NEWSLETTER ON ATMOSPHERIC ELECTRICITY

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INTERNATIONAL COMMISSION ON ATMOSPHERIC ELECTRICITY (IAMAS/IUGG)

AMS COMMITTEE ON ATMOSPHERIC ELECTRICITY

AGU COMMITTEE ON ATMOSPHERIC AND SPACE ELECTRICITY

EUROPEAN GEOPHYSICAL SOCIETY

SOCIETY OF ATMOSPHERIC ELECTRICITY OF JAPAN

The Newsletter on Atmospheric Electricity being now sent by e-mail, those colleagues needing a paper version should contact Serge Chauzy: (serge.chauzy@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 now 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 now available on the new website of the International Commission on Atmospheric Electricity:

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

This site includes information on the next 12th International Conference on Atmospheric Electricity (Versailles: 9-13 June 2003). 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.

Futhermore our publication will be included in the online library of the new associated institutions websites. The EGS site is:

http://www.cosis.net

and the SAEJ site:

http://lightning.pwr.eng.osaka-u.ac.jp/saej .

Contributions to the next issue of this Newsletter (November 2002) will be welcome and should be submitted to Serge Chauzy or Pierre Laroche before October 31, 2002, preferably under word attached documents. A reminder will be sent to all colleagues whose e-mail addresses are presently listed.

ANNOUNCEMENTS

Dr. TOSHIO TAKEUTI DECEASE

Zen Kawasaki announced Dr. Takeuti death: Dr. Toshio Takeuti passed away on December 24, 2001. Dr. Takeuti and his colleague Prof. Minoru Nakano discovered the natural positive lightning discharges during winter thunderstorms in Hokuriku Coast, Japan in early 70s. After their discovery Marx Brook came to Japan to carry out a cooperative field campaign, and the existence positive lightning flashes and their anomalous features became quite well known. Dr. Takeuti's contribution to our community is very enormous, and we want to pray for his long and peaceful sleep.

THE ESF SCIENTIFIC NETWORK "SPECIAL"

The European Science Foundation (ESF, see webpage at http://www.esf.org) supports a scientific network on Space Processes and Electrical Changes Influencing Atmospheric Layers (SPECIAL, see webpage at http://sgo.fi/SPECIAL). In this interdisciplinary area, possible links between changes of energetic charged particle fluxes and of weather and climate occurring via electrical processes in the atmosphere are investigated by studying solar activity, magnetospheric variability, clouds, thunderstorms and lightning. The approach is based on the physical mechanisms by which space weather and the Earth's weather are causally linked. The energy input to different atmospheric layers, from above and below is considered, as is the energy transfer from one location to the other.
The SPECIAL scientific network has held three meetings since 1999, which engendered considerable interdisciplinary discussion and research. During the most recent SPECIAL meeting, from Jan. 3-6, in Cambridge, UK, the SPECIAL community (currently appr. 40 scientists from Europe and Russia) started to plan for a larger scientific project in which atmospheric electrodynamic processes in the atmosphere and their relation to climate are being investigated.Seven different workpackages and representatives have been identified:

WP1: Ionosphere: (Thomas Ulich: thu@sgo.fi)
WP2: Cosmic rays and energetic particles (Mikhail Pudovkin: pudovkin@snoopy.phys.spbu.ru)
WP3: Solar wind and interplanetary magnetic field (Oleg Troshichev: olegtro@aari.nw.ru)
WP4: Sprites and lightning (Torsten Neubert: neubert@dsri.dk)
WP5: Global circuit (Brian Tinsley: tinsley@utdallas.edu)
WP6: Cloud microphysics (Giles Harrison: r.g.harrison@reading.ac.uk)
WP7: Schumann resonances and climate (Colin Price: colin.price@ec.gc.ca)

The SPECIAL community intends to place a bid for a large scale collaboration to the European Commission. The next meeting will most likely be held at the beginning of the year 2003 in Frankfurt/Main, Germany. Further contributions from the scientific communities in space weather and the Earth's weather research are strongly encouraged. Please contact the respective workpackage representatives in this regard.

EDITOR'S CHOICE-ATMOSPHERIC ELECTRICITY

The American Geophysical Union's new electronic journal, Editor's Choice-Atmospheric Electricity is off to a strong start. The address is:

http://www.agu.org/pubs/editor_choice.html

The journal editor is, Collection Editor: Richard E. Orville, Texas A&M University; with an Advisory Panel: Vladimir A. Rakov, University of Florida; David D. Sentman, University of Alaska.

Contact the AGU for a subscription which will provide access to this journal. No hard copy is available unless you choose to print an article.

GLOBAL ATMOSPHERICS, INC. JOINS VAISALA GROUP

VAISALA Group, has acquired the company Global Atmospherics, Inc. of Tucson, Arizona, USA, well-known for its long range lightning detection sensors and networks, as well as for owning and operating the National Lightning Detection Network® in the USA and participating in several international data ventures. In early 2000, Vaisala acquired another lightning detection network manufacturer, Dimensions SA of France, which currently belongs to the Remote Sensing Division of Vaisala. It is currently the leading manufacturer of VHF technology Total Lightning Detection Networks. For more information, visit the websites: http://www.lightningstorm.com, and http://www.vaisala.com.

C. T. R. WILSON NOTEBOOKS

Earle Williams informs:

Academic Microforms in London has recently reported that the transfer to microfilm of the 50 volumes of research notebooks of C.T.R. Wilson, archived at the library of the Royal Society, is now complete. The copy will be transferred to the American Institute of Physics in College Park, Maryland for general access.

CONFERENCES

2002 AGU SPRING MEETING

The 2002 AGU Spring Meeting, sponsored by the American Geophysical Union, is being held 28 – 31 May 2002 in Washington, DC (Washington Convention Center), U.S.A. For detailed information, contact: AGU Meetings Department, 2000 Florida Avenue, NW, Washington, DC, 20009 USA; Phone: +1-202-462-6900; Fax: +1-202-328-0566; E-mail: meetinginfo@agu.org; Web Site: www.agu.org/meetings. For more information, visit the site http://earth.agu.org/meetings/meetings.html.

11th CONFERENCE ON CLOUD PHYSICS

The AMS Conference on Cloud Physics, sponsored by the American Meteorological Society and organized by the AMS Committee on Cloud Physics, is held 3–7 June 2002 at the Ogden Eccles Conference Center located in the Ogden Marriott in Ogden, Utah. This year Cloud Physics is held in conjunction with the AMS 11th Conference on Atmospheric Radiation, with which there will be several joint sessions.

10th CONFERENCE ON MOUNTAIN METEOROLOGY

The 10th Conference on Mountain Meteorology and the Mesoscale Alpine Programme (MAP) Meeting 2002 will be held 17-21 June 2002 in Park City, Utah. The conference is sponsored by the American Meteorological Society, the International Conference on Alpine Meteorology (ICAM), and the European Meteorological Society (EMS) and organized by the AMS Committee on Mountain Meteorology. More information on the website: http://www.ametsoc.org/AMS.

INTERNATIONAL TROPICAL RAINFALL MEASURING MISSION (TRMM) CONFERENCE

The International Tropical Rainfall Measuring Mission (TRMM) Science Conference will be held 22–26 July 2002 at the Hyatt Regency Waikiki in Honolulu, Hawaii. The conference is sponsored by the National Aeronautics and Space Administration (NASA) and the National Space Development Agency (NASDA) of Japan. For further information: visit http://trmm.gsfc.nasa.gov.

21st CONFERENCE ON SEVERE LOCAL STORMS

The 21st Conference on Severe Local Storms, sponsored by the American Meteorological Society and organized by the AMS Committee on Severe Local Storms, will be held 12–16 August 2002 at the Henry B. Gonzalez Convention Center in San Antonio, Texas. This conference will be held in conjunction with the 19th Conference on Weather Analysis and Forecasting and the 15th Conference on Numerical Weather Prediction. Detailed information on BAMEX can be found at http://www.mmm.ucar.edu/bamex/science. For more information visit web page at http://www.ametsoc.org/AMS.

2002 URSI GENERAL ASSEMBLY

The 2002 URSI General Assembly will be held 17-24 August 2002 in Maastricht, Netherlands. There will be a joint session organized by Commissions H, G, and E, titled: "Lightning effects in the ionosphere and the radiation belts". Session Organizers: Steve Cummer, Craig Rodger, and Yasuhide Hobara. This session will cover all aspects of coupling between lightning and the ionosphere/magnetosphere system. This includes direct interactions, such as those leading to transient optical emissions like sprites and jets, and indirect interactions, such as whistler-induced magnetospheric particle precipitation and its effect on the radiation belts. Papers reporting experimental and theoretical results on these and

related topics, such as the local and global effects of these processes and the characteristics of lightning responsible for these phenomena, have been solicited. Information available on the web at: http://www.ursi-ga2002.nl.

26th INTERNATIONAL CONFERENCE ON LIGHTNING PROTECTION

The 26th International Conference on Lightning Protection, ICLP 2002 will be held at Cracow in Poland 2nd to 6th September 2002. This conference will provide an excellent opportunity for scientists, engineers, designers and users of lightning protection systems, from a wide range of universities and industry, to present and discuss the latest scientific results and share their practical experience in the field of lightning protection technology. http://www.iclp2002.pl.
Notification of final acceptance of presentation is given before June 1st 2002.
Main topics are:
1. Lightning discharge
2. Lightning occurrence characteristics
3. Lightning electromagnetic impulse (LEMP) and lightning-induced effects
4. Lightning attachment
5. Lightning down-conductors and grounding
6. Lightning protection of power systems
7. Lightning protection of electronic systems
8. Lightning deleterious effects
9. Practical and specific lightning protection problems
10. Lightning protection and lightning testing standards
For more information, visit website: http://www.iclp2002.pl.

MID-ATLANTIC WINTER STORMS REGIONAL CONFERENCE

The AMS Board for Operational Government Meteorologists, District of Columbia AMS Chapter, AMS Board of Private Sector Meteorology, and National Weather Association's Weather Analysis and Forecasting Committee are co-sponsoring an operations- and community-focused regional conference on Mid-Atlantic Winter Storms. This conference will be held in the NOAA Auditorium and Science Center, Silver Spring, Maryland, on 3–5 October 2002. The NOAA Auditorium and Science Center is adjacent to the National Weather Service Headquarters.
The theme of the 2002 conference is "Improving Mid-Atlantic Winter Storm Forecasts, Warnings and Decision Making." This regional conference is the first in a series of meetings focused on areas of regional interest. We plan on this conference serving as a prototype for future and continued efforts to understand and address regional challenges and issues.
For further information visit AMS website (http://www.ametsoc.org/AMS).

34th COSPAR SCIENTIFIC ASSEMBLY

The second World Space Congress will be held at Houston, TX, USA, 10-19 October 2002. Of special interest for our community is session C2.6: Changing Middle Atmosphere

Electrodynamic Phenomena included in Scientific Commission C: Space Studies of the Upper Atmosphere of the Earth and Planets including Reference Atmospheres.
CALL FOR PAPERS:
An important, and somewhat neglected, area of middle atmosphere science concerns the broad range of electrodynamic phenomena occurring there. Changes of such phenomena, over a very large range of temporal scales, are the topics to be discussed in this event, and will include:
* the effects of lightning, blue jets, sprites and elves,
* Schumann resonance effects,
* solar flare and auroral effects on the global atmospheric electric circuit, ion chemistry and electrical conductivity profiles,
* longitudinal and tidal effects,
* solar rotation, cosmic ray (Forbush decrease) and geomagnetic storm effects, and
* solar cycle effects, due both to solar UV radiation and to galactic cosmic ray changes.
Observations, theory and numerical simulations will all be considered, in order to improve our understanding of the physics underlying such different phenomena in our changing atmosphere: particular attention will be paid to positive and/or negative feedback effects. The event will be comprised of a balanced mixture of solicited presentations, contributed papers and poster presentations.
The main scientific organiser is Michael J.Rycroft (Professor) CAESAR Consultancy, 35 Millington Road, Cambridge CB3 9HW, U.K. (michael.j.rycroft@ukgateway.net), Phone: +44 (0)1223 353839, Fax: +44 (0)1223 303839. For more information visit the website: http://www.copernicus.org/COSPAR/COSPAR.html. The final deadline for abstracts submission was 1 May 2002.
This event is co-sponsored by ICAE(IAMAS/IUGG), NCAR, SCOSTEP, and URSI.

2002 INTERNATIONAL LIGHTNING DETECTION CONFERENCE

The 2002 International Lightning Detection Conference, sponsored by Global Atmospherics, Inc., will be held 16–18 October 2002, in Tucson, Arizona, at the University Park Marriott. Topics will include meteorological correlations, lightning signatures, geographic and orographic effects on observed lightning parameters, global lightning detection, 3-dimensional lightning mapping, large-scale (regional/continental) lightning network integration, forecasting and nowcasting improvements, forensic analysis and damage investigation, electric power line performance, telecommunications issues, aviation management, and developing safety recommendations.
For those who received abstracts acceptance notification, final papers are due 15 August 2002. Contact gstevens@glatmos.com. For further information please contact: Shelly Denman, 2002 ILDC Coordinator, Global Atmospherics, Inc., 2705 East Medina Road, Tucson, AZ 85706 (tel: 520-806-7498 or 800-283-4557, fax: 520-741-2848, e-mail: sdenman@glatmos.com).

3th BRAZILIAN WORKSHOP ON ATMOSPHERIC ELECTRICITY

The Atmospheric Electricity Group (ELAT) of the Brazilian National Institute of Space Research (INPE) is organizing the Third Brazilian Workshop on Atmospheric Electricity. The focus of the event is on the following topics: lightning physics, detection, observations and effects; thunderstorm dynamics and electrification; and electrical properties of the

atmosphere. Relevant contributions in other related topics could be considered. The event will be held in Rio de Janeiro from 04 to 07 Nov 2002. The first two events were in São Paulo in 1997 and in Rio de Janeiro in 1999 during the 5th and 6th International Congress of the Brazilian Geophysical Society. At this time, the event will occur together with the Ground' 2002 International Conference on Grounding and Earthing, which will be held in the same hotel. Authors interested to present a paper in the event were invited to submit a free format abstract before June 15 (extended deadline) to "osmar@dge.inpe.br", with copy to "lrc@cpdee.ufmg.br". A notification of acceptance will be sent. For the accepted abstracts, a full text should be sent until August 20. For further information contact:
ELAT Coordinator: Dr. Osmar Pinto Junior
Address: INPE, Av. Astronautas 1758
S.J. Campos, SP – Brazil 12227-010
Phone: 55-0xx-12-39456777, Fax: 55-0xx-12-39456810
E-mail: osmar@dge.inpe.br

2002 AGU FALL MEETING

The 2002 AGU Fall Meeting, sponsored by the American Geophysical Union, will be held 6 – 10 December 2002 in San Francisco, California, U.S.A. For detailed information, contact: AGU Meetings Department, 2000 Florida Avenue, NW, Washington, DC, 20009 USA; Phone: +1-202-462-6900; Fax: +1-202-328-0566; E-mail: meetinginfo@agu.org; Web Site: www.agu.org/meetings.

15th INTERNATIONAL ZURICH SYMPOSIUM AND TECHNICAL EXHIBITION ON ELECTROMAGNETIC COMPATIBILITY

The 15th International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility is planned for February 18-20, 2003 at the Swiss Federal Institute of Technology (ETZ) in Zurich, Switzerland. Vlad Rakov has been invited to organize and chair a Special Session on Lightning and Its Effects. Papers for this Special Session may be submitted on the following topics.
Properties of the lightning discharge important for EMC
Lightning return-stroke models
Lightning EMP
Coupling of lightning electromagnetic fields to overhead and buried conductors
Lightning locating systems
Atmospherics
Lightning effects in the middle and upper atmosphere
Lightning protection
Lightning testing standards
Original, not previously published or elsewhere submitted preliminary manuscripts shall be sent electronically (preferred) to emc@nari.ee.ethz.ch or in 2 copies to:

Technical Program Committee EMC Zurich '03
ETH Zentrum - IKT, ETF
Sternwartstrasse 7
CH-8092 Zurich, Switzerland

so that they arrive not later than July 1, 2002. The manuscript (in English) should not exceed 3600 words (6 pages in the final form including figures and tables). The format and style of

the preliminary manuscript should have the character of a detailed description and must include key figures, diagrams, and data. The manuscript should be preceded by a 100-word abstract containing concepts and results, which are new with respect to previous work in the area. Please see the Call for Papers for further information at:

http://www.emc-zurich.ch/emc03/CfPemc03.html.

All contributions will be reviewed by the Technical Program Committee. To facilitate anonymous reviewing, authors' names and addresses with professional affiliations, phone, fax numbers, and E-mail addresses should be quoted on a separate sheet or file. Authors will be notified by September 16, 2002, author's kits will be enclosed. Camera-ready manuscript will be due by November 25, 2002.

2003 EGS – AGU – EUG JOINT ASSEMBLY

The 2003 European Geophysical Society – American Geophysical Union – European Union of Geosciences Joint Assembly will be held 7 – 11 April 2003 in Nice, France. It will be sponsored by EGS, AGU, and EUG. Contact: EGS office, Max-Planck-Str. 13, 37191 Katlenburg-Lindau, GERMANY; Phone: +49-5556-1440; Fax: +49-5556-4709; E-mail: egs@copernicus.org; Web Site: www.copernicus.org/EGS; Deadline for receipt of abstracts : 15 January 2003; Deadline for pre-registration 07 March 2003

12th INTERNATIONAL CONFERENCE IN ATMOSPHERIC ELECTRICITY

As it has been decided by the International Commission on Atmospheric Electricity during the 11th Conference held in Huntsville (Alabama, USA) in 1999, the Versailles (France) in 2003. The period chosen is 9-13 June. The 12th International Conference on Atmospheric Electricity is a unique opportunity to present and discuss the newest results and to assess the most relevant issues on atmospheric electricity and lightning physics. Young scientists are especially encouraged to attend the meeting and present the results of their research.

Most of the topics related to electricity in Atmosphere will be addressed: Fair Weather Electricity, Physics of lightning, Lightning Protection …

Deadline for abstract submission is 1st September 2002. The overall information on the Conference is available on the website of the International Commission on Atmospheric Electricity : http://www.atmospheric-electricity.org/.

XXIIIrd IUGG GENERAL ASSEMBLY

The XXIIIrd General Assembly of the International Union of Geodesy and Geophysics will be held in Sapporo, Japan, June 30 – July 11, 2003. The scientific program intends to highlight the latest developments in the relevant fast-breaking sciences, as well as reviewing progress in the traditional fields. Amongst the various associations depending from IUGG, IAMAS

(International Association of Meteorology and Atmospheric Sciences) will be present. The ICAE is one of the specialized commissions related to IAMAS. More information is available on the website: http://www.jamstec.go.jp/jamstec-e/iugg/index.html.

More information about conferences on websites of AGU (www.agu.org/meetings**) and AMS (**http://www.ametsoc.org/AMS**).**

RESEARCH ACTIVITY BY ORGANISATION

THE UNIVERSITY OF ARIZONA (Tucson, Arizona, USA)

N. D. Murray, E. P. Krider, and J. C. Willett have re-examined the sub-microsecond structure of dE/dt and E waveforms that are radiated during the onset of first return strokes in cloud-to-ground lightning. They find that most strokes produce multiple pulses in dE/dt during the slow front and/or during the fast transition in E, and as a result there are often very narrow peaks and considerable fine-structure in the associated E signatures. G. Baffou and N. Murray are currently extending this study to include the waveforms that are radiated by individual steps within the stepped-leader process.
N. D. Murray and E. P. Krider are also examining the spatial and temporal coherence of the space charge that is generated within and near the surf zone at the NASA Kennedy Space Center (KSC). N. D. Murray and E. P. Krider also participated in the ABFM measurement campaigns at the KSC during the summers of 2000 and 2001.
N. G. Parker and E. P. Krider have developed a portable data collection platform for making optical and electromagnetic measurements of lightning in conjunction with video imagery. Initial applications of this system have extended W. J. Valine's work on the luminous development of cloud-to-ground (CG) lightning and provide new data on the development of multiple ground contacts in CG flashes, attempted leaders, and horizontal air discharges. In the future, we plan to operate several such systems at different locations so that we can study the geometry of lightning channels in 3-dimensions.
N. M. Kempf and E. P. Krider have extended B. Gungle's work on the relationships between CG lightning and convective rainfall by examining data obtained during The Great Flood of 1993 in the Upper Midwest and also data obtained at an instrumented watershed in Southern Arizona. The values for the precipitation volume (and integrated streamflow) per CG flash during The Great Flood are in remarkably good agreement with results obtained by Petersen and Rutledge (and others) in the same geographic region.
C. D. Weidman and P. Lewis have developed photoelectric sensors that elementary, middle, high school, and college students can use to help validate the performance of satellite lightning sensors.

DEPARTMENT OF PHYSICS INDIAN INSTITUTE OF TECHNOLOGY ROORKEE (Roorkee - 247 667 INDIA)

The Physics Department, Indian Institute of Technology Roorkee (Formerly University of Roorkee) organized the National Workshop on Recent Development in Atmospheric and Space Sciences from March 18-20, 2001. About 100 scientists from throughout India participated in it. Proceeding of the workshop has been printed and released. Prof. Jagdish Rai was the convener of the workshop and Prof. Vir Singh as co-convener. Jagdish Rai and D. K. Sharma have analyzed the data collected using RPA payload abroad SROSS-C2 satellite in the altitude range 425-625 km. They have found that during thunderstorm activities the electron and ion temperatures increase. The increase in the ion densities H+, He+, O+ and O2+ have been found to be insignificant in the above altitude range. They are studying the

Te/Ti ratio problem above different locations over Indian subcontinent. This effect is also being studied theoretically by D. K. Sharma, Smita Darmora and Jagdish Rai:
The studies on atmospheric particles and electrical conductivity during different weather conditions have been made by A. K. Singh. Recently Dr. A. K. Singh joined the Space Application Center of ISRO (Indian Space Research Organization) at Ahmedabad. M. P. Singh is engaged in the studies on the application of atmospherics in geophysical exploration. He has done theoretically studies on the ratio of horizontally and vertically polarized components of lightning electric fields and it's relation to soil electrical conductivity structure.

UNIVERSITY OF FLORIDA (Gainesville, Florida, USA)

Triggered-lightning experiments will continue in Summer 2002 (for the tenth 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 observations and (2) continued studies of the interaction of lightning with power distribution lines (both direct and induced effects).
Jens Schoene defended his Masters thesis titled “Analysis of Parameters of Rocket-Triggered Lightning Measured During the 1999 and 2000 Camp Blanding Experiment and Modeling of Electric and Magnetic Field Derivatives Using the Transmission Line Model”.
Farhad Rachidi (Swiss Federal Institute of Technology in Lausanne (EPFL)), Carlo Alberto Nucci (University of Bologna, Italy), Vladimir A. Rakov (UF), and Jose Luis Bermudez (EPFL) authored a paper titled “The Effect of Vertically-Extended Strike Object on the Distribution of Current Along the Lightning Channel”. Based on a distributed-source representation of the lightning channel, several engineering lightning return stroke models are generalized to take into account the presence of a vertically-extended strike object (tower). Treatment of the impedance discontinuity at the tower top is improved relative to previously published models. The distribution of current along the lightning channel for each model is expressed in terms of the “undisturbed” current, object height, and current reflection coefficients at the top and at the bottom of the object. The undisturbed current is defined as the current that would flow in the channel if the current reflection coefficients at the extremities of the strike object were equal to zero, that is, the characteristic impedances of the lightning channel and the strike object were equal to each other and equal to the grounding impedance of the strike object. The strike object is modeled as a lossless uniform transmission line, and the reflection coefficients are all assumed to be constant. The distribution of current along the strike object is independent of the return-stroke model, provided that the same undisturbed current is specified for each model. The paper has been submitted to the Journal of Geophysical Research.
Vladimir A. Rakov, Martin A. Uman, Mark I. Fernandez, Carlos T. Mata, Keith J. Rambo, Michael V. Stapleton, and Rafael R. Sutil authored a paper titled “Direct Lightning Strikes to the Lightning Protective System of a Residential Building: Triggered-Lightning Experiments”. Lightning triggered from natural thunderclouds using the rocket-and-wire technique was employed to subject to direct lightning strikes the lightning protective system of a test house at the ICLRT at Camp Blanding, Florida. The electrical circuit of the test house was connected to the secondary of a padmount distribution transformer located a distance of about 50 m from the house. The transformer primary was connected to a 650-m long unenergized underground power cable. The test house had two ground rods, one for the lightning protective system grounding and the other for the power supply system grounding. The two rods were about 3 m apart and were connected by a metallic cable. Lightning current

was injected into the lightning protective system ground rod, and the currents and voltages at different point in the test system were measured. The waveshapes of currents in the ground rods of the test house differed markedly from the current waveshapes in other parts of overall system. The ground rods at the test house appeared to filter out the higher frequency components of the lightning current, allowing only the lower frequency components of the current to enter the house's electrical circuit. Thus the ground rods appeared to exhibit a capacitive behavior rather than the often-expected resistive behavior. This effect was observed for dc grounding resistances of the rods (driven in sandy soil with conductivity of about 2.5 x 10^{-4} S/m) ranging from more than a thousand ohms to some tens of ohms. The peak values of (1) the current entering the test house's electrical circuit, (2) the current flowing to the distribution transformer secondary neutral, and (3) the current flowing through the surge protective devices at the test house's service entrance were observed to be greater than in two scenarios suggested by the International Electrotechnical Commission (IEC). The paper is published in the IEEE Trans. on Power Delivery, vol. 17, No. 2, pp. 575-586.

FMA RESEARCH INC. (Fort Collins, Colorado, USA)

FMA Research, Inc. continues its ongoing analyses of the extensive STEPS 2000 database. The observations from Yucca Ridge, in spite of a dearth of storms, were successful. Over 100 sprites were detected within range of New Mexico Tech's 3-D Lightning Mapping Array (LMA). In conjunction with ELF measurements acquired by Steve Cummer (Duke), Earle Williams (MIT), Martin Fullekrug (Germany) and others, a wealth of data are available to investigate the special characteristics of lightning discharges which produce sprites and other transient luminous phenomena. Walt Lyons and Tom Nelson co-authored a paper with Colin Price in a recent issue Geophysical Research Letters. This paper describes greatly improved results for geolocating sprite parent +CGs at a range of 11 Mm using a hybrid VLF/ELF technique. The charge moments associated with many confirmed sprites during STEPS have been reported in Hu et al., (2002). As anticipated the sprite parent +CGs generally had very large charge moment changes, 600 to 1000 C km or higher. Ongoing analyses of the LMA data are suggesting that, for the small number of cases studied so far, that the sprite parent lightning discharge lowers charge from the 3-6 km layer, and not the 10 km level as postulated in numerous theoretical studies. FMA has inaugurated a new division, Sky Fire Productions. We will be creating, also under NSF support, a DVD program for planetariums entitled, "The Hundred Year Hunt for the Red Sprite," which will have a companion educational website (www.Sky-Fire.TV). The debut presentation will be late summer, 2002, at the U.S. Air Force Academy Planetarium in Colorado Springs. Walt Lyons is currently serving as subject matter editor for Atmospheric Electricity for the Bulletin of the American Meteorological Society. BAMS welcomes short articles, especially reviews, on lightning and related phenomena. In addition to participating in several papers and posters at 2001 AGU Fall Meeting (including an invited paper in the memorial session honoring John R. Winckler), FMA has participated in additional papers listed in the "Publication section" of this Newsletter issue.

INDIAN INSTITUTE OF TROPICAL METEOROLOGY – PHYSICAL METEOROLOGY AND AEROLOGY DIVISION (Pune, India)

The Indian Institute of Tropical Meteorology (IITM) functions as a national centre for basic and applied research in monsoon meteorology of the tropics in general with special reference

to monsoon meteorology of India and neighborhood. Its primary functions are to promote guide and conduct research in the field of meteorology in all its aspects. Since its inception, the Institute is engaged in several scientific research programmes of National and International in the area of Meteorology and Atmospheric research. Its goals are to enhance the knowledge of Atmospheric Science by identifying and conducting research programme on problems of National and International importance. Its challenging area of the research is the Monsoon Meteorology. Beside this it also contributes significantly to area of Climate Modeling, Hydro-meteorology, Atmospheric Chemistry etc. Atmospheric Electricity is one of these areas, in which the research work is in progress by conducting field programmes, SERC School etc. These programmes were organized to have interaction of scientists working in different areas of Atmospheric Sciences.

In India the interest of thunderstorm and associated rainfall has be evinced for long time. It is an important weather phenomenon particularly during pre and post monsoon seasons over the Indian region. For meteorologists, thunderstorms are considered to be main channel of energy exchange in the atmosphere. For aviator it is an important aviation hazard to the aviation activity. A knowledge of therefore of thunderstorm climatology with respect to its frequency percentage occurrence is essential. Hence in the present study the authors have examined the percentage occurrences of thunderstorms and associated rainfall over the Indian region.

A comparative study of thunderstorm and rainfall activity over India is performed by S.S. Kandalgaonkar, M.I.R. Tinmaker, Asha Nath and P. Seetaramayya. Thirty years (1951-1980) mean monthly values of thunderstorms (TS) and rainfall (RF) amounts for 260 Indian Observatories spread uniformly over the country were used to obtain their monthly and seasonal percentage occurrences from all India totals. India has been divided into six homogeneous zones based on RF. These zones are Northwest India (NWI); North-central India (NCI); North-east India (NEI); West-peninsular India (WPI); South-peninsular India (SPI) and East-peninsular India (EPI) respectively. The percentage occurrence of TS and RF for individual zones is also obtained by using all India totals of TS and RF. These study has revealed that the monthly mean percentage occurrence of TS activity has exhibited bimodal oscillation and that of RF has shown a unimodal oscillation over the Indian region. There is a time lag of one month in the occurrence of first maxima of TS and RF which may due to prime period onset of SW monsoon over the Indian region.

Seasonal analysis of these two parameters suggest that the in the post-monsoon season the percentage occurrence of TS activity seem to tend to increase the percentage occurrence of RF, this may be due to the occurrence of tropical cyclone in the Bay of Bengal and Arabian sea. The negative value of correlation coefficient between TS and RF in the monsoon season may be due to the mixed modes of continental and monsoonal regimes of the convective rainfall. There may be mixing of these two modes because even in the monsoon season, the pre-monsoon kind of convection can dominate for the days on both the ends of the monsoon season. Six zone analysis of TS and RF has suggested that there exists a wide range of variations in both these parameters, month after month, in respective zone, but the 30 year mean percentage occurrence seem to be more or less equal in the magnitude of the percentages for both TS and RF in each zone.

INTERNATIONAL LIGHTNING RESEARCH CENTER (Cachoeira Paulista, BRAZIL), INDELEC: NATURAL AND TRIGGERED LIGHTNING ACTIVITY

For the third consecutive year an experimental campaign on natural and triggered lightning was held from November 20, 2001 to February 20, 2002, on Cachoeira Paulista site (Sao

Paulo state) in Brazil. Initiated by INDELEC (France and Brazil), in collaboration with the National Institute of Space Research (INPE), the University of Campinas (UNICAMP) and Belo Horizonte (UFMG), this in situ research center on lightning is now perfectly operational. It received in 2001, the support of France Telecom (Studies and Research of Lannion) and Telebras (Campinas).
The conditions of triggering were confirmed as being more difficult than on Florida and France sites, due in particular to the tropical weather characteristics, generating strong storms within short durations, with in particular high level of thunderstorm cloud bases.
The last campaign allowed to identify the parameters to improve the triggering system in order to reach significant success rate. Indeed altitudes of triggering are about 400 to 600 meters, compared to the 50 to 250 meters of the sites of Florida, New Mexico and France. One of the consequences (positive) is that the average amplitude of current is 27,5 kA, more than twice the average observed on the others sites.(13,5 kA).
Indelec Company carries on tests on their Early Streamer Emission lightning rods (ESE) on the Cachoeira Paulista triggering site.
On the other hand, France Telecom and Telebras have taken profit of the very active storm period from their experimental lines instrumented to compile numerous electromagnetic data. Encouraged by these results, they plan an evolution of their experimentation, towards direct strikings of the lines of tests.

LOS ALAMOS NATIONAL LABORATORY. SPACE AND ATMOSPHERIC SCIENCES GROUP (Los Alamos, New Mexico)

Abe Jacobson, FORTE project leader (ajacobson@lanl.gov) reports :
The FORTE satellite continues to be used in the study of lightning. Recent reports available as PDF files on the Web at : http://nis-www.lanl.gov/nis-projects/forte_science/ include:
FORTE Observations of Simultaneous VHF and Optical Emissions from Lightning: Optical Source Properties and Discrimination Capability - LA-UR-01-5187.
Multi-Sensor Observations of Lightning from Space Using the TRMM and FORTE Satellites - LA-UR-02-0526.
Characteristics of impulsive VHF lightning observed by the FORTE satellite - LA-UR-01-6407.
A Clustering Algorithm for the Automated Storm Identification of Space-Based Optical Lightning Data - LA-UR-01-5189.
Polarization Observations of Lightning-Produced VHF Emissions by the FORTE Satellite - LA-UR-01-3316 PDF.
On-orbit direction-finding of lightning radio-frequency emissions recorded by the FORTE satellite - LA-UR-01-3604.
LF/VLF and VHF Lightning Fast Stepped Leader Observations - LA-UR-01-3695.
FORTE satellite observations of very narrow radiofrequency pulses associated with the initiation of negative cloud-to-ground lightning strokes - LA-UR-01-6320.
Identifying Storms in Noisy Radio Frequency Data via Satellite: an Application of Density Estimation and Cluster Analysis.
Joint Observations of Marine Lightning Over the Atlantic by the FORTE Satellite and the United Kingdom Meterorological Office Sferics Array - LA-UR-02-62 PDF
VHF Radiation Beam Pattern of Return Strokes Observed by the FORTE Satellite - LA-UR-01-5060 PDF.
Ionospheric Profiling Through Radio-Frequency Emissions Recorded by the FORTE Satellite - LA-UR-01-6326 PDF.

Leader Studies with the Los Alamos Sferic Array - LA-UR-01-4198.
These reports are typically rough preprints intended for informal use, and they should not be cited in formal references. Eventual published versions in journals should be cited instead.

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

As part of ongoing work with the FAA to identify hazardous conditions to aviation over oceans, globally located lightning flashes have been paired with oceanic mesoscale convective systems (MCSs). The global lightning data set is comprised of energetic Q-bursts located with Schumann resonance methods from West Greenwich, Rhode Island. The oceanic MCSs are identified in NASA TRMM (Tropical Rainfall Measuring Mission) infrared imagery (VIRS) with an algorithm devised with Erich Stocker at NASA GSFC. As anticipated on the basis of earlier studies by Zipser and his colleagues, continental matches predominate over oceanic matches. In the oceanic subset, the MCSs with verified Q-bursts show lower mean cloud top temperatures than those without lightning, but there is considerable overlap between the two populations of mean temperatures. A study of the relationship between MCS area and the measured vertical charge moments of the Q-bursts is currently underway.

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

Following up on participation in a Paris Workshop on Thunderstorms organized by Anne Bondiou at ONERA last November, Earle Williams and Sharon Stanfill have recently submitted a manuscript to Comptes Rendus entitled "The Physical Origins of the Land-Ocean Contrast in Lightning Activity". This study confronts both the traditional thermal hypothesis and the aerosol hypothesis as explanations for this contrast. The study considers islands as miniature continents and quantifies the dependence of electrical activity on island area to discriminate mechanisms; in this test the thermal hypothesis is supported. The resolution of the "CAPE paradox" between land and ocean (i.e., large oceanic CAPE with little lightning) is resolved by expanding on ideas of other investigators. Further evidence is presented to support the idea that the updraft width scales with cloud base height, and cloud base heights over land are 2-5 times greater than over oceans. Broader continental updrafts are less prone to mixing and more prone to achieve velocities predicted on the basis of parcel theory.
With considerable assistance from Mike Stewart, the new wideband (3 Hz- 20 kHz) antenna for the vertical electric field component in Rhode Island is complete. We have had a first glimpse at the complete bandpass--the Schumann resonance modes, the 'slow tail' region, the waveguide cutoff centered near 1.5 kHz, and the increase again to the sferics region. Student David Lowenfels is busily notching out harmonics of 60 Hz with DSP methods to clean up the entire band for geophysical analysis.

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

(www.lightningsafety.com)

We have added information to our "lightningsafety.com" website which may be of interest to AE Newsletter readers.

1. Twenty lightning protection codes and standards from many countries, see: www.lightningsafety.com/nlsi_bus/nlsi_pub1.html

2. Lightning isokeraunic and flash density maps from six countries and the world at large, see: www.lightningsafety.com/nlsi_info/lightningmaps/worldlightning.html

3. A summary of NLSI's approach to lightning hazard mitigation for structures, including explosives and sensitive electronics facilities, can be reviewed at "Structural Lightning Safety", see: www.lightningsafety.com/nlsi_lhm/lightningeffects.html

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

The National Severe Storms Laboratory is continuing its analyses of data from the STEPS field program in collaboration with other organizations. One analysis of these data has been accepted for publication: Rust, W. D., and D. R. MacGorman, 2002: Possibly inverted-polarity electrical structures in thunderstorms during STEPS. Geophys. Res. Lett. A project analyzing electric field structure in the mesocyclone region of supercell storms is nearing completion. Several other analysis projects are underway.

Update of facilities destroyed by the July 2001 fire at NSSL: The report from the Norman Fire Investigator states that the fire was intentionally set and had multiple ignition locations. The suspect has been arrested. We thank all who have inquired about and supported our continuing efforts to recover from the fire. Recovery activities include installation of a lightning mapping array built by New Mexico Tech for the University of Oklahoma and NSSL in central Oklahoma to begin in June, fabrication of mobile mesonet systems, and procurement of a vehicle to be a mobile laboratory/mobile ballooning facility. Work is also underway in collaboration with New Mexico Tech to improve the balloon-borne electric field meters.

NORTH CAROLINA STATE UNIVERSITY (NCSU, Raleigh, North Carolina, USA)

Larry Carey (larry_carey@ncsu.edu) and Tracy McCormick of NCSU have begun a collaborative project with Martin Murphy and Nick Demetriades of GAI-Vaisala Inc to study the relationship between three-dimensional total lightning patterns and severe storm morphology over the Dallas-Fort Worth (DFW, Texas) area. The GAI-Vaisala Inc Lightning Detection and Ranging (LDAR II) network for the DFW area will provide the three-dimensional (3D) total lightning measurements.

This network was specifically designed to detect, locate, analyze, display, and archive cloud-to-ground and cloud lightning strikes in 3D. The DFW network uses seven (7) Very High Frequency (VHF) Lightning Detection and Ranging (LDAR II) technology sensors. This 7-sensor network provides high-quality lightning information with very high flash detection efficiency of over 90% and excellent median event location accuracy of less than 250 meters.

LDAR II measured total lightning will be compared to severe storm morphology, as inferred from the KFWS WSR-88D radar and GOES satellite, and the meteorological environment. It is well known that the total lightning flash rate is well correlated to updraft strength in vigorous convection with an active mixed phase zone. Since the strength of the updraft is either directly or indirectly responsible for the production of severe weather (e.g., hail,

tornadoes, winds, heavy rain/flash flooding) in this situation, there is great promise in the utilization of total lightning as a forecasting tool for the short term prediction of severe weather.
As in recent studies, the project will explore the relationship between the total lightning flash rate and the occurrence of severe weather. However, the focus of this project will be a basic investigation of the 3-D spatial structure and temporal evolution of total lightning flash source location and VHF source density within the context of radar derived kinematic and precipitation structure. The ultimate goal will be to study the predictive value of 1) total lightning flash rate, 2) in-cloud/cloud-to-ground (IC/CG) ratio, 3) percentage of positive CG lightning, 4) VHF lightning source density and 5) lightning flash origins in nowcasting severe weather as a function of storm type and the meteorological environment.

THE UNIVERSITY OF READING (Reading, United Kingdom)

The work at Reading is investigating physical links between atmospheric electricity, clouds and climate. This has concentrated on (1) theoretical work on the enhanced removal of charged aerosol by water drops, and (2) experimental investigations into the formation of ultrafine aerosols from small ions.
On the first topic, Sachchida Tripathi has made new numerical simulations of the removal rates of charged aerosols by water droplets, using theory including the electrical image force. In the case of highly-charged aerosols, such as those carrying radioactive material, the aerosol removal rates by water droplets are greatly increased (*Atmos Environ*, **35,** 33, pp 5817-5821, 2001). Because of the effect of the image force however, particles with even smaller charges are removed more effectively than uncharged aerosol, for certain radii. On the particle formation topic, simultaneous observations of increases in small ions and ultrafine aerosol particles have been reported (*J. Atmos. Solar Terrestrial Physics* **63**, 17, pp1811-1819, 2001), using the ion mobility spectrometers developed by Karen Aplin. These findings support the theoretical work which shows a link between atmospheric ions and condensation nuclei, and potentially therefore with cloud processes. Further indirect evidence for this climate link was found by examining the radiative measurements made during the nuclear weapons tests in the 1960s (*Atmos Environ* **36**, pp159-160, 2002), when atmospheric ionisation rates were artificially greatly increased.
To investigate long term changes in atmospheric electricity associated with climate change, Giles Harrison has started to compile and reconstruct atmospheric electrical data from observatories operating in the late nineteenth and early twentieth century. Potential Gradient data was been archived from 1843 in the UK, with high resolution data available from 1898-1981. He is particularly interested in obtaining sources of data from other European observatories, such as those at Paris, Potsdam and Lisbon. The global nature of atmospheric electrical measurements means all data in unpolluted air is of interest. Please email him (r.g.harrison@reading.ac.uk) if you are aware of the sources of regular Potential Gradient measurements made before 1950, or any atmospheric electrical data obtained before 1900.

SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY, INSTITUTE OF ATMOSPHERIC SCIENCES (Rapid City, South Dakota, USA)

Andrew.Detwiler@sdsmt.edu or John.Helsdon@sdsmt.edu

The SDSMT armored T-28 will be involved in a one-month field program during June, 2002, in association with the CSU-CHILL polarimetric radar. The goals are to observe hydrometeor distributions and NO production by lightning. The hydrometeor observations will supplement the database used in ongoing radar hydrometeor signature research programs involving V. Chandrasekar and V. N. Bringi at CSU, and P. Smith at SDSMT. The NO observations will supplement observations obtained during the STERAO field program in 1996, and the associated modelling studies of J. Helsdon.

Our analysis of STEPS storms continues. Analysis of radar, LMA, and airborne observations for several storm days is underway, including June 29, June 23, and June 11, 2000. The goal is to work out the links between an inverted or non-traditional positive dipole/tripole storm electrical structure, and storm microphysics/dynamics. Contributors include T. Warner, D. Kliche, Q. Mo, J. Helsdon, and A. Detwiler. R. Farley and J. Helsdon have a 3D simulation of the June 29 storm including electrification and lightningunder development.

Mr. Xingjun Zhang has completed his PhD dissertation work under J. Helsdon. The work involves the modeling of lightning production of NO using the IAS Storm Electrification Models. The final part of the dissertation involves a simulation of the 10 July 1996 STERAO storm. Using the same initialization of Skamarock et al. (2000), with 3 simultaneous cells, we were able to simulate three hours of the multicell stage of the observed storm. The results indicated anvil NO concentrations that were a factor of 8 larger than observed. This overestimate showed the necessity of modifications to the model physics - including breakeven field lightning initiation and pressure dependent NO production - and sensitivity tests of the NO production parameter and the lightning charge transfer parameter. Since the results were in qualitative agreement with the observations, model runs with the listed modifications should result in quantitative agreement as well.

Once quantitative agreement is achieved, the model can then be used to aid in the development of parameterizations of lightning NO production in models without explicit lightning physics.

TEXAS A&M UNIVERSITY, DEPARTMENT OF ATMOSPHERIC SCIENCES (College Station, Texas 77843-3150, USA)

Research at Texas A&M University is concentrating on the analysis of information from the North American Lightning Detection Network (NALDN). Interesting features in the accumulating data reveal a high percentage of positive lightning along the British Columbia - Alberta Province border and the west coast of the United States; high median peak positive currents that do not extend into Canada as we previously hypothesized. These analyses are being cooperatively performed by graduate students, Brandon Ely and Scott Steiger, in cooperation with Ron Holle and Ken Cummins of GAI, Bill Burows of the Meteorological Service of Canada, and Gary Huffines of the Air Force Institute of Technology. A paper on the NALDN is now in press in the Monthly Weather Review.

Scott Steiger is continuing his work on the Houston lightning anomaly first reported last summer in a GRL paper. We discovered an unusually high lightning ground flash density in the Houston area that ranks second only to the Tampa Bay, Florida area. This research, with authors Renyi Zhang, John Nielsen-Gammon, Scott Steiger, Brandon Ely, Stephen Phillips, Steve Allen (National Weather Service-Houston), and Bill Read (also the NWS) is expanded in another paper that is in press in the JGR-Atmospheres. The source of the enhanced lightning activity is hypothesized to occur because of the unique convergence produced by the Texas coastline in this area, the high population density of Houston, and the extensive petroleum refining capacity in the area that accounts for 50% of the USA's refining capacity.

In an effort to better understand the enhanced lightning activity in the Houston area, we are proposing the Houston Environmental Aerosol Thunderstorm (HEAT) project for the summer period(s) of 2004/2005. Funding is committed by the TNRCC (Texas Natural Resources Conservation Commission) for this period and other agencies will be contributing to this field program as the experimental time, still two years away, approaches. Atmospheric chemistry and atmospheric electricity are central to the proposed study and papers will be presented on this topic at the spring AGU meeting in Washington DC.

UNIVERSITY OF TEXAS AT DALLAS (Texas)

Report on an Organization for Research:
The SPECIAL II (Space Weather and the Earth's Weather and Climate) Scientific Network is an ESF sponsored network, set up to explore the physical mechanisms by which space weather and space climate are causually linked to Earth's weather and climate by solar effects and aerosols, the two largest uncertainties in the IPCC 2001 report. In this research area, electrodynamic and electromagnetic processes in the atmosphere, including the global electric circuit, are investigated to determine possible links between solar activity, magnetospheric variability, clouds, thunderstorms, and lightning. The network has a web site at http://www.sgo.fi/special.

A. I. VOEIKOV MAIN GEOPHYSICAL OBSERVATORY – CLOUD PHYSICS, CLOUD SEEDING, AND SOLAR RADIATION DEPARTMENT (sinkev@main.mgo.rssi.ru)

Dr. A. A. Sinkevich chief of the Department, reports on the «Role of electrical discharges in cloud microphysics and electrical field strength changers. », by Dovgaluk J.A., Kashleva L.V., Pershina T.A., Ponomarev Yu.Ph., Sinkevich A.A., Stepanenko V.D., and Veremei N.E.
Investigations to study the effect of electric discharges of various types on fog spectra have been carried out in cloud chambers. Corona dischargers were produced in cloud chamber and freezing temperature of drops were measured. It was obtained that corona discharges can cause a rise of freezing temperature up to -5 - -6 °C. The dependence of drops freezing temperature from distance to corona discharges was also studied. Streamers were produced in Large Volume MGO cloud chamber with the help of high voltage Tesla transformer. Data analyze clearly show that one can observe fog particles enlargement due to streamers. They also provide great increase in fog volume charge and hence electrical field strength.
Theoretical investigations of the role of corona dischargers in cloud characteristics changers have been carried out with numerical cloud model. Results of these investigations have shown that corona dischargers can play significant role in cloud electrization.

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