipitation Features. Part I: Radar, Radiometric, and Lightning Characteristics. Monthly Weather Review: Vol. 133, No. 3, pp. 543–566.

Cheng, Z., and S. A. Cummer (2005), Broadband VLF measurements of lightning-induced ionospheric perturbations, Geophys. Res. Lett., 32, L08804, doi:10.1029/2004GL022187.

Choi, Y., Y. Wang, T. Zeng, R. V. Martin, T. P. Kurosu, and K. Chance (2005), Evidence of lightning NO_x and convective transport of pollutants in satellite observations over North America, Geophys. Res. Lett., 32, L02805, doi:10.1029/2004GL021436.

Cifelli, Robert, Lawrence Carey, Walter A. Petersen and Steven A. Rutledge. 2004: An Ensemble Study of Wet Season Convection in Southwest Amazonia: Kinematics and Implications for Diabatic Heating. Journal of Climate: Vol. 17, No. 24, pp. 4692–4707.

Clilverd, M. A., C. J. Rodger, and D. Nunn (2004), Radiation belt electron precipitation fluxes associated with lightning, J. Geophys. Res., 109, A12208, doi:10.1029/2004JA010644.

Cummer, S. A., and W. A. Lyons (2005), Implications of lightning charge moment changes for sprite initiation, J. Geophys. Res., 110, A04304, doi:10.1029/2004JA010812.

Dwyer, J. R., H.K. Rassoul, M. Al-Dayeh, L. Caraway, A. Chrest, B. Wright, E. Kozak, J. Jerauld, M.A. Uman, V.A. Rakov, D.M. Jordan, and K.J. Rambo, (2005), X-ray bursts associated with leader steps in cloud-to-ground lightning, Geophys. Res. Lett., 32, L01803, doi:10.1029/2004GL021782.

Ely, B. and R. Orville, 2005: High Percentage of Positive Lightning along the USA West Coast, *Geophys. Res. Ltr.*, In Press.

Farges, T., E. Blanc, A. Le Pichon, T. Neubert, and T. H. Allin (2005), Identification of infrasound produced by sprites during the Sprite2003 campaign, Geophys. Res. Lett., 32, L01813, doi:10.1029/2004GL021212.

Haldoupis, C., T. Neubert, U. S. Inan, A. Mika, T. H. Allin, and R. A. Marshall (2004), Subionospheric early VLF signal perturbations observed in one-to-one association with sprites, J. Geophys. Res., 109, A10303, doi:10.1029/2004JA010651.

Harrison R.G., 2005. Columnar resistance changes in urban air J. Atmos. Solar-Terrestrial Physics 67/8-9, 763-773.

Hayakawa, M., T. Nakamura, D. Iudin, K. Michimoto, T. Suzuki, T. Hanada, and T. Shimura (2005), On the fine structure of thunderstorms leading to the generation of sprites and elves: Fractal analysis, J. Geophys. Res., 110, D06104, doi:10.1029/2004JD004545.

Holzworth, R. H., M. P. McCarthy, J. N. Thomas, J. Chin, T. M. Chinowsky, M. J. Taylor, and O. Pinto Jr. (2005), Strong electric fields from positive lightning strokes in the stratosphere, Geophys. Res. Lett., 32, L04809, doi:10.1029/2004GL021554.

Jones, B.E., K.S. Jones, K.J. Rambo, V.A. Rakov, J. Jerauld, and M.A. Uman, (2005), Oxide reduction during triggered-lightning fulgurite formation", J. Atmos. Solar-Ter. Phys., 67, 423-428.

Liu, N., and V. P. Pasko (2005), Molecular nitrogen LBH band system far-UV emissions of sprite streamers, Geophys. Res. Lett., 32, L05104, doi:10.1029/2004GL022001.

Lynn, Barry H., Alexander P. Khain, Jimy Dudhia, Daniel Rosenfeld, Andrei Pokrovsky and Axel Seifert. 2005: Spectral (Bin) Microphysics Coupled with a Mesoscale Model (MM5). Part II: Simulation of a CaPE Rain Event with a Squall Line. Monthly Weather Review: Vol. 133, No. 1, pp. 59–71.

Marshall, R. A., and U. S. Inan (2005), High-speed telescopic imaging of sprites, Geophys. Res. Lett., 32, L05804, doi:10.1029/2004GL021988.

Marshall, T. C., M. Stolzenburg, C. R. Maggio, L. M. Coleman, P. R. Krehbiel, T. Hamlin, R. J. Thomas, and W. Rison (2005), Observed electric fields associated with lightning initiation, Geophys. Res. Lett., 32, L03813, doi:10.1029/2004GL021802.

Miki, M., V. A. Rakov, T. Shindo, G. Diendorfer, M. Mair, F. Heidler, W. Zischank, M. A. Uman, R. Thottappillil, and D. Wang (2005), Initial stage in lightning initiated from tall objects and in rocket-triggered lightning, J. Geophys. Res., 110, D02109, doi:10.1029/2003JD004474.

Molinari, John, David Vollaro and Kristen L. Corbosiero. 2004: Tropical Cyclone Formation in a Sheared Environment: A Case Study. Journal of the Atmospheric Sciences: Vol. 61, No. 21, pp. 2493–2509.

Murphy, Martin J. and Ronald L. Holle. 2005: Where Is the Real Cloud-to-Ground Lightning Maximum in North America?. Weather and Forecasting: Vol. 20, No. 2, pp. 125–133.

Neubert Torsten, Thomas H. Allin, Elisabeth Blanc, Thomas Farges, Christos Haldoupis, Agnes Mika, Serge Soula, Lars Knutsson, Oscar van der Velde, Robert A. Marshall, Umran Inan, Gabriella Sátori, Jozsef Bór, Arthur Hughes, Andrew Collier, Steen Laursen, and Ib L. Rasmussen, 2005, Co-ordinated observations of transient luminous events during the EuroSprite2003 campaign, Journal of Atmospheric and Solar-Terrestrial Physics, in press.

Ohkubo, A., H. Fukunishi, Y. Takahashi, and T. Adachi (2005), VLF/ELF sferic evidence for in-cloud discharge activity producing sprites, Geophys. Res. Lett., 32, L04812, doi:10.1029/2004GL021943.

Peter, W. B. and U. S. Inan (2004), On the occurrence and spatial extent of electron precipitation induced by oblique nonducted whistler waves, J. Geophys. Res., 109, A12215, doi:10.1029/2004JA010412.

Peter, W. B. and U. S. Inan, Electron precipitation events driven by lightning in hurricanes, (in press into the J. Geophys. Res).

Pinto JR., O.: Cardoso, I., "Decifrando os raios", 2004, Scientific American Brasil, ano 2, 20, p.30-35, (in Portuguese).

Prigent, C., E. Defer, J. R. Pardo, C. Pearl, W. B. Rossow, and J.-P. Pinty (2005), Relations of polarized scattering signatures observed by the TRMM Microwave Instrument with electrical processes in cloud systems, Geophys. Res. Lett., 32, L04810, doi:10.1029/2004GL022225.

Qie, X., T. Zhang, C. Chen, G. Zhang, T. Zhang, and W. Wei (2005), The lower positive charge center and its effect on lightning discharges on the Tibetan Plateau, Geophys. Res. Lett., 32, L05814, doi:10.1029/2004GL022162.

Qie X. Yuan T., Xie Y., and MA Y., Spatial and temporal distribution of lightning activities on Tibetan Plateau, Chinese J Geophys, 47(6):997-1002

Rakov, V. A., V. Kodali, D. E. Crawford, J. Schoene, M. A. Uman, K. J. Rambo, and G. H. Schnetzer (2005), Close electric field signatures of dart leader/return stroke sequences in rocket-triggered lightning showing residual fields, J. Geophys. Res., 110, D07205, doi:10.1029/2004JD005417.

Schmeits, Maurice J., Kees J. Kok and Daan H. P. Vogelezang. 2005: Probabilistic Forecasting of (Severe) Thunderstorms in the Netherlands Using Model Output Statistics. Weather and Forecasting: Vol. 20, No. 2, pp. 134–148.

Schulz W., K. Cummins, G. Diendorfer, and M. Dorninger, 2005: Cloud-to-ground lightning in Austria: A 10-year study using data from a lightning location system. *Journal Geophys. Res*., VOL. 110, D09101, doi:10.1029/2004JD005332.

Shoory, A. R., Moini, S.H.H. Sadeghi, and V.A. Rakov, 2005, Analysis of lightning-radiated electromagnetic fields in the vicinity of lossy ground", IEEE Trans. on EMC, vol. 47, no. 1, pp. 131-145.

Sun Juanzhen, 2005: Initialization and Numerical Forecasting of a Supercell Storm Observed during STEPS. Monthly Weather Review: Vol. 133, No. 4, pp. 793–813.

Yair, Y., C. Price, B. Ziv, P. L. Israelevich, D. D. Sentamn, F.T. Sao-Sabbas, A. Devir, M. Sato, C. Rodger, M. Moalem, E. Greenberg and O. Yaron, (2005), Space shuttle observation of an unusual transient atmospheric emission, Geophys. Res. Lett., 32, L02801, doi:10.1029/2004GL021551.

Zhang, Jian, Kenneth Howard and J. J. Gourley. 2005: Constructing Three-Dimensional Multiple-Radar Reflectivity Mosaics: Examples of Convective Storms and Stratiform Rain Echoes. Journal of Atmospheric and Oceanic Technology: Vol. 22, No. 1, pp. 30–42.

Zhou, Y., S. Soula, V. Pont, and X. Qie, 2005, NOx ground concentration at a station at high altitude in relation to cloud-to-ground lightning flashes, Atmos. Res., Vol. 75, 1-2 , pp 47-69.