NEWSLETTER ON ATMOSPHERIC ELECTRICITY

Vol. 13 No. 2 November 2002

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 (May 2003) will be welcome and should be submitted to Serge Chauzy or Pierre Laroche before April 30, 2003, preferably under word attached documents. A reminder will be sent to all colleagues whose e-mail addresses are presently listed.

ANNOUNCEMENTS

IN MEMORIAM MARX BROOK

Paul Krehbiel announced to the Atmospheric Electricity community that Marx Brook passed away last September 3, while in the hospital following emergency abdominal surgery. Marx was born on July 12, 1920 in New York City. He is survived by his wife of 55 years, Dorothy, and by children Janet, Jim, Georgia, and their families. Persons wishing to make a memorial contribution may do so by donating to the Esther and Abraham Brook Award Fund, established at Tech by Marx in memory of his parents, c/o Office for Advancement, New Mexico Tech, 801 Leroy Place, Socorro, NM 87801.

The outstanding tribute of Marx Brook to the field of atmospheric electricity cannot be summarized in a few words. A memorial writeup has been posted on the Langmuir Laboratory web page at:

http://www.ee.nmt.edu/~langmuir/mbrook.html .

You will find there substantial information on Marx career, discoveries and contributions to our discipline.

OBITUARY: DR. STANISLAW WARZECHA

Piotr Baranski and Marek Kubicki announce:

With great regret we inform that on September 22, 2002 our outstanding coworker Stanislaw Warzecha died unexpectedly. He received his Ph.D. degree from the Department of Climatology at the University of Wroclaw, and joined our electricity group at the Institute of Geophysics, Polish Academy of Sciences in 1956. He was the head of the Swider Observatory of our Institute for many years, from 1971 to 1993, and the author of meteorological and atmospheric electricity data yearbooks of this Observatory, published in Series D of the Publications of the Institute of Geophysics since 1957.

Basing on the long term Swider recordings, he and other authors were able to analyze variations in electric elements in relation to natural (solar activity) and anthropogenic (aerosol, radioactive debris) factors. The long-term excellent-quality data he collected are now an indispensable background for statistical analyses of local and global trends of various environmental parameters. Of particular importance was his report on the response of atmospheric electricity elements to the Chernobyl power plant accident, which indicated that the electric conductivity measurements may serve as a relatively simple tool for monitoring the radioactive hazard.

His papers dealing with atmospheric ions, air pollution and radioactivity were published in Przeglad Geofizyczny and presented on several international and domestic conferences. Together with S. Michnowski he studied the problems of gas to particle conversion of air pollutants and environment problems of influence of atmospheric electric, aerosol and radioactive parameters on human body.
Being the expert in atmospheric mystery life connections, he was also very skillful and talented electronic constructor of ion counters, vibrational electrometers, field mills and collectors, electric field and current amplifiers, instruments indicating raindrop charges, and many others. He constructed these instruments according to his unique design, with great deal of invention, and they are still reliable and very useful in observatory practice.
He was a very good colleague and friend. We all, especially members of our atmospheric electricity group at the Institute of Geophysics, feel his loss deeply.

NEW EU RESEARCH TRAINING NETWORK FOR ATMOSPHERIC ELECTRICITY: 7 POST DOC / Ph.D. POSITIONS AVAILABLE

The research training network "Coupling of Atmospheric Layers" CAL - concerns thunderstorms, electrical- and space radiation effects in the stratosphere, mesosphere and lower thermosphere. The network will study unanswered questions relating to discharges in the stratosphere and mesosphere, also termed "high-altitude lightning", their relation to various aspects of the atmospheric system and the overall dynamic response of the atmospheric layers to forcing of the mesosphere and lower thermosphere regions by thunderstorm and solar activity.

Objectives :
The investigation focuses on the question: "are these high-altitude discharges only pretty and beautiful like rainbows, or do they significantly impact the atmosphere ?". To answer this question, the network studies 7 aspects:
(1.) Under what conditions do thunderstorms generate sprites and blue jets ?
(2.) What is the sprite discharge mechanism ?
(3.) What is the global rate of discharges ?
(4.) How is the global atmospheric electric circuit affected ?
(5.) What are the chemical changes to the stratosphere and mesosphere ?
(6.) How do the discharges modify atmospheric circulation ?
(7.) How do they affect the ionosphere ?

The CAL network began 1 November 2002 and has a duration of four years. It will interact with many research teams all over the world in connection with international observational campaigns during the northern summer. Positions are open until filled.
For more details, visit the CAL project webpage at: http://www.dsri.dk/cal .

CONFERENCES

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.
The annual AGU Focus Group on Atmospheric and Space Electricity reception / meeting will be held on Saturday, 7 December from 5:45-7:00 at the Fall Meeting; Moscone Center Rm 125.

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
Submission deadline was July 1, 2002. Papers were submitted to the:

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

Please see the Call for Papers for further information at:
http://www.emc-zurich.ch/emc03/CfPemc03.html.

All contributions have been reviewed by the Technical Program Committee. Authors have been notified by September 16, 2002, author's kits being enclosed. Camera-ready manuscript were due by November 25, 2002.

SPECIAL II 2003 WORKSHOP (FIRST CALL)

The forthcoming SPECIAL II workshop in Frankfurt am Main, Germany, February 20-23, 2003, is now open for registration. The workshop will start on Thursday, Feb. 20th, 14:00 and will end on Sunday, Feb. 23rd., 13:00.
All contributions which relate to Space Processes and Electrical Changes Influencing Atmospheric Layers (SPECIAL), Space Weather and the Earth's Weather and Climate - Links between Solar Activity, Magnetospheric Variability, Clouds, Thunderstorms and Lightning, are warmly welcome. Particular attention will be given to contributions related to the seven SPECIAL Working Groups:
(1) Thunderstorms, global lightning, and ULF/ELF/VLF radiation associated with climate
(2) Intense tropospheric lightning and mesospheric transient luminous events such as sprites, elves, and blue jets
(3) Solar wind variability associated with tropospheric dynamics
(4) Ionospheric effects on the global atmospheric circuit
(5) Energetic charged particles and cosmic rays, and their relation to cloud morphology, dynamics and microphysics
(6) Electrical microphysics of ions and aerosols and their significance for clouds
(7) Global atmospheric electric circuit and current density variability affecting cloud microphysics
Please register as soon as possible through the ESF webpage at:
http://www2.esf.org/physical/pesc/Special/meeting_form.htm#top
The *final* deadline for registration is January 3rd, 2003. A detailed travel description to the venue is available at:
http://www.geophysik.uni-frankfurt.de/~fuellekr/SPECIAL/FFM
For more detailed information on the SPECIAL mission, please check: http://sgo.fi/SPECIAL .

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; The various deadlines are:
1. Deadline for Support Application: 01 December 2002
2. Deadline for "Early Bird" Registration: 31 December 2002
3. Deadline for Receipt of Abstracts: 15 January 2003
4. Deadline for Pre-Registration: 07 March 2003.

Call for Papers for Session ST22 on "Heliospheric influences on the Earth's weather and climate"

During the forthcoming EGS/AGU/EUG Joint Assembly, in Nice, France,April 6-11, 2003, a SPECIAL session on "Heliospheric influences on the Earth's weather and climate" will be held and calls now for submission of contributions. Event Information:

This session explores the physical mechanisms which causally link space weather and space climate to the Earth's weather and climate by heliospheric variability and aerosols via space processes and electrical changes influencing atmospheric layers. Atmospheric electrodynamic and electromagnetic processes are investigated to determine possible links between solar activity, magnetospheric variability, clouds, thunderstorms, and lightning. Solicited are in particular contributions which deal with the global atmospheric electric circuit and mesospheric sprites.

(1) The first section on the global atmospheric electric circuit deals with ionospheric variability effects on the global circuit, its current density variability affecting cloud microphysics, electrical microphysics of ions and aerosols and their significance for clouds, energetic charged particles and cosmic rays and their relation to cloud microphysics, and solar wind variability associated with tropospheric dynamics.

(2) The second section on mesospheric sprites deals with thunderstorm development and lightning generation, particularly intense lightning discharges, mesospheric transient luminous events such as sprites, elves and blue jets, global lightning activity and its association with surface temperature, water vapour, tropospheric ice, and climate variability.

Convener: Füllekrug, M.; Co-Conveners: Rycroft, M., Ulich, T., Shumilov, O.

Call for Papers for Session AS6.01 on “Microphysics and heterogeneous chemistry of aerosols”.

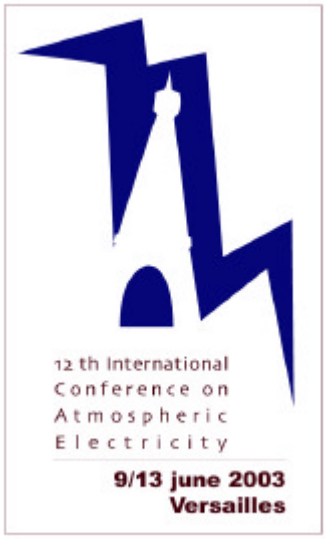
A large number of atmospheric physical and chemical processes involve aerosols. It is therefore the aim of session AS6.01 to provide a forum where recent and exciting advances in our knowledge of tropospheric aerosols can be discussed. We encourage you to present your work on microphysics and heterogeneous chemistry of aerosols in session AS6.01.

Key topics will be introduced by invited speakers: Barbara Finlayson-Pitts (UC Irvine), Scot Martin (Harvard University), Spyros Pandis (Carnegie Mellon University), and Thomas Peter (ETH Zurich).

The deadline for receipt of abstracts is 15 January 2003. For more information and to submit abstracts, please visit the website: http://www.copernicus.org/egsagueug/

Conveners: Thomas Koop and Christian George

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:

Storm Electrification
Electrical activity and meteorology
Lightning physics
Lightning Protection
Middle atmosphere electrical events (sprites, jets and elves)
Global Lightning Observations
Fair Weather Electricity and Atmospheric Ions
Global Electrical Circuit

Abstracts deadline was October 1st, 2002. Extended abstracts must be received by April 1st, 2003. On acceptation of the abstract, a four page paper, including figures and references, will be included in the conference proceedings.

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.

Call for papers of lightning session in IUGG GA 2003

Hiroshi Fukunishi, Martin Fuellekrug, and Davis D. Sentman report:

As conveners of the IAGA symposia in the upcoming IUGG XXIII General Assembly, we would like to inform you about the symposium "Lightning-induced Transient Processes in the Middle and Upper Atmosphere and Their Impact on the Earth System." This symposium is currently scheduled for Monday, July 7, 2003. You must submit an abstract by January 30, 2003 at

http://www.jamstec.go.jp/jamstec-e/iugg/htm/abstract.htm. We hope to see you at the 2003 IUGG General Assembly in Sapporo.

GAII.04 Lightning-Induced Transient Processes in the Middle and Upper Atmosphere and Their Impact on the Earth System

With the recent unexpected discovery of red sprites, blue jets, ELVES, and other optical lightning after-effects in the middle and upper atmosphere above very active thunderstorms, there has occurred an explosion of research activity to investigate their significance within the context of the larger terrestrial system. Investigators of upper atmospheric and ionospheric effects of lightning are invited to submit abstracts on all aspects of this new discipline, including global distribution and relationship to the global electrical circuit, the underlying meteorology, microphysics and transport dynamics, spectroscopy, electromagnetic signatures, electrochemistry and atmospheric chemistry effects, possible extraterrestrial analogs, and methods and problems of remote sensing. Of special interest are papers devoted these new phenomena associated with Asian thunderstorm systems. Related Session: JSA02

Convener: Hiroshi Fukunishi, Dept. of Geophysics, Graduate School of Science, Tohoku Univ., Aramaki-aoba, Sendai 980-8578, Japan, tel:+81-22-217-6734, fax: +81-22- 217-5775, fuku@pat.geophys.tohoku.ac.jp.
Co-Conveners:
Martin Füllekrug (Univ. Frankfurt/Main, Germany, fuellekr@geophysik.uni-frankfurt.de)
Davis D. Sentman (Univ. of Alaska, USA, dsentman@gi.alaska.edu)

INTERNATIONAL SYMPOSIUM ON LIGHTNING PROTECTION (VII SIPDA)

The International Symposium on Lightning Protection (VII SIPDA) will be held on November 17 - 21, 2003 in Curitiba, BRAZIL. Topics covered by the Symposium include:

1) Lightning Discharges
2) Protection of Structures
3) Substation
4) Transmission Lines
5) Distribution Lines (Medium and Low Voltage)
6) Protection of Electronic Systems
7) Induced Effects
8) Electromagnetic Compatibility
9) Grounding
10) Tests and Standardization
11) Modeling
12) Surge Protective Devices
13) Lightning-Caused Damages

Abstract (up to two pages) should be submitted to sipda@iee.usp.br before January 20, 2003.
For more information visit www.iee.usp.br/sipda.

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

RESEARCH ACTIVITY BY INSTITUTION

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

The Atmospheric Electricity Group (ELAT) of the Brazilian Institute of Space Research begun in November 2002 two international campaigns: the first is to measure sprites and related parameters in the stratosphere using stratospheric balloons, an airplane and cameras on ground. The campaign is in collaboration with the University of Washington and the Utah State University. The second is a continuation of the triggering lightning experiments in collaboration with several institutions in Brazil and France. The ELAT also organized the third Brazilian Workshop on atmospheric electricity that happened in Rio in the first week of November. The workshop occurred simultaneously with the Ground'2002 International Conference on Grounding and Earthing. The next workshop is planned to 2004 and, probably, it should be held again in Rio.

DEPARTMENT OF ATMOSPHERIC SCIENCE – COLORADO STATE UNIVERSITY (Fort Collins, Colorado, USA)

Timothy Lang and Steven Rutledge are utilizing dual-Doppler and multiparameter radar data, along with electric field change meter and cloud-to-ground lightning detection network data, to examine a broad spectrum of thunderstorm types and intensities. The goal is to better understand how storm kinematic and microphysical structure affect lightning production. Ten case studies have been identified: five mid-latitude thunderstorms observed in northeast Colorado in 1998, and five tropical thunderstorms observed during the TRMM/LBA project, which occurred in early 1999 in the western Amazon of Brazil. These storms vary from weak airmass and monsoonal thunderstorms to intense squall lines and supercells. By examining how variations in lightning patterns and production correlate to variations in the kinematic and microphysical structures within this diverse array of storms, we hope to gain new insights into how storm kinematics and microphysics affect lightning production.

The Frequency and Distribution of Severe Storms That Produce Predominately Positive Cloud-to-ground Lightning in the Contiguous United States

Although the polarity of most cloud-to-ground (CG) lightning is negative, the ground flashes beneath severe storms are sometimes predominately positive (i.e., > 50%). Occasionally, the

+CG lightning flash density is very high (i.e., ≥ 0.01 km^{-2} h^{-1}). The existence of predominately positive cloud-to-ground (PPCG) lightning in severe storms evokes fundamental questions regarding thunderstorm electrification mechanisms and raises the possibility of nowcasting severe storms with CG lightning data. Despite their intriguing nature, the regional frequency and % of severe storms dominated by +CG lightning in the contiguous U.S. are not well understood. In addition, little is known about the magnitude of positive peak currents in these storms.

To address this issue, Lawrence D. Carey and Steven A. Rutledge determined the %, flash density, and mean peak current of +CG lightning within the vicinity of every large hail and tornado report during a ten year period (1989 - 1998) during the warm season (April - September). These analyses reveal that PPCG lightning rarely occurs beneath severe storms in the contiguous U.S. Only 15% (5%) of severe storm reports were associated with (high flash density) PPCG lightning. However, there was significant regional variability. The overwhelming majority of +CG lightning dominated severe storms occurred in the central U.S. The Eastern U.S. was nearly devoid of these unique storms; only 3% (0.5%) of severe storms produced (high flash density) PPCG lightning there. In the Central and Northern Plains, about 41% (15%) of severe storm reports were accompanied by (high flash density) PPCG lightning.

Broad frequency and % maxima of severe storms that generate PPCG lightning stretched from eastern CO and the OK Panhandle northeastward through KS and NE to the eastern Dakotas and southern MN. In this southwest-to-northeast tilted region, typically > 30% of severe storms were +CG dominated. Interestingly, this feature is remarkably similar in location and shape to the region of high percentage (e.g., > 10%) of +CG lightning found in the Great Plains and Upper Midwest when analyzing annual NLDN data from 1989 - 1998. This region is also characterized by a relative maxima in the median positive peak current (> 30 kA; Orville and Huffines, Proceedings of the 11th ICAE, 412-415, 1999). Inspection of our results shows that severe storms dominated by PPCG lightning generate a markedly different population of positive peak currents than other severe storms. The mean positive peak current for severe PPCG lightning events typically ranges from 35 kA to 65 kA while it ranges primarily from 10 kA to 30 kA for all other severe storms. Based on these results, we suggest that severe storms that produce PPCG lightning may be largely responsible for the annual maxima in both the percent of positive CG lightning flashes and the positive peak current that is found in the Great Plains and Upper Midwest when analyzing annual NLDN data from 1989-1998. Additional information can be found at the following web site: http://olympic.atmos.colostate.edu/ppcgsvr.html .

DEPARTMENT OF PHYSICS AND SPACE SCIENCES – FLORIDA INSTITUTE OF TECHNOLOGY (Florida, USA)

New Measurements of Energetic Radiation from Rocket-Triggered Lightning have been performed. Using scintillation detectors designed to operate in an electrically noisy environment, J. R. Dwyer, H. K. Rassoul, M. Al-Dayeh, E. L. Caraway, V. Corbin, and B. Wright of the Department of Physics and Space Sciences at the Florida Institute of Technology, in collaboration with M. A. Uman, V. A. Rakov, J. Jerauld, D. M. Jordan, and K. J. Rambo of the Department of Electrical and Computer Engineering at the University of Florida, Gainesville have conducted x-ray observations of rocket-triggered lightning at the International Center for Lightning Research and Testing (ICLRT) at Camp Blanding, Florida. During the summer of 2002, a total of 7 triggered lighting flashes, consisting of 37 return strokes, were observed from a

distance of less than 50 m, and intense bursts of energetic radiation were measured just prior to the majority of the return strokes. The timing of the energetic radiation suggests that the mechanism that produces this radiation may be associated with the dart leader phase of the lightning. These results have been recently submitted for publication in Science Magazine and will be presented at the fall 2002 AGU meeting. Preparations are currently underway for continued energetic radiation observations at ICLRT during the summer of 2003.

GEOELECTROMAGNETIC MONITORING LABORATORY (GemM) – BOROK GEOPHYSICAL OBSERVATORY OF RUSSIAN ACADEMY OF SCIENCES (Borok, Russia)

The GemM Laboratory Measurement Complex has been used for the routine continuous observations of atmosphere electric field and atmosphere electric current during 2001-2002. The data of electric field observation are presented on the web-site of Borok Geophysical Observatory Database (http://geobrk.adm.yar.ru:1352/electric/index.html).
Current studies are directed to the study of atmosphere electric sources and geophysical shells coupling, to the experimental and theoretical investigations of near-surface atmosphere electricity as a part of the global electric circuit, to the development of the global electric circuit conception.
The members of the research team of GemM Laboratory are Dr. S. V. Anisimov (Head of GemM Laboratory), Dr. E. M. Dmitriev, Dr. N. M. Shikhova and Dr. S. S. Bakastov. The researches are performed in collaboration with the Plasma Physics and Electronics Department of the Institute of Applied Physics, RAS (Dr. E. A. Mareev, A. E. Sorokin and others). The universal power-law spectra of aeroelectric field pulsations and aeroelectric structures have been substantiated experimentally and theoretically during 2001-2002. The researches on electrodynamics properties of the fog were carried out in June-September, 2001 and June-October, 2002. The experimental base of investigations is the data, obtained from the long-term measurements of atmosphere electric field and atmosphere temperature at several remote points.
The results of recent researches were reported at the Conference on fog and fog collection, St. John's, Canada, July 2001, XXVII General Assembly of URSI, Maastricht, the Netherlands, 17-24 August 2002, and Conference of the Russian Foundation for Basic Research - “Geophysics from XX to XXI century”, Moscow, Russia, 8-10 October, 2002.

Recent publications

Anisimov S.V., E.A.Mareev, N.M.Shikhova and E.M.Dmitriev, Mechanisms for the Formation of Electric-Field Pulsation Spectra in the Near-Surface Atmosphere, *Radiophysics and Quantum Electronics*, 44, 7, 562-576, 2001.

Anisimov S.V. and E.A.Mareev, Spectra of Electric Field Pulsations in the Near-Surface Atmosphere, *Doklady Academii Nauk, Geophysical Sciences*, 381, 8, 975-980, 2001.

Anisimov S.V., E.M.Dmitriev, E.B.Anisimova and A.N.Sychev, The database of Geophysical observatory "Borok", "Herald of the DGGGMS RAS" #4(19), URL: http://www.scgis.ru/russian/cp1251/h_dgggms/4-2001/anisimov.htm, 2001 (in Russian).

Anisimov S.V., Mareev E.A., Sorokin A.E., Shikhova N.M. and Dmitriev E.M., Electrodynamic properties of the fog, *Izvestiya, Atmospheric and Oceanic Physics*, 39, 1, 1-15, 2002.

Anisimov S.V., Mareev E.A., Shikhova N.M. and Dmitriev E.M., Universal spectra of electric field pulsation in the atmosphere, Geophys. Res. Letters, accepted, 2002.

HIGH VOLTAGE RESEARCH INSTITUTE AT TOMSK POLYTECHNIC (Tomsk, Russia)

For over 30 years the High Voltage Research Institute at Tomsk Polytechnic is carrying out the regional mapping of thunderstorm activity based on the data from the meteorological stations, from the networks of lighting flash counters, and as derived from the lighting related power line outage statistics (for both distribution and transmission power lines). Research is concentrating on the analysis of time and space inhomogeneous of thunderstorms.
An attempt to correlate an average number of thunderstorm days per annum with an average number of lightning discharges to the ground for different landscape types have been made by Gorbatenko V.P., Dulzon A.A., Reshetko M.V. cooperatively by Thern S. (Siemens AG, Karlsruhe, Germany). This study is based on comparing average multiannual values of thunderstorm activity and the data of a density of lightning discharges to the ground, obtained with a multistation system locating thunderbolts to the ground on the territory of Germany. An attempt to construct the dependencies for different uniform landscapes has perspective for estimation of thunderstorm hazard of territories not covered with instrumental observations. A comparative study of lightning discharges to the ground and physico-geographical factors of territory is performed by Ershova T.V., Gorbatenko V.P., Dulzon A.A, Reshetko M.V. Analysis of correlation allows to do the conclusions: above the big rivers or other water basins the density of lightning discharges to the ground is 1.5-2 times bigger then above the neighbouring territories.
The structure of dates of thunderstorm days and forms of atmosphere circulation are studied. It is shown the periodical structure of temporal ranges (the years 1891-1996) of number of days with thunderstorm on the territories different in its' geographical position. These analyses are being performed Gorbatenko V., Dulzon A., Reshetko M co-operative by Ippolitov I. , Kabanov M., Loginov S.V. of the Institute for Optical Monitoring SB RAS. Therefore, analysing longterm variations of thunderstorm days or the duration of thunderstorms, we can assess the expected range of temporal changes of lightning discharges to the ground. The results of calculations show, that the extreme meanings of lightning discharges to the ground calculated on maximal number of thunderstorm days, are 1,5-2 times higher than the average meanings, defined for these territories earlier.

Recent publications:

Gorbatenko V.P. About dependency of density lightning discharges to the ground on thunderstorm activity // Electricity (Russ). –2001. - 7.- p. 16-21.

Gorbatenko V., Dulzon A., Reshetko M, Ippolitov I., Kabanov M. Loginov S. Analyses of the structure of dates of forms of atmosphere circulation and number of thunderstorm days. Optic of atmosphere and ocean (Russ). - 2002 - 15. - 8. - 693-698.

Gorbatenko V.P., Dulzon A.A., Reshetko M.V., Thern S. Dependence of density of lightning discharges to the ground on number of thunderstorm days for different landscape types.// Proceedings of the International Conference on Lightning Protection (ICLP 2002). -Cracow, Poland, 2-6 2002. - Vol. I. - 121-126.).

Ershova T.V., Gorbatenko V.P., Dulzon A.A, Reshetko M.V. Dependence of density of lightning discharges to the ground on physico-geographical factors of locality // Proceedings of the 6 th Russian-Korean Int. Symposium on Science and Technology (KORUS-2002), 1-5 July. – Novosibirsk, 2002. – P. 414-417.

Gorbatenko V.P., Dulzon A.A., Reshetko M.V. Research on longterm data of thunderstorm days // Proceedings of the VI International Symposium on Lightning Protection. 19-23 November, 2001. - Santos, Brazil, 2001.- P. 65-68.

INDIAN INSTITUTE OF TECHNOLOGY IN ROORKEE (Roorkee, India)

Atmospheric Physics group of Department of Physics, I. I. T. Roorkee (Formerly University of Roorkee) is actively engaged in the research in Atmospheric Electricity. The group leader Prof. Jagdish Rai attended the 17th International Lightning Detection Conference held at Tucson, Arizona, U. S. A. from October 16-18, 2002 and presented the work on the mapping of intracloud lightning discharges. Dinesh K. Sharma attended the 39th Annual Convention and Meeting on "Sustainability Science and Environmental Geophysics" held at NEERI, Nagpur from October 4-6, 2002 and presented a paper on the sunrise effect on ionospheric temperature as measured by SROSS-C2 satellite. The Indian Space Research Organization (ISRO) has granted a research project for the study of ionospheric response to the tropospheric disturbances. The SROSS-C2 satellite data on electron and ion temperatures and ion density were supplied by ISRO and the data on thunderstorms activity by India Meteorological Department (IMD). It has been found that during thunderstorms the electron and ion temperatures in the ionosphere in the height range 425 to 625 km are enhanced. The enhancement in electron temperature is 1.4 to 2.3 times while for ions it is 1.2 to 1.7 times over the normal days. The ion density has been found to be unaffected by the thunderstorms.
Miss Smita Darmora is doing theoretical studies on the effect of thunderstorms on the ionosphere. Dinesh C. Singh joined the group recently as Junior Research Fellow.
Mohammad Israil from the Department of Earth Sciences and V. K. Katiyar from Mathematics Department take active part in group activity.

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

The Atmospheric Science has been recognised as an important area of research due to its impact on various human activities, specially agriculture and earth's environment. Hence, the objectives of the Institute are set forth to undertake and encourage research aimed at advancing the present knowledge in Atmospheric Sciences. Atmospheric Electricity is the branch of atmospheric physics, which comes under the domain of atmospheric sciences. It is a topic in which the electrical properties of the earth's atmospheric regions are studied through the measurements of electric field, conductivity, currents and related parameters at different times and during different weather conditions.

The topic atmospheric electricity is divided into two categories of weather conditions : fair and disturbed weather. Disturbed weather atmospheric electricity mainly originates from the electrification of the thunderstorms. This includes the understanding of their distribution, seasonal, latitudinal variation. Beside these, the study of the thunderstorm related electrical parameters such as measurements of point discharge current and lightning events is also equally important as it plays an important role in the global electric circuit.

With this view, the authors have taken an opportunity to collect the data of lightning flash from the Global Hydrology and Climate Center Lightning Research Team at NASA's Marshall Space Flight Center for the Indian region and the results were discussed.

S.S. Kandalgaonkar, M.I.R. Tinmaker, and Asha Nath study the characteristics of lightning flashes over the Indian region. Satellite (LIS) based lightning flash grid (0.5^o x 0.5^o) data for 78 Indian observatory stations covering 8^o-30^oN for a period of 4 years (1998-2001) form the data set for the study. These data have been analyzed to examine their annual, interannual, seasonal and geographical distribution. An attempt has been made to obtain the IC:CG ratio. The result of this study demonstrates that there exists latitudinal variation of lightning flash density, which is also confirmed through seasonal and ratio analysis. There exists a weak negative relationship between N_t and latitude, with a fall rate of 0.032 for every 1° increase in latitude. The magnitude of lightning flash density is observed to be 2.5 times higher in the premonsoon season than in the postmonsoon suggesting that premonsoon season thunderstorm are their contribution to the global electrical circuit is highly significant. The annual variation of lightning flash density exhibits a typical bimodal variation giving the first maximum in the month of May and second in the month of September. The observed bimodal variation of N_{tm} over the Indian region is found to be an important characteristic feature of the lightning activity. Time series of this parameter showed a consistent increase in the peak values. The IC:CG ratio values are found to be more or less equal to the values reported by other investigators for the tropics. The above study is our first attempt to obtain significant information from LIS satellite over the Indian region.

INSTITUT FÜR METEOROLOGIE UND GEOPHYSIK – JOHANN-WOLFGANG GOETHE UNIVERSITÄT (Frankfurt am Main, Germany)

The Institut hosts an Applied Geophysics division with an Atmospheric Electromagnetics group. The primary research interest is the remote sensing of the global atmospheric electromagnetic environment. The final goal is to quantify links between the global atmospheric electromagnetic environment, weather, and climate in particular. The main research tools are networks of high precision magnetometers to passively record the natural electromagnetic fields of atmospheric sources in the ULF/ELF frequency range from 0.1-2000 Hz. Specific research targets are

particularly intense lightning discharges, sprites, global lightning activity, ionospheric conductivity variability, and Earth-ionosphere cavity resonances.

Recent publications:

M. Füllekrug, A.C. Fraser-Smith, and K. Schlegel, " Global ionospheric D-layer height monitoring ", Europhysics Letters, Vol. 59, No. 4, p. 626, 2002.

M. Füllekrug and C. Price, "Estimation of sprite occurrences in central Africa", Meteorologische Zeitschrift, Vol. 11, No. 2, p. 99, 2002.

M. Füllekrug, C. Price, Y. Yair, and E.R. Williams, " Intense oceanic lightning ", Annales Geophysicae, Vol. 20, p. 133, 2002.

LABORATORY OF ATMOSPHERIC ELECTRICITY - INSTITUTE OF GEOPHYSICS – GEORGIAN ACADEMY OF SCIENCES (Tbilissi, Georgia)

Avtandil Amiranashvili reports:
Regrettably the instrumental system for complex observation of parameters of atmospheric electricity in Dusheti (electric field, air electric conductivity, air ion concentration, thunderstorms discharges) practically had ruined after disintegration of USSR. Same pertains also toward laboratory experimental investigation. All of the said works require significant financial expenses but budget of Georgian Academy of Sciences is very little. So we have to basically apply with analysis of the past data. For example, we conduct the investigation within the project “Modern Climate Change in Georgia” (long-term variation of various meteorological elements and parameters of atmospheric electricity, etc...). On the other hand we try at least partly to restore activity of Dushety observatory. But in our conditions this is very difficult. However in past semester we have begun repair the Benndorf instrument. We hope by year's end to finish the instrument repair.

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

Comparisons are underway with Mark Stanley (LANL), Steve Cummer (Duke University) and Walt Lyons (FMA Research) on measurements of vertical charge moment on large positive ground flashes in STEPS (Severe Thunderstorm and Precipitation Study). Values determined on the basis of the traditional electrostatics approach at close range (D< one ionospheric height) are showing good agreement with values derived from ELF electromagnetic measurements at great distance (D> one ionospheric height).
David Lowenfels has completed an M. Eng. Thesis on the DSP analysis of wideband (3 Hz-25 kHz) signals recorded with the new 7-meter-tall electric antenna in Rhode Island. 60 Hz and its numerous harmonics have been successfully removed from the waveforms. Comparisons of the measurements with simulations using the normal mode equations show clearly that ‘slow tails’

are the result of waveguide dispersion and the deficit of energy in the waveguide cutoff region (~1.5 kHz), rather than due to the continuing current.

Vadim Mushtak and Earle Williams are making comparisons between the flash rates of thunderstorms observed with the Lightning Imaging Sensor on the NASA TRMM (Tropical Rainfall Measuring Mission) satellite and surface thermodynamic measurements of the boundary layer air ingested by these same storms. The mean flash rate has been found to increase exponentially with the dry bulb temperature of boundary layer air. These results were presented at the International TRMM Conference in Honolulu, Hawaii in July.

The paper entitled: "The Physical Origins of the Land-Ocean Contrast in Lightning Activity" by E. Williams and S. Stanfill, is now in print in Comptes Rendus Physique (2, 1-17, 2002), thanks to the generous efforts of editors Anne Bondiou and Marcia Baker. The essential idea in this paper is the important role of cloud base height in influencing the updraft velocity in deep convection.

Earle Williams recently participated in the SMOCC field campaign in Rondonia, Brazil (September-November, 2002) focused on the effect of smoke on cloud microphysics during the transition from dry to wet season there. Theodolite measurements of cloud top ascent speeds were carried out toward assessing the effect of variable cloud base height on updraft speed and lightning activity. The analysis of results is in progress.

The paper entitled: ELF Propagation Parameters for Uniform Models of the Earth-Ionsphere Waveguide" by V. Musktak and E. Williams is now in press in the Journal of Solar and Terrestrial Physics.

Vadim Mushtak (with co-authors Colin Price and Earle Williams) presented a comparative analysis of ELF and VLF methods for bearing determination in locating lightning on a global basis, at the recent COSPAR meeting in Houston, Texas.

Dick Dowden visited MIT for a week in August, 2002 to install a VLF receiver in Cambridge, now part of his growing global VLF network for lightning location.

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

Mike Donovan and Earle Williams are working with Fred Mosher at AWC and Rich Benkert and Jeff Hawkins at NRL (Monterey) on the comparative analysis of deep oceanic convection on June 10, 2002. TRMM (Tropical Rainfall Measurement Mission) satellite observations (notably, radar and lightning) are being used to explore the internal structure of storm cells previously diagnosed as thunderstorms/CB's on the basis of GEO-satellite IR data alone.

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

Our Annual Lightning Safety Recognition Awards were presented to nominated individuals for their accomplishments, for providing leadership and for serving as role models in the community:

Michael Cherington MD, St. Anthony Hospital Denver CO
Mary Ann Cooper, MD, Univ. Illinois at Chicago, Chicago IL
Ronald L. Holle, Meteorologist, Tucson AZ

Aage E. Pedersen, Ph.D. TU (retired), Gentofte, Denmark
John Tobias, Ph.D, P.E., US Army, Fort Monmouth, NJ

New members of NLSI's Board of Advisors, appointed in October, 2002 are:

Vladimir Rakov, Ph.D, Univ. of Florida, Gainsville, FL
John Tobias, Ph.D.,US Army, Fort Monmouth NJ
Phil Francis, ATC, Dallas Independent School District, Dallas, TX
Chris Andrews MD, Mater Hospital, Brisbane Australia

NLSI presented papers in recent months at the International Conf. on Lightning Detection, Tucson AZ and the National Weather Association Annual Meeting, Ft. Worth TX.

Recent lightning safety site assessments were performed for US Navy, Kings Bay GA, Federal Aviation Administration, Oklahoma City OK, and NASA Goddard Space Flight Center, Greenbelt MD.

NLSI has added three newly available lightning protection codes to those now listed on the Website: Chinese GB 50057-94; Polish PN 86/89/92; and US Dept Energy M440.1-1. For a review of the complete list go to:

www.lightningsafety.com/nlsi_bus/nlsi_pub1.html .

NCAR FOOTHILLS LAB – CONVECTIVE WEATHER RESEARCH GROUP (Boulder, Co, USA)

Alexandre Fierro, Matthew S. Gilmore, Edward R. Mansell, Jerry M. Straka, and Louis J. Wicker are investigating idealized numerical simulations of supercells that move between environments. They are investigating how changes in the local environment can influence changes in thunderstorm kinematics, microphysics, electrification and lightning.

The following are papers related to this work, some informal, published within the last two months.

Recent publications:

Gilmore, M. S., and L. J. Wicker, 2002: Influences of the local environment on supercell cloud-to-ground lightning, radar characteristics, and severe weather on 2 June 1995. *Mon. Wea. Rev.*, **130**, 2349–2372.

Gilmore, M. S., L. J. Wicker, E. R. Mansell, J. M. Straka, and E. N. Rasmussen, 2002: Idealized boundary-crossing supercell simulations of 2 June 1995, *21st Conf. on Severe Local Storms, San Antonio, TX, Amer. Meteor. Soc.*, 251–254.

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

The NASA Lightning Imaging Sensor (LIS) on the TRMM satellite will continue to operate continuously through the foreseeable future, perhaps through 2005. The solar panel orientation was adjusted earlier in the year to minimize drag on the satellite in order to extend the mission.

One consequence of this change was insufficient power at low beta angles to operate all the TRMM instruments. LIS was powered off twice during the past two months, but the mission operations team has now produced a configuration that will allow LIS to operate continuously through the on-coming El Nino event. We are especially interested in contrasting the present ENSO with the 1997-98 event, which resulted in a 100 percent increase in lightning activity in the Gulf of Mexico and significant changes in thunderstorm activity worldwide.

Calibrated and gridded LIS and Optical Transient Detector (OTD) climatologies have been released to the public. These include a 0.5 and 2.5 degree climatological composites, a 2.5 degree "climatological annual cycle", and a 2.5 degree "climatological local hour cycle". The data are in HDF Scientific Data Set (SDS) format and are freely accessible at:

http://thunder.nsstc.nasa.gov/data.html.

Gridded and smoothed time-series products are under development.

A merged Level-1 (pixel-level) TRMM LIS, PR, TMI and NCEP database, building from the University of Utah precipitation feature database is being compiled and analyzed (D. Boccippio). Preliminary results include the dependence of convective parameters (including lightning) on environmental variables, and the development of optimal rule-based, linear multivariate, and nonlinear multivariate (neural network) algorithms to classify storms as flashing or non-flashing based upon radar, microwave and/or environmental observations alone. In addition, W. Koshak continues to compare the 5 year OTD dataset with corresponding data from the North American Lightning Detection Network (NALDN). Potential links between OTD flash radiance and NLDN peak current are being investigated for ground flashes (with Prof. E. P. Krider, Univ. of Arizona).

Extending previous work completed during the recent EPIC-2001 field campaign, W. Petersen, UAH, is working on correlations between synoptic scale circulation features and signals in TRMM-LIS lightning data. He is finding some interesting changes in lightning flash density as a function of tropical easterly wave phase over W. Africa and the tropical E. Pacific. For example (and consistent with EPIC results), over W. Africa peaks in lightning activity occur ahead of the wave trough- where it is expected that conditional instability will be at a maximum. Lightning falls off in the wave trough where previous research indicates widespread stratiform and weaker convection should be located. In a temporal sense, the diurnal cycles of lightning in the African easterly waves also appear to markedly differ between phases. Utilizing TRMM PR and TMI data in conjunction with NCEP Reanalysis data, W. Petersen and D. Boccippio will produce a comprehensive description of the environmental and convective structure changes associated with each phase of the waves. Following the results of TRMM-LBA, the effect of intraseasonal variability of the meridional wind over the Amazon and its effect on lighting flash density and convective structure is being examined (W. Petersen and Prof. R. Fu, Georgia Tech). Results thus far indicate a robust increase in lightning flash density when southerly winds penetrate deep into the Amazon and visa versa for cross equatorial northerly flow.

The Altus Cumulus Electrification Study (ACES), an unmanned aerial vehicle (UAV)-base science demonstration project, provided detailed optical, electrical, and magnetic observations of thunderstorms over the Florida Everglades and surrounding oceans. This study demonstrated the great potential for utilizing UAV platforms for thunderstorm and meteorological research. The ACES team included R. Blakeslee, D. Mach, and J. Bailey (NSSTC), Dick Goldberg, W. Farrel, M. Desch, and J. Houser (GSFC), and J. Mitchell and C. Croskey (Penn State). Ancillary CG and total lightning data were acquired, respectively, from the NALDN and the Florida EDOT network (M. Heavner, LANL). Additional information on ACES is available from:

http://aces.msfc.nasa.gov.

The NASA 10-station VHF Lightning Mapping Array in Northern Alabama began continuous real-time operations in November 2001. In collaboration with regional offices of the National Weather Service, the 3-D mapping and time rate of change of total lightning are providing new insight into the development and intensification of severe storms.
Analysis of the NASA Airborne Field Mill (ABFM) data sets continues (H. Christian, D. Mach, and M. Bateman, NSSTC and J. Dye, NCAR) and results will be presented to the Lightning Advisory Group during a November ABFM workshop. This research is directed toward lightning related Launch Commit Criteria rules used for both manned and unmanned launches at KSC.

Recent publications

Boccippio, D.J., "Lightning scaling relations revisited", J. Atmos. Sci., 59:1086-1104, 2002.

Boccippio, D.J., W.J. Koshak and R.J. Blakeslee, "Performance assessment of the OTD and LIS. Part I: Predicted diurnal variability", J. Atmos. Oc. Tech., 19, 1318-1332, 2002.

Christian, H.J., R.J. Blakeslee, D.J. Boccippio, W.L. Boeck, D.E. Buechler, K.T. Driscoll, S.J. Goodman, J.M. Hall, W.J. Koshak, D.M. Mach, and M.F. Stewart, "Global frequency and distribution of lightning as observed from space by the Optical Transient Detector", J. Geophys. Res., in press, 2002.

NORTH CAROLINA STATE UNIVERSITY (NCSU, Raleigh, NC, USA)

In collaboration with Martin Murphy and Nick Demetriades of Vaisala GAI Inc., Tracy McCormick and Larry Carey:
(larry_carey@ncsu.edu, http://www4.ncsu.edu/~ldcarey/radarlab/frames.html) of NCSU are analyzing the three-dimensional radar and total lightning characteristics for two mesoscale convective systems (MCSs) occurring in the Dallas-Fort Worth, Texas region during 12-13 October 2001 and 7-8 April 2002. This study utilizes WSR-88D Level II radar (KFWS), Vaisala GAI Inc. Lightning Detection and Ranging II (LDAR II), and National Lightning Detection Network (NLDN) data to gain a better understanding of the structure and evolution of MCSs, with special emphasis on total lightning. Results thus far indicate that cloud-to-ground lightning polarity in both MCSs is predominantly negative (~85%), and cells within the MCSs that exhibit very strong updrafts have higher mean lightning flash origin heights than cells with weaker updrafts. Finally, a significant increase in lightning production (from 10-18 flashes/min) followed by a significant decrease (from 18-12 flashes/min) is evident approximately one-half hour and ten minutes, respectively, prior to tornado touchdown from a severe storm located behind the main convective squall line of the 12-13 October 2001 MCS. Research on the total lightning and radar characteristics of these two MCSs is ongoing.
A recent collaborative study between NCSU (Brandon Vincent and Larry Carey) and the Raleigh NWSFO (Doug Schneider, Kermit Keeter and Rodney Gonski) examined a sample of 50 central North Carolina thunderstorm cases to explore the utility of accurately nowcasting cloud-to-ground lightning activity using WSR-88D radar reflectivity data. For the fifty case studies, eight different sets of WSR-88D reflectivity criteria were analyzed. The criteria were comprised of three variables: the number of radar volume scans the criteria must be met (1 or 2), the threshold

reflectivity (35 or 40 dBZ) and the –10 ºC or -15 ºC isotherm height. Based on the CSI and lead-time, the 1 Volume Scan / 40 dBZ / -10ºC criteria did the best with a 100 % POD, a 37 % FAR, a 63% CSI and a mean lead-time of 14.7 minutes. If lead-time is a higher priority and a slight reduction in CSI can be tolerated, the 35 dBZ criteria may be a better choice, providing 2-3 minutes of additional lead time in the mean. An analysis of vertical profiles of reflectivity between the 0 and –20 ºC isotherm heights in both detection and false alarm cases showed that vertical reflectivity lapse rates for false alarms (-2.04 dBZ/kft) were much larger than for detections (-0.69 dBZ/kft). The results show it is possible to use WSR-88D reflectivity to reasonably predict the onset of CG lightning in the central North Carolina region using criteria similar to that used in previous studies of storms in other regions. Future work will examine the use of WSR-88D volumetric radar data for nowcasting "excessive CG lightning."
In collaboration with Steven Rutledge (CSU), Larry Carey (NCSU) has completed a climatological study of the characteristics of CG lightning in the vicinity of severe and non-severe storms over the central U.S. Over a region from the Kansas/Colorado border to Minnesota, previously associated with positive anomalies in the mean annual positive cloud-to-ground (CG) lightning percentage and positive peak current, they found significant differences in the properties of CG lightning flashes between warm-season severe and non-severe storms. The percentage of CG lightning flashes lowering positive charge to ground was substantially higher in severe storms (i.e., up to three times higher). The median positive peak current in severe storms was significantly larger (i.e., by about 25%). Finally, the median negative peak current in severe storms was very low (i.e., as low as 12-16 kA) and was noticeably smaller than in non-severe storms (i.e., by at least 10%). They also found substantial differences in the properties of CG lightning flashes associated with severe storms in other regions. The mean warm season properties of CG lightning associated with severe storms in the region of peak large hail and tornado activity (e.g., Oklahoma) were fundamentally different (i.e., significantly lower positive CG percentage, lower positive peak currents and higher negative peak currents) compared to severe storms over the anomaly region.

POLISH ACADEMY OF SCIENCES (Warsaw, Poland)

The atmospheric electricity research group at the Institute of Geophysics P.A.Sci. has continued to work in the following thunderstorm and fair weather electricity directions:
In the last time, caused by close cloud-to-ground lightning discharges have provided, together with the meteorological radar and Central European Lightning Detection Network (CLDN) data, a possibility to find some characteristic properties of multiple stroke flashes and their relations to the position and shape of precipitation cores of different thunderclouds observed in temperate region. The obtained results, presented by Piotr Baranski, were discussed during the 26-th International Conference on Lightning Protection, in Cracow, on 2-6 September 2002.
The results of the SAFIR network, radar and field mill observations for selected thunderstorms near Warsaw, reported by P. Baranski during the SAFIR'2002 Workshop (18-20 September in Budapest), have indicated that any widespread lightning location and detection network system should constantly cooperate with at least one so-called independent reference point in order to receive the current validation of own lightning detection data even for some limited area. In this way it may be possible to improve the discrimination criteria for different type of lightning

discharges and to put them to the software of the SAFIR system in Pland in order to extend its detection efficiency.
Possibilities of explanation of lightning discharge initiation in clouds have been further examined by Nguyen Manh Duc and S. Michnowski.
The atmospheric electricity recordings of electric field, conductivity, air-earth current and space charge density have been continued on the background of meteorological, aerosol, radioactivity and chemical pollution at Swider Geophysical Observatory (Marek Kubicki). The results are being published and exchanged (M. Kubicki).
The long term variations of electrical, radioactivity and air pollution elements are examined by means of wavelet analysis (M. Kubicki, S. Michnowski, B. Laurikeinen and S. Warzecha). The changes of Be7 concentration and electrical conductivity at the ground are studied by use of neural network analysis (B. Laurikainen and M. Kubicki).
Atmospheric response to solar cosmic ray events has been statistically investigated (Z. Kobylinski and S. Michnowski).
At the polar station at Hornsund, Spitsbergen, the electric field and vertical air-earth current recording supplemented by the meteorological observations, and magnetometer, riometer and other geophysical measurements are continued (M. Kubicki and S. Michnowski). The influences of solar wind on the electrical element variations at the ground in Hornsund are being examined by S. Michnowski, N. Nikiforova, N. Kleimonova, S. Israelsson, M. Kubicki with the use of geophysical data from Hornsund, IMAGE net of magnetometer and riometer stations, and satellite solar wind data. New sensors for air-earth current density and space charge recordings are designed (J. Drzewiecki, M. Kubicki).

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

Karen Aplin, now at the Rutherford Appleton Laboratory has continued to work on modern methods of ion measurement using the Programmable Ion Mobility Spectrometer (PIMS) (described in Aplin K.L. and Harrison R.G. (2001), *Rev. Sci. Inst*.**, 72**, 8, 3467-3469). The PIMS is a versatile instrument for ion mobility and concentration measurements. Within a research programme of the US Air Force, the new operating system for the instrument (PIMSOS) has seen its first deployment. PIMSOS permits remote interrogation of the instrument from a computer running high level instrument control software, via a serial interface. This further establishes the operating versatility of the PIMS's already broad range of environmental monitoring applications, which include radioactivity and aerosol detection.
The PIMS instrument, including the upgraded PIMSOS remains available to order. Modern Windows PC control software, which permits display of conductivities in real time is an integral part of the package. Please contact Dr K.L. Aplin (k.l.aplin@rl.ac.uk) for further details.

TEL AVIV UNIVERSITY, DEPARTMENT OF GEOPHYSICS AND PLANETARY SCIENCES (Tel Aviv, Israël)

During the academic year 2001/2002 Colin Price was on sabbatical in Canada working at the Meteorological Services of Canada (MSC) in Toronto. Together with Bill Burrows, Pat King, and

Brian Murphy they used the Canadian Lightning Detection Network (CLDN) to study summer and winter thunderstorms in Canada and North America. Two papers have resulted from this collaboration (Price, C., and B. Murphy, 2002, Lightning Activity during the 1999 Superior Derecho, Geophys. Res. Lett., in press; and Price, C., W. Burrows and P. King, 2002, The Likelihood of Winter Sprites over the Gulf Stream, Geophys. Res. Lett., in press). Earlier in the year a paper related to improved geo-location of sprite-producing lightning using ELF/VLF data from the Negev desert also appeared in GRL) Price et al., 2002, An improved ELF/VLF method for globally geolocating sprite-producing lightning, GRL, 29(3), 1.1-1.4). Work continues on our Schumann Resonance data from our Negev site with graduate student Mustafa Asfur.

Olga Pechony has completed her MSc degree under the guidance of Zev Levin and Colin Price on the topic of lightning-rainfall relationships in Israel. A number of storms were analysed using TRMM data, METEOSAT data, LPATS data and ground-based raingauges. The results reveal a great similarity in both spatial and temporal distribution of lightning and rain. A time delay of a few minutes was found to exist between lightning and rainfall maxima. Analysis of METEOSAT IR data indicate a correlation between lightning activity and cloud-top temperature, and thus height. This is indirect evidence of the lightning-to-rainfall relation since a strong dependence was found between rainfall and cloud-top-height in a study of Israeli thunderstorms by Rosenfeld and Gagin (1989).

Orit Altaratz, Zev Levin, Tamir Reisin and Yoav Yair (Open University) are developing numerical schemes that formulate the electrification processes in thunderstorms into the meso-scale 3D RAMS model. The aim is to simulate the development of thunderstorms on a regional scale and to understand the role of different parameters, such as topography or sea-land temperature difference in affecting the dynamical and microphysical characteristics of the thunderclouds. The development of the model involves the parameterization of the non-inductive graupel-ice charge separation mechanism and calculations of the electric potential and the electric field. Orit Altaratz, Zev Levin, Yoav Yair and Baruch Ziv analyzed the LPATS measurements of lightning ground strikes during Cyprus Low winter storms in order to study the characteristics of lightning activity over land and sea on the eastern coast of the Mediterranean. It was found that larger frequencies of ground flashes were detected over the sea than over land during the study period. The diurnal variation showed that the maximum in maritime lightning activity was at 0500 LST and over land at 1300 LST. The mean peak current of positive ground flashes was higher over land and of negative ground flashes, over the sea. A paper presenting the results was submitted to the Monthly Weather Review.

Yoav Yair, Zev Levin and Colin Price are anxiously awaiting the January mission of the Space Shuttle Columbia with the first Israeli astronaut and the MEIDEX experiment that will be attempting to image sprites from above, while teams on the ground collect ELF/VLF data of the parent storms. Several groups from Japan, Taiwan and the USA will also take part in this campaign.

UNIVERSITY OF FLORIDA (Gainesville, Florida, USA)

A total of 19 lightning flashes were initiated from July 9 to September 13, 2002 at the International Center for Lightning Research and Testing (ICLRT) at Camp Blanding, Florida. Of these 19, 14 contained leader/return stroke sequences and 5 were composed of the initial stage only. All triggered flashes effectively transported negative charge to ground. Eleven flashes were triggered using the tower launcher (one of them terminated on the Instrument station, about 60 m from the launcher), and three flashes were triggered using a mobile launcher mounted on a bucket truck.

Additionally, five natural lightning discharges that terminated on site were recorded by the multiple-station electric and magnetic field measuring network. One of these five was a two-stroke positive flash.
Jens Schoene, Martin Uman, Vladimir Rakov, Venkateswara Kodali, Keith Rambo, and George Schnetzer authored a paper titled «Statistical Characteristics of the Electric and Magnetic Fields and Their Time Derivatives 15 m and 30 m from Triggered Lightning.» The authors present a statistical analysis of the salient characteristics of the electric and magnetic fields and their derivatives at distances of 15 m and 30 m from triggered lightning strokes that lowered negative charge to ground. Return stroke current and current derivative characteristics are also presented. The measurements were made during the summers of 1999 and 2000 at Camp Blanding, Florida. Lightning was triggered to a 1 to 2 m strike object at the center of a 70 m x 70 m metal-grid ground plane that was buried beneath a few centimeters of soil. The strike object was mounted on the rocket launching system that was located below ground level in a pit. The experiment was designed (1) to minimize the influence of the strike object on the field and field derivative waveforms and (2) to eliminate potential distortions of the field and field derivative waveforms both due to ground surface arcing and due to the propagation of the field being over imperfectly conducting ground. Measurements were made on about 100 return strokes, although not all field quantities were successfully recorded for each stroke. The authors present histograms and parameters of statistical distributions for the following 28 waveform characteristics: current peak, risetime, and width; current derivative peak, risetime, and width; return-stroke electric field change and field pulse width at 15 m and at 30 m; electric field derivative peak, risetime, and width at 15 m and at 30 m; magnetic field peak, risetime, and width at 15 m and at 30 m; and magnetic field derivative peak, risetime, and width at 15 m and at 30 m. The results are compared with those from previous studies. It has been inferred that for strikes to the buried metal-grid ground plane the current risetime and width are, on average, smaller than for strikes to concentrated grounding electrodes (vertical ground rods). The paper has been submitted to the Journal of Geophysical Research.

AWARD

Recognizing the achievements of its members is an important part of the mission of the IEEE. Each year, following a rigorous evaluation procedure, the IEEE Fellow Committee recommends a select group of recipients for one of the Institute's most prestigious honors, election to IEEE Fellow. The IEEE Board of Directors, at its meeting on 17 November 2002, elected Dr. Vladimir A. Rakov an IEEE Fellow, effective 1 January 2003, with the following citation:
For contributions to the understanding of lightning discharge phenomena.

Recent publications

«Lightning: Physics and Effects», Cambridge University Press, 696 p., 2002, in press (publication is planned for April 2003), ISBN 0521583276, V.A. Rakov and M.A. Uman.
«Positive Blitzentladungen», Jahrbuch Elektrotechnik 2003, pp. 315-324, VDE VERLAG GMBH, Offenbach, V.A. Rakov

«A Review of the Interaction of Lightning with Airborne Vehicles», Progress in Aerospace Sciences, accepted, M.A. Uman and V.A. Rakov.

«A Review of Positive and Bipolar Discharges», Bull. Amer. Meteorol. Soc., accepted, V. A. Rakov.

«Statistical Characteristics of the Electric and Magnetic Fields and Their Time Derivatives 15 m and 30 m from Triggered Lightning», J. Geophys, Res, submitted, J. Schoene, M.A. Uman, V.A. Rakov, V. Kodali, K.J. Rambo, G.H. Schnetzer.

«Lightning Return Stroke Modeling: Recent Developments», in Proc. of the 3rd Brazilian Workshop on Atmospheric Electricity / 3rd International Conference on Grounding and Earthing, Rio de Janeiro, Brazil, November 4-7, 2002, V.A. Rakov.

«Lightning and Tall Structures», in Proc. of the International Lightning Detection Conference, Tucson, Arizona, 2002, V.A. Rakov.

«Statistical Characteristics of Lightning Discharges», in Proc. of the Int. Conf. on Probabilistic Methods Applied to Power Systems (PMAPS), Naples, Italy, September 22 26, 2002, pp. 677-682, V.A. Rakov.

«Characteristics of Distant Lightning Electric Fields», in Proc. of the Int. Conf. on Probabilistic Methods Applied to Power Systems (PMAPS), Naples, Italy, September 22 26, 2002, pp. 703-707, A. Pavlick, D.E. Crawford, and V.A. Rakov.

«Measurement of the Division of Lightning Return Stroke Current Among the Multiple Arresters and Grounds of a Power Distribution Line» (Abstract), IEEE Power Engineering Review, September 2002, pp. 60-61, C.T. Mata, V.A. Rakov, K.J. Rambo, P.Diaz, R.Rey, and M.A.Uman.

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THE UNIVERSITY OF READING (Reading, UK)

Giles Harrison (r.g.harrison@reading.ac.uk) reports:
Work in the Meteorology Department at Reading continues to investigate microphysical links between atmospheric electricity, clouds and climate. A recent theme of the research has been investigation of long-term secular changes in the atmospheric electrical system and evaluating suitable proxies for the atmospheric electric field in climate work. Many high-resolution measurements of the Potential Gradient have been recovered from UK Observatories from the middle of the nineteenth century: many other datasets also exist on:

http://www.met.rdg.ac.uk/~swshargi/WebStuff/AEWebPages/PGObs.html .

The range of data available broadens in the twentieth century to include determinations of the Air-earth Current and Ionospheric Potential, which are more representative of the global parameters. Taken together, a substantial decrease is the broad conclusion drawn about the atmospheric electrical system in the twentieth century, published recently in GRL (Harrison R.G., Twentieth century secular decrease in the atmospheric electric circuit *Geophys Res Lett*, 29(14) DOI 10.1029/2002GL014878, 2002). This reduction is quantitatively consistent with the reduction in cosmic rays during the twentieth century, caused by an increase in solar activity.

VAISALA INC. (Helsinki, Finland)

This is the first "merged" contribution by Vaisala's Thunderstorm Business Unit. As noted in the Spring Issue, our Business Unit has combined the two leading manufacturers of lightning detection networks -- Dimensions SA of France (acquired in early 2000), and Global Atmospherics (acquired in April, 2002). The combined business unit will continue to produce direction finding and time-of-arrival lightning detection systems operating at VLF, LF, and VHF frequencies, as well as providing lightning information services in the U.S., Canada, and several European countries. The following paragraphs briefly summarize our key research and development activities.

During October 16-18, Vaisala-GAI hosted the 17th International Lightning Detection Conference in Tucson, AZ. The conference theme was *"A Comprehensive Look at Total Lightning."* The range of presentations varied from research-oriented satellite-based lightning observations and lightning prediction to application-focused wildfire management and outdoor lightning safety. The scientific conference spanned two and a half days of general sessions, specialty-oriented breakout sessions, topical round table discussions, and a poster session. Attendees included researchers, scientists, engineers, industrial specialists, professionals and students from 19 countries who share a common passion for understanding lightning and how it affects the world we live in. The conference program, abstracts and most papers are available on the Vaisala Thunderstorm web site at www.lightningstorm.com/ILDC.

The U.S. National Lightning Detection Network (NLDN) is currently undergoing a complete upgrade involving the installation of 114 IMPACT-ESP sensors. The upgrade will be completed this winter. The IMPACT-ESP sensor is a third generation of the IMPACT sensor with improved sensitivity, shorter dead time (< 1.0 msec), and more processing power. This upgrade is expected to result in 20-30% higher stroke detection efficiency and a 5-10% higher flash detection efficiency.

Vaisala-GAI is also working with Steven Businger (University of Hawaii), Steve Goodman (Marshall Space Flight Center) and other collaborators to install a 5-sensor IMPACT network in the mid-Pacific. The sensors for this network are tailored for long-range operation, allowing them

to interact with sensors in the U.S. and Canada. Cloud-to-ground lightning data produced by this network will be used for research purposes, and may eventually be available commercially.

The LDAR II network in the Dallas-Fort Worth, Texas, area (DFW) continues to collect data for research on severe storms. Nicholas Demetriades of Vaisala-GAI and Tracy McCormick of North Carolina State University will (individually) present some results from the network at the upcoming AGU meeting. During the winter, a SAFIR network will also be placed around DFW. The SAFIR and LDAR II systems will be used for research related to nowcasting/forecasting applications. Nick Demetriades, Martin Murphy, Philippe Richard and Ron Holle are studying the relationship between total lightning and weather radar information, focusing on using total lightning as a complementary and, at times, supplementary dataset to weather radar for thunderstorm identification, growth and decay trends. Results have lead to potential meteorological and aviation applications of both datasets, and will be reported at the Winter AMS meeting.

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