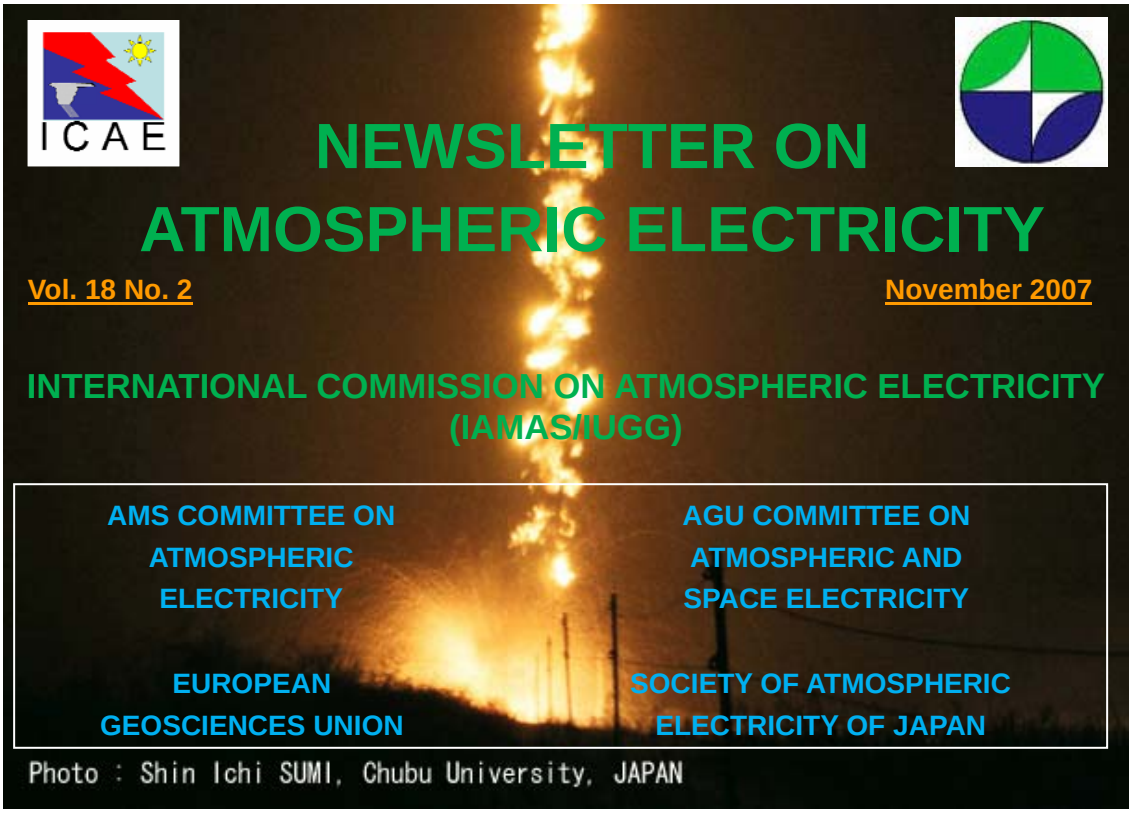

The easiest way to distribute the Newsletter on Atmospheric Electricity is by e-mail. We would be grateful to all of those who can help us complete the "atmospheric electricity" list of e-mail addresses already available. Those colleagues who need a paper version should contact Daohong Wang: (wang@gifu-u.ac.jp) or Zen Kawasaki: (zen@comm.eng.osaka-u.ac.jp). They will receive the Newsletter by regular mail. Those who know anybody who needs a printed version are also welcome to contact us. All issues of this Newsletter are available on the website of the International Commission on Atmospheric Electricity:

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

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

http://ae.nsstc.uah.edu/

thanks to Monte Bateman's help.

Contributions to the next issue of this Newsletter (May 2008) will be welcome and should be submitted to Daohong Wang (wang@gifu-u.ac.jp) before May 15, 2008, preferably by e-mail as an attached word document. A reminder will be sent to all colleagues whose e-mail addresses are presently listed.

***Comment on the photo above*: A behemoth of lightning flash that was artificially triggered to a test-windmill-blade in Japanese winter thunderstorm using rocket-wire technique by Prof.Sumi, Chubu University of Japan. The total electric charge lowered by this lightning flash to the ground is +500 C. The photo was taken at the ending stage of the lightning flash.**

During the 13th ICAE conference in Beijing, China several Commission meetings were held. After a series of procedures, **Rio de Janeiro, Brazil** has been chosen as the venue of the next ICAE conference (14th conference), which will be held in **8-12 August 2011**. Also in these meetings, ICAE two new Officers and three new members, as shown in the following, have been elected.

New ICAE officers:
President: Zen Kawasaki (Japan, Professor of Osaka University of Japan)
Secretary: Daohong Wang (China, Associate professor of Gifu University of Japan)

New ICAE members:
Vernon Cooray (Sweden)
Colin Price (Israel)
Daohong Wang (China)

In these meetings, three members have retired:
Changming Guo (China)
Minoru Nakano (Japan)
Sven Israelsson (Sweden)

Due to the above changes, the present composition of ICAE committee is as follows:

Officers:
President: Zen Kawasaki (Japan, Professor of Osaka University of Japan)
Secretary: Dahong Wang (China, Associate Professor of Gifu University of Japan)

Committee Members:
S. Anisimov (Russia), H.Christian (USA) , V. Cooray (Sweden), J.E.Dye (USA), M. Ishii (Japan), Z. Kawasaki (Japan), P. Krebhiel (USA), P .Laroche (France), S. Michnowski (Poland), O.Pinto (Brazil), C. Price (Israel), X. Qie (China), V. Rakov (USA), D. Rust (USA). C. Saunders (UK), S. Soula (France), D. Wang (China), E. Williams (USA)

Honorary Members:
H.Dolezalek (USA), J.Hugues (USA), N. Kitagawa (Japan), E.P. Krider (USA), J.Latham (UK), L.Runhke (USA), T.Ogawa (Japan), H. Tammet (Estonia)

Summary of the 13th International Conference on Atmospheric Electricity

By X. Qie, P. Laroche, S. Soula, and Y. Zhao

The 13th International Conference on Atmospheric Electricity (13th ICAE) was held successfully in Beijing, China at the Beijing Friendship Hotel from August 13-17, 2007. About 220 scientists and students from 30 countries and regions attended the Conference. Professor Guoxiong Wu, the President of IAMAS, attended the Opening Ceremony of 13th ICAE and gave a very warm congratulation speech.

A total of 264 papers were submitted in 9 sessions which were organized by the International Commission on Atmospheric Electricity. About 250 papers were successfully presented during the conference thanks to the well organization of all the chairpersons.

A photo of whole participants which was taken in front of the conference hall, friendship palace. For any colleagues, if you need the participant list including e-mail addresses, please contact Dr.Yang Zhao (zhaoy@lzb.ac.cn).

1. International Commission:

Chairman： P. Laroche (France)

Secretary： S. Soula (France)

Member: S. Anisimov (Russia), H. Christian (USA), H. Dolezalek (USA), J. E. Dye (USA), C. Guo (China), J. Hugues (USA), M. Ishii (Japan), S. Israelson (Sweden), Z. Kawasaki (Japan), N. Kitagawa (Japan), P. Krehbiel (USA), P. Krider (USA), P. Laroche (France), J. Latham (UK), S. Michnowski (Poland), M. Nakano (Japan), O. Pinto (Brazil), T. Ogawa (Japan), X. Qie (China), V. Rakov (USA), L. Ruhnke (USA), D. Rust (USA), C. Saunders (UK), S. Soula (France), H. Tammet (Estonia), E. Williams (USA)

2. Local Organizing Committee:

Honorary Chairman: Xiuji Zhou and Daren Lu

Chairperson: Xiushu Qie

Member: Jianchun Bian, Hongbin Chen, Guili Feng, Changming Guo, Xiangzhen Kong, Liangfu Li, Jinli Liu Xinsheng Liu, Hui Luo, Yunfeng Luo, Jietai Mao, Xiaobo Ren, Shanchang Tao, Chunyi Wang, Deyan Wang, Jianchu Wang, Zhenhui Wang, Shaojie Yang, Guangshu Zhang, Lu Zhang, Tong Zhang, Yijun Zhang, Yunjun Zhou, Baoyou Zhu, Yang Zhao (Secretary)

3. Topics of the Conference:

Session 1 Global Circuit,
Session 2 Lon and Fair Electricity,
Session 3 Thunderstorm Electrification,
Session 4 Lightning Physics,
Session 5 Lightning and Meteorology
----Operational Application and Basic Research,
Session 6 Lightning and Climate,
Session 7 Electrical Effects of Thunderstorms on the Middle and Upper Atmosphere,
Session 8 Lightning Detection,
Session 9 Lightning Effect and its Protection.

4. Summary of Presentations:

SESSION	PAPER SUBMITTED	OVERVIEW	ORAL PRESENTION	POSTER PRESENTION
S1	23	1	5	17
S2	27	1	4	22
S3	35	2	11	22
S4	58	1	13	44
S5	33	1	5	27
S6	27	1	6	20
S7	17	0	5	12
S8	19	0	6	13
S9	25	0	4	21
TOTAL	264	7	59	198

5. Invited Overview Presentations:

1. "The Global Electrical Circuit: A Review" by ***Earle Williams*** from Massachusetts Institute of Technology, Cambridge, MA USA.
2. "Air ion research 2003-2006" by ***Hannes Tammet*** from University of Tartu, Estonia.
3. "Thunderstorm electrification: An overview of recent observation results" by ***Paul R. Krehbiel*** from Langmuir Laboratory, Geophysical Research Center, New Mexico Institute of Mining and Technology Socorro, USA.
4. "What's new from model and laboratory results in storm electricity" by ***Edward Mansell*** from University of Oklahoma, USA.
5. "Recent progress and open questions on the physics of lightning" by ***Pierre Laroche*** from Instrument and Sensing Department ONERA, France.
6. "Emerging trends and opportunities for the operational application of lightning data" by ***Steve J.Goodman*** from NOAA/NESDIS/Office of Research and Applications, USA.
7. "Lightning and climate-recent developments" by ***Colin Price*** from Department of Geophysics and Planetary Sciences, Tel Aviv University, Israel.

6. Scientific Summary from Chairpersons of each Session:

Session 1: Global Circuit (oral),

By Colin Price % Eugene Mareev

This session had 6 talks, 1 overview talk and 5 contributed talks. The session dealt with the global electric circuit, both a review of the advances over the past few years, and the latest developments.

Earle Williams gave a review talk covering a number of topics ranging from the diurnal variations of the global circuit; surface-based measurements of the global circuit at high latitudes; the annual variation of the global circuit; the semiannual variation of the GC; the role of lightning and shower clouds in the GC; the impact of nuclear weapons on the GC; long term trends; and the connection with climate change. Substantial progress has been achieved in understanding the global electrical circuit, and yet controversial issues remain. Renewed efforts are needed to monitor the global

circuit on a continuous basis toward exploiting this natural framework for study of global change.

Jeremy Thomas presented results from balloon flights above thunderstorms in Brazil. It is estimated the mean quasi-static conduction current during this period to be ~2.5 A. Integration over the one hour duration of the measurements suggests that a total charge of ~9000 C, about 2% of the total net charge in the fair-weather atmosphere, is transferred from the thundercloud to the middle and upper atmosphere above the balloon altitude.

Sven Israelsson discussed the relationship between the global circuit and solar wind changes. It was shown that the ground-level electric field (Ez) and current (Jz) disturbances recorded at Hornsund are often in concurrence with solar wind induced changes in the magnetosphere-ionosphere (MI) system.

Tom Marshall discussed the charging of the stratiform regions of MCSs and the impacts on the global circuit. As current drivers in the Earth's global electric circuit, individual MCS stratiform regions are important due to their large horizontal extent and long duration. Because of the variability seen in the electric field inside and above stratiform regions, however, the overall contribution of MCSs to the global circuit can be generative or dissipative.

Brian Tinsley discussed the role of the GC in influencing clouds and climate. He reported a variety of meteorological responses to short-term changes in the global electric circuit associated with a number of disparate inputs. The meteorological responses consist of changes in cloud cover, atmospheric temperature, pressure, or dynamics.

Eugene Mareev discussed the electrical energy in the GC. He estimates the lifetime of electric energy in the atmosphere, which turns out to be very small – to be from about 2 minutes to 30 seconds, depending on the assumptions on the control parameters of the global electric circuit.

Session 2: Lon and Fair Weather Electricity (oral),

By Lothar H. Ruhnke, Kenkichi Nagato

H. Tammet gave an overview of research activity on aerosol and ions. He found significant increases of ion research due to better awareness of global

contamination by manmade aerosols and due to the believe in a coming global climate change. The emphasis of this increase in research activity is on ion induced nucleation.

S. Israelsson summarized in his presentation long term measurements of electric field in Sweden. His measurements locations were free of long-term variations, like tree growth, which might as some locations affect the long term trends in measured values. His results were that no increase in average electric fields can be seen in his data, with a possibility of a slight decrease in electric field values, in agreement with Marksen's recent analysis of long term trends in ionosphere potentials.

K. Nagato described careful laboratory measurements of small ion generation and their properties. The instrumental set-up is remarkable and clearly shows the influence of humidity, trace gases and pressure on the mobility and composition of ion clusters. Ion mobility and reaction times were carefully measured and interpreted. The growth in time of airborne ions was demonstrated.

L. Zhou discussed the influence of aerosols in the atmosphere on ions generated by cosmic rays. He developed a new model of aerosol distributions over the globe that better represents the global state and variations of aerosols and ions than previous models. Conductivity profiles in the atmosphere can now be predicted well, e.g. in case of a strong volcanic eruption.

S. Anisomov presented data on the relationship between electric fields near the surface and the three components of wind. It was on special interest to relate increased electric fields with vertical velocity of winds some height above ground. Good correlations could be detected between surface electric field and vertical wind component at 90 m altitude. There seems to be a special height at which wind and electric field correlate best.

Session 3: Thunderstorm Electrification (oral) Part 1,

By Clive Saunders, Conrad Ziegler

Paul Krehbiel Overview of recent observational results. The continued development of the LMA has provided new insight into electrification process inside thunderstorms. Normal polarity storms can be explained by non-inductive process. However, anomalous storms were discovered in STEPS, with inverted polarity. It is clear that graupel particles carry the charge. Tornado storms have a multi-layer

structure and the observed double dipole suggest inductive charging. Observations of electrification following drop freezing suggest crystal production. Extensive regions of positive charge reported.

Tinglong Zhang et al., The charge structure of a typical thunderstorm in Chinese Inland Plateau. Field changes provide charge neutralization height. Negative CG has charge region ~4km. Positive CG are around 5.5 km. So a triple charge structure existed. A large LPCC previously identified in the storm, but no observation of positive CG from the LPCC.

Stolzenburg et al., Initial Electrification of Thunderstorms: Evidence for a Connection Between Precipitation and Charging. Initial development of E associated with particle growth above ~5° level as detected by radar. Followed by rapid E growth associated with larger particle. Lightning followed the particle growth. First flashes in region -10 to -21℃ . All results point to non-inductive charging leading to initial electrification.

C. Saunders and C. Emersic presented an analysis of graupel- ice charging at anomalously low values of effective water content (EW) in the University of Manchester cloud chamber. They inferred that the relative growth rates of cloud ice and graupel by vapour deposition control the sign and magnitude of graupel charging resulting from the rebounding graupel-ice collisions, with high (low) supersaturations favoring positive (negative) graupel charging. Charging rates in the low-EW charging region are additionally higher than charging in the (non-anomalous) high- EW region of the EW-versus-temperature charging space.

J. Dye et al. analyzed electric fields in Florida thunderstorm anvils in the context of in-situ microphysics, lightning, and radar measurements. The existence of strong fields (~10-20kvm^{-1}) in the presence of crystals at low ice supersaturations suggests the possibility of noninductive charging in the absence of EW. Large across-anvil and small along-anvil field gradients in the presence of slowly-varying crystal concentrations/sizes and reflectivity may provide supportive evidence of charge transport from the convective region.

Fierro et al. presented result of numerical simulations of a tropical squall line (SL) and a tropical cyclone (TC) using a high resolution cloud model that includes parameterized microphysical and electrical processes and a discrete lightning flash scheme. The simulated SL contains low cloud liquid water content (CWC) in weak,

high-precipitation convective updrafts, with a resulting normal tripolar charge arrangement and negative cloud-to-ground (-CG) flashes from the lower bi-level intercloud (IC) flash region. In contrast, the TC produces –CG flashes in the eyewall convection and a few +CG flashes in the outer rainbands, corresponding to normal tripolar charges in the eyewall and normal dipoles in the rainbands. The microphysical charging in both the SL and TC cases arise from some combination of the non-inductive and inductive mechanisms.

Session 3: Thunderstorm Electrification (oral) Part 2,

By Tsutomu Takahashi

Non-inductive mechanism was emphasized as main charge separation mechanism in thunderstorm by the many different tools such as TMI (37 GHz), TRMM-PR, polarization radar and videosondes. However, conflict between Takahashi (1978) and Saunders and Peck (1998) still remain unsolved. This is a hindrance to extend lightning model research and for its application to the large-scale observations. Further laboratory work is urged. It is recommended to conduct riming electrification, extending from ice saturation to water saturation.

Evidence for substantial charge transfer in ice particle collisions in the absence of riming but in the presence of ice super saturation may be important for explaining the strong electrification in the upper portions of supercells. But more work is needed. The laboratory regimes applicable to roughly documented inverted polarity electrification need to be identified.

More in-cloud soundings are highly recommended to increase understanding of charge evolution in storm system.

Since multipole electric structure have been proposed recently, it was timely that the dispute between Wilson and Simpon on thundercloud polarity was revisited by the survey of Wilson's original notebooks. Lightning flash pattern constructed by the use of VHF lightning detection techniques for thunderclouds have greatly advanced volcano lightning knowledge.

Session 3: Thunderstorm Electrification (poster)

By Hui Luo

There are four papers absent from this session 3. They are: PS3-5, PS3-9, PS3-21 and PS3-22

Session 4: Lightning Physics (oral) part 1

By Martin Murphy & Richard Orville

All speakers were present.

First presentation by Laroche was an overview of the last 4 years of investigation on the physics of lightning. Topic: Initiation of lightning, effects of corona on initiation of upward leaders, properties of lightning from rocket- triggered lightning studies, high-speed video observations of flashes, intracloud flashes, electromagnetic radiation due to lightning flashes in a variety of bands, interaction of charges and lightning with cloud particles.

Questions: It was mentioned that CG and IC flashes are equally effective at producing NO.

2nd presentation: triggered lightning during SHATLE by Yang Zhao Electric field mill, flat plate antennas (2), and optical observations, and a direction finder. Current measurements were made with 2 Rogowski coils and a shunt. They triggered a couple of flashes during high flash rate storms and showed the data from some of these.

3rd presentation: High-current upward lightning by Prof. Ishii comparing GPS-equipped fault recorders and flat plate antennas. 99% of lightning hitting 500 KV line were upward.

4th presentation: long continuing luminosity observed in an urban area in Brazil. Radar, video camera, lightning detection network observations.

5th high-speed video in Guangdong –Yijun Zhang- Natural CG flashes. He shows some stepped leaders. One case was an attempted leader. Some statistics on M components and estimates of leader velocity were also shown.

Session 4: Lightning Physics (oral) part 2,

By Vladimir A. Rakov

There were a total of 8 papers from 6 countries scheduled for this session. All 8

papers were presented. Both experimented and theoretical results were presented. All papers were discussed with audience participation.

Of particular interest are papers presenting high-speed video images of lightning (OS4-7 and others).

Session 4: Lightning Physics (poster),

By Masaru Ishii

34 posters were presented. Posters were not displayed for the following 10 presentations. PS4-1, 4-16, 4-17, 4-19, 4-25, 4-29, 4-31, 4-32, 4-35, 4-44

Observations with high-speed video cameras are reported from Brazil (4-11, 4-13, 4-18, 4-36) and China (4-12), in conjunction with oral papers OS4-4 and OS4-7. Brazilian and Chinese observations give consistent results on the propagation velocity of positive downward leaders, which are within the velocity range of negative stepped leaders. The same device is also applied to produce statistics on continuing currents and to study characteristics of M-components for continuing currents of both polarities.

There are extensive reports on the experiment of rocket-triggered lightning in Shandong, China (4-7, 4-8, 4-20, 4-21) in conjunction with an oral paper OS4-1.

Observations of electric field changes associated with lightning discharges are reported from Florida (4-4, 4-22, 4-41), Mew Mexico (4-6) China (4-33, 4-37) and Poland (4-34). Observation of peak fields associated with negative return strokes by LLS from Brazil is reported (4-38). Studies of calculated e-field changes based on models are presented (4-5, 4-10, 4-26).

Miscellaneous posters are on models of leaders (4-3, 4-9), on more general pictures (4-23, 4-40), on space charge layer (4-15) on circuit model (4-27); laboratory experiments on long-gap discharge (4-28, 4-39); laser-triggered lightning (4-42); X-ray detection (4-2); NOx production; and observation of lightning (4-14, 4-24, 4-43).

Session 6: Lightning and Climate (oral)

By Osmar Pinto Jr.

The session was very good. Everything was as expected. Particularly, the overview given by Colin Price was very complete and useful for the ICAE community.

The subject lightning and climate has received recently and increasing interested by the scientific community, stimulated in part by the IPCC reports, and it should be encouraged and stimulated by the ICAE committee.

At this time it is not clear the role of lightning in the climate change, but there is no doubt that this subject should be investigated in detail.

Session 7: Electrical Effects of Thunderstorms on the Middle and Upper Atmosphere(oral)

By Yoav Yair & Serge Soula

Five presentations were given in oral session 7 (OS7). First, Su et al. gave a review of the global distribution of TLEs based on ISUAL satellite observations. The global rate of TLEs was 4.1 min^{-1} with 80 % of elves and 20 % of sprites or halos. Sprites and lightning activity were found well correlated. Elves were also found over oceans, probably because of intense lightning flashes. In the second paper, van der Velde et al. reported statistical results on occurrence conditions of sprites from ground observations over France. 9 % of +CGs from 7 analysed MCS-type storms produced sprite events. These sprite-producing flashes were mainly located in stratiform precipitation areas and associated with other CGs in short time sequences (typically 1 sec). The sprites with a large number elements corresponded with time delays after the parent +CG and with high peak-current +CGs. In the third paper, Yair et al. reported on two winter campaigns conducted in Israel describing the meteorological conditions for sprite occurrence. The similarities with Japan results in terms of sprite morphology and number of elements, were noted. Unique aspect is long delay times between parent +CG and sprite. Initial conditions of 3D-structure of column sprites were presented. In the fourth paper, Goto et al. presented laboratory sprite simulation at different pressures. They reported good match with natural sprites. They found that colors, states and spectral distributions depended on the air pressure. In the last paper, Thomas et al. reported on the possible influence of strong thunderstorms (big CG flashes) on the D-layer of the ionosphere. They compared the results of their electromagnetic model on the lightning influence to lower ionospheric electron density with in-situ electric field transients from a rocket campaign.

Session 8: Lightning Detection (oral),

By Zen Kawasaki

In this session we have 6 oral papers.

Rison gives an idea on portable LMA, and its application to the audience. The specification of LMA is given in detail. The observation of VHF sources associated with volcano eruption is briefly presented.

Akita gives a talk on a broadband digital interferometer. He shows the Field campaign in Darwin. VHF locations of cloud discharges are given, and source locations preceding K change are presented.

Zhao gives a talk on narrowband interferometer, which is newly developed in China. He shows the image of the stepped leader and electrical activity in cloud.

Koshak gives a talk on OTD observations of continent US ground and cloud flashes. He compairs the OTD data and NLDN data. Baysean theory is applied to develop the algorithm which is applied to the geostationary LIS.

Morimoto gives the ongoing project of space-borne broadband digital interferometer

Lojou makes the discussion of the lifecycle of thunderstorm with the observation of total lightning activity. The lightning channel images by ITF are also shown.

Session 8: Lightning Detection (poster),

By Hui Luo

There are four posters absent from total 13 posters in session 8. They are: PS8-8, PS8-9, PS8-10, PS8-12.

Session 9: Lightning Effect and its Protection (oral),

By Pierre Laroche & Daohong Wang

The first paper presented measurements of induced currents and voltages by direct and nearby discharge on instrumental tower. Author showed on the importance of considering the location of the event to interpret the sign of the measurements.

The second paper presented a computation of current induced inside a building protected by conducting wire, by a direct strike on top of the building. Author shows that the use of metallic plate covering each floor reduces significantly the induce voltage and current inside. Computation can locate the spot of large electromagnetic coupling.

The third paper presented the experimental results which concerned the discharging characteristics of simulated sparks to a building's plastic-steel windows and doors.

The fourth paper reported the analysis results on the potential vulnerability and vulnerability zoning of thunderstorm disaster in Shanghai.

CONFERENCES

2007 AGU FALL MEETING

The fall meeting of AGU will be held on 10-14 December 2007, at the Moscone Center West, 800 Howard Street, San Francisco. For detail, please visit http://www.agu.org/meetings/fm07/

THIRD CONFERENCE ON METEOROLOGICAL APPLICATIONS OF LIGHTNING DATA

The *Third Conference on the Meteorological Applications of Lightning Data*, sponsored by the American Meteorological Society (AMS), and organized by the AMS Committee on Atmospheric Electricity, will be held 22–24 January 2008, as part of the 88th AMS Annual Meeting in New Orleans, Louisiana. General meeting information and conference details can be found at http://www.ametsoc.org/meet/annual/index.html.

The goals of the conference can be found in the 88th AMS Annual Meeting Call for Papers: http://www.ametsoc.org/meet/annual/call.html.

The final program listing is available at the following website:
http://ams.confex.com/ams/88Annual/techprogram/programexpanded_449.htm

2008 EGU GENERAL ASSEMBLY

The General Assembly 2008 of the European Geosciences Union (EGU) will be held in **Vienna**, Austria, on **13 – 18 April 2008**

The EGU General Assembly covers all disciplines of the Earth, Planetary and Space Sciences. Especially for young scientists the EGU appeals to provide a forum to present their work and discuss their ideas with experts in all fields of geosciences.

The website address of the assembly is:
http://meetings.copernicus.org/egu2008/index.html

This assembly has a session on thunderstorm effects on the middle and upper atmosphere.
The deadline for abstract submission is January 14th, 2008.
http://meetings.copernicus.org/egu2008/

AS1.07: Effects of thunderstorms on the middle and upper atmosphere
Convener: Yair, Y. Co-Convener: Neubert, T.; Fullekrug, M.

The regions of the atmosphere above thunderstorms are affected by the strong convection of thunderstorms and the associated electrical activity. Thunderstorms carry chemically and radiatively active species into the stratosphere and mesosphere, generate gravity waves, modify electrical properties, create high-altitude discharges and heat the ionosphere. The European space missions ASIM, and TARANIS focus on the physics of the atmosphere and ionosphere above thunderstorms, in particular the sprites jets and elves. In preparation for the missions, European groups have fielded increasingly sophisticated ground observational instrumentation.
Presentations are solicited of all aspects of thunderstorm-driven processes in the stratosphere, mesosphere and ionosphere.

20th ILDC (INTERNATIONAL LIGHTING DETECTION CONFERENCE)
2nd ILMC (INTERNATIONAL LIGHTNING METEOROLOGY CONFERENCE)

Vaisala will present the 20th International Lightning Detection Conference (ILDC) 21-23 April 2008 and the 2nd International Lightning Meteorology Conference (ILMC) 24 - 25 April 2008.

The 20th ILDC will provide a forum for presentations and discussion related to advances in lightning detection technology, network performance evaluation, and fundamentals of lightning physics and current research.

The 2nd ILMC will focus on applications of lightning data related to thunderstorm nowcasting for the meteorological and aviation communities, oceanic extratropical and tropical cyclone nowcasting, and data assimilation into numerical weather prediction models.

Both events will be held in Tucson, Arizona USA at the Marriott Tucson University Park.
Important Dates:

Abstracts due	3 December 2007
Acceptance notification will begin	7 January 2008
Final papers due	29 February 2008

ILDC Conference	21-23 April 2008
ILMC Conference	24-25 April 2008

Call for papers and updated conference information will be available at www.vaisala.com/ILDC in July 2007. Please send any questions to ildc@vaisala.com.

ICLP 2008

From 23rd to 26th of June 2008, the 29th International Conference on Lightning Protection (ICLP) will be held in Uppsala, Sweden.
http://www-conference.slu.se/ICLP2008/index.html

The Conference will be located in Uppsala University : http://www.uu.se/

Several topics in the field of lightning physics and lightning protection will be investigated at this Conference:

- **Lightning discharge**
- **Lightning occurrence characteristics**
- **Lightning electromagnetic pulse**
- **Lightning attachment**
- **Lightning down conductors and grounding**
- **Lightning protection of power systems**
- **Lightning protection of electronic systems**
- **Lightning deleterious effects**
- **Practical and specific lightning protection problems**
- **Lightning protection of windmills and other alternative power systems,**
- **Lightning testing standards.**

INTERNATIONAL SYMPOSIUM ON TOPICAL PROBLEMS OF NONLINEAR WAVE PHYSICS (NWP-2008)

International Symposium on "Topical Problems of Nonlinear Wave Physics-2008" (NWP-2008) will be held on board a comfortable boat cruising up and down the Volga river starting in Nizhny Novgorod from July 20 through July 26, 2008.
This meeting is a continuation of the previous symposia "Topical Problems of Nonlinear Wave Physics-2003 and 2005" that attracted leading experts from around the world. Information about NWP-2003, 2005 is available at the web site http://www.nwp.sci-nnov.ru

The upcoming Symposium will be devoted to recent progress in the interrelated fields of nonlinear physics with applications to systems of different origin.
The Symposium will include three parallel Topical Conferences:

- **NWP-1: Nonlinear Dynamics of Electronic Systems (16-th International Workshop)**
- **NWP-2: Physics of Extreme Light**
- **NWP-3: Global and Synoptic Nonlinear Processes in the Atmosphere**

Each Conference will feature oral (invited and contributed) talks and poster sessions. Besides, some plenary lectures on interrelated topics are planned. Oral and poster presentations will be selected by the Program Committee Members by results of the considered submissions. For detailed information, please visit the website http://www.nwp.sci-nnov.ru

XXIX URSI General Assembly Chicago, Illinois, USA (2008)

The XXIX General Assembly of the International Union of Radio Science (Union Radio Scientifique Internationale-URSI) will be held at the Hyatt Regence Chicago Hotel in downtown Chicago, Illinois, USA on August 07-16, 2008. There are several sessions which directly related to lightning. In the following you can find the description on the two sessions which are mostly related to lightning. For other sessions or other detailed information, please visit the website http://www.ece.uic.edu/2008ursiga

E06: Lightning Discharges and Related Phenomena
Monday 11/08/2008 13:40 – 17:20 / Oral Session / 10 Papers Room: Columbus CD
Conveners: Z. Kawasaki, <zen@comm.eng.osaka-u.ac.jp>
V. A. Rakov, <rakov@ece.ufl.edu>
Summary: The lightning discharge is one of the two natural sources of electromagnetic interference (EMI), the other one being the electrostatic discharge. Lightning can be defined as a transient, high-current (typically tens of kiloamperes) electric discharge whose length is measured in kilometers. Electric and magnetic fields generated by lightning represent a serious hazard to various systems, particularly those containing sensitive electronics. The scope of the session includes the following topics:
Properties of the lightning discharge important for EMC, lightning return-stroke models, lightning electromagnetic pulse (EMP), coupling of lightning electromagnetic fields to overhead lines and buried conductors, lightning locating systems, atmospherics, lightning effects in the middle and upper atmosphere, lightning protection and testing standards.

EGH: Terrestrial and Planetary Electromagnetic Disturbances and Effects
Wednesday 13/08/2008 13:40 – 17:20 / Oral Session / 10 Papers Room: Columbus CD
Conveners: M. Hayakawa, <hayakawa@whistler.ee.uec.ac.jp>
C. Price, <cprice@flash.tau.ac.il>
M. Füllekrug, <m.fullekrug@bath.ac.uk>
Summary: This session welcomes papers on the general topic of natural and anthropogenic electromagnetic disturbances in the atmospheres of the Earth and other planets. Papers dealing with ULF, ELF and VLF disturbances are particularly encouraged, although papers dealing with any frequency range are welcome. Some topics related to this session include geomagnetic pulsations and VLF/ELF emissions, Schumann resonances and global lightning, lightning detection and thunderstorm research, upper atmosphere discharges, ionospheric and magnetospheric remote sensing, electromagnetic noise, their effects on transmission lines, etc.

IAMAS ASSEMBLY 2009 (CANADA)

The next IAMAS (The International Association of Meteorology and Atmospheric Sciences) assembly will be held in Montreal, Canada 19-29 July 2009. This is also a big meeting for ICAE colleagues. For detailed information, please visit the official site of IAMAS: http://www.iamas.org/

As one of the 10 commissions of IAMAS, ICAE has proposed the following four topics.

1. Electrical characteristics of thunderstorms (including global circuit)
2. Lightning and meteorology
3. Lightning: general characteristics, hazard and management
4. Lightning discharge in the upper atmosphere (sprite etc)

RESEARCH ACTIVITY BY INSTITUTION

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

The last recent activities of ELAT includes: the participation in the ICAE Conference in Beijing with a total of 16 papers; six of them should be submitted to the special issue of Atmospheric Research. Other researches in development include: investigation of the relationship of lightning activity and surface air temperature changes in the city of São Paulo; detailed analysis of positive lightning data in the South of Brazil; detailed analysis of high-speed camera lightning observations in Arizona, United States in collaboration with the University of Arizona; use of neural networks to predict lightning activity; and the relationship of lightning and fires in Brazil.
Brazil was elected to organize the next ICAE Conference in 2011, which should be held in Rio de Janeiro. At the beginning of 2008 the ICAE2011 will already have a site in the internet to promote the event.

ATMOSPHERIC ELECTRICITY GROUP - PHYSICS DEPARTMENT AT THE UNIVERSITY OF MUNICH (Garching, Germany)

In 2007 the European Lightning Detection Network LINET was extended and now comprises more than 80 sensors in 16 countries. Real-time and archived data is collected for scientific and operational purposes. During 2007, features and results have been presented at 12 conferences, mostly in cooperation with other research groups. Of particular value are the total-lightning capability and the high location accuracy, available from LINET over large areas.
Numerous research projects are under way, such as experimental studies of lightning activities associated with observations of sprites (Sopron), correlated lightning emission by spatially separated storm cells (Raanana), wave-form studies (Warsaw), strikes into instrumented towers (Barcelona), correlations with satellite data (Rome, Paris), severe weather nowcasting (DLR Wessling, nowcast Inc. Stegen), and comparisons with VHF measurements from operational networks.
One of the research interests continues to focus on the poorly understood observation that VLF/LF techniques allow measurement of massive amounts of cloud discharges. 2D- and 3D-location of VLF/LF emission, event time, current and polarity are parameters, which can be exploited in comparisons with VHF data. With this,

present understanding of cloud discharges can be tested and a large data-base is created which might contribute to improve the description of influential cloud processes.

ATMOSPHERIC ELECTRICITY RESEARCH GROUP AT THE INSTITUTE OF GEOPHYSICS, POL. ACAD. SCI. (WARSAW, POLAND)

Our activities in the field of thunderstorm and lightning research (Piotr Baranski: baranski@igf.edu.pl) are extended by engagement in the COST P18 program, as it is reported on www pages (http://www.costp18-lightning.org/). The progress in project of studying of multiple cloud-to-ground lightning flashes and setting up a regional lightning detection and location network in the region of Warsaw we intend to show during the next ICLP conference in Uppsala (Sweden). In this summer thunderstorm season we have been able to obtain a several tens of new reference E field recordings of RS and IC signatures with 40 ns time resolution and GPS time stamp for particular lightning trigger pulse used in A/D PC card. That database is now prepared to be compared and related to simultaneous lightning detections given by the SAFIR/PERUN and LINET networks monitoring lightning activities over Poland.
In Swider Observatory since January 2007 the AWESOME receiver has been installed with a set of 2 cross-loop magnetic antennas adding that measuring point to the world wide network for monitoring of electromagnetic disturbances in ionosphere in VLF (Very Low Frequency) range. This installation was carried out in cooperation with Stanford University (California, USA) and Marek Golkowski (mag41@stanford.edu).
Zenon Nieckarz (nieckarz@if.uj.edu.pl) and Andrzej Kulak from Jagiellonian University (Cracow, Poland) attempt to compare and relate their method (Kulak et al., J. Geophys. Res., vol. 111, No. A10, 2006) of calculating of global storm activity rate on the basis of Schumann resonance to experimental data obtained from global network of magnetic VLF observations. Such comparative investigations appear to be able to test some features of the global electric circuit (GEC) models.
At Swider Geophysical Observatory we continue electric field, vertical air-earth current density and electrical conductivity recordings together with simultaneous observations of radioactivity and air pollution elements, and meteorological parameters (M.Kubicki, W. Kozłowski, B. Laurikainen). The recording data are published in year books of Swider Observatory (Marek Kubicki: swider@igf.edu.pl). Measurements of electric field in middle latitude Swider station, magnetic field components from the Scandinavian IMAGE magnetic station network and satellite recordings of Interplanetary Magnetic Field (IMF) indicated that for days 13-14.10.2000, 23-24.05.2000 and 30-31.03.2001 during the main phase of a magnetic storm, a strong daytime negative Ez at Swider deviations could be noticed simultaneously with magnetic substorm development at night side of the auroral zone, when no local magnetic perturbations were observed. The night storm-time Ez disturbances were more complicated and less sensible to the substorm activity than

the dayside ones. These storm-time Ez anomalies are reveal by comparing the recorded data with Ez daily variations obtained under the quiet magnetic conditions (at least Kp<2), (N. Kleimenova: kleimen@ifz..ru, O. Kozyreva, N. Nikiforova, M. Kubicki, S. Michnowski).
The influences of solar wind on the electrical element variations at the ground in Hornsund are being examined with the use of geophysical data from Hornsund, satellite solar wind data, riometer stations and IMAGE net of magnetometers (S. Michnowski, M. Kubicki, N. Kleimonova, S. Israelsson, N. Nikiforova).
The studies of effects of the cosmic rays of the galactic and solar origin on lower atmosphere parameters are continued (Z. Kobylinski, M. Kubicki, S. Michnowski).
An attempt to study a possibility of the ground level electric field response to lithosphere sources (earthquakes) has been undertaken (Z. Kobylinski, K. Teisseyre, S. Michnowski).
The 7 different contributions to the recent Proceedings of the 13-th ICAE conference in Beijing (China) illustrate in a part our current research work.

ELECTRICAL ENGINEERING LAB OF CHUO UNIVERSITY (TOKYO, JAPAN)

Abstract (based on a research about broken characteristic of curved copper wires due to lightning impulse current and authored by Xiaobo Hu, Tsuginori Inaba, Bastian Lewke, Josef Kindersberger): the winter lightning strikes frequently for long term in the Hokuriku district in Japan. And high voltage and large current give a serious damage to the various apparatus. So we cooperate with Laboratory for High Voltage Technology and Power Transmission in Technical University of Munich, Germany to design experiments to research these phenomena.
An excellent impulse current generator located in Technical University of Munich is used. The maximum charge voltage is 160 kV and the maximum stored energy is 80 kJ. There are 32 capacitors with maximum rating of each 2.5 μF in capacitance and 40 kV in voltage, which are divided into 4 groups. Each group has 20 μF with a possibility of a parallel (80 μF), series (5 μF) and series-parallel (20 μF) connection of these groups. The current waveform is adjusted by linear high energy resistors, and the lightning current is measured by a coaxial shunt which is connected with an oscilloscope (OS).
The impulse current generator has three different voltage setups which are 50KV, 100KV, and 200kV. And the impulse current waveform is similar with 8/20μs.
With 200kV setup we could get the maximum current peak value about 35kA.
With 100kV setup we could get the maximum current peak value about 75kA.
With 50kV setup we could get the maximum current peak value about 135kA.
The maximum current peak value changes with the adjustment of linear high energy resistors. And the waveform is also influenced by the adjustment of linear high energy resistors. With the 200kV setup the front-wave becomes a little faster (about 6,7μs) comparing with 8μs because of increase of resistors.

INDIAN INSTITUTE OF TROPICAL METEOROLOGY, PUNE-411008

Two studies have been performed and their abstracts are as follows.

Abstract 1 (summary for a study from ground based observations, authored by M.K. Kulkarni, M.I.R. Tinmaker and S.S. Kandalgaonkar): Lightning is one of the most spectacular meteorological phenomenon and the most common severe weather hazardous event. Lightning flashes/stroke density or number of flashes are of fundamental interest on spatial as well as on temporal scales. The cloud to ground lightning over the land is well known which has a large peak associated with maximum convective activity in the afternoon. The cloud to ground flashes/strokes are most common since they are one of the processes that lower the negative charge to the earth's surface and are also well documented.

The thunderstorm activity recorded by the Boltek Storm Tracker during the period 2004-07 have been utilized to study the distribution of Total Strokes (TS), Total Cloud to Ground strokes (TCG) and Total Inter/Intra Cloud strokes (TIC) over a tropical inland station Pune (18°32'N 73°51'E, 557 amsl). During the period of study the 110 thunderstorms occurred over this region. Among them 26 were in 2004, 34 in 2005, 18 in 2006 and 32 in 2007 (up to 7 Nov 2007). Majority of the lightning activity during the course of study is confined to April, May, June and September months whereas during the months March, July, August, October, and November show a minimum activity, and the months December, January, February are totally free from lightning activity. Distribution of TS follows a bimodal variation with two peaks in June and September. The magnitude of TS is higher in the month of June than in September. The TCG strokes also show the bimodal variation with two peaks in June and September, but both the peaks are of similar magnitude. The percentage of TIC strokes (IC includes Intra cloud as well as Inter cloud) also explore two peaks similar to TS and TCG. The magnitude of TCI is higher in June than that in Sept.

Year wise analysis reveals that the percentage of lightning strokes for TS is maximum in 2005 and minimum in 2004. Similarly TCG is highest in 2005 and lowest in 2006 where as TIC is maximum in 2007 and minimum in 2006.

Abstract 2 (summary for a study of land-ocean contrast in lightning activity over the Indian region, authored by S.S. Kandalgaonkar, M.I.R. Tinmaker, J.R. Kulkarni, M.K. Kulkarni and Gayatri Vani): Satellite (LIS) based lightning flash grid data for the two oceanic regions [Arabian Sea (AS) and Bay of Bengal (BoB)] and Indian land mass region for a period of 5-years (1998-2002) are used to study the land-ocean contrast in lightning activity. The data have been analyzed to examine temporal and spatial distribution in lightning contrast. The study revealed that lightning activity over the land region is dominant whereas over BoB it is higher than AS. Maxima in activity over land, BoB and AS are noticed between 28 to 30oN, 12 to 14oN and 12.5 to 13oN latitudes respectively. Land to AS ratio is found to be

2.5 times higher than Land to BoB. The ratio analysis in the present study over AS and BoB may provide some information about distribution and transition of maritime to continental clouds and this information will be useful for the validation of numerical simulations of cloud resolving models.

LABORATORY OF LIGHTNING PHYSICS AND PROTECTION ENGINEERING, CHINESE ACADEMY OF METEOROLOGICAL SCIENCES (Beijing, China)

In recent years, the Laboratory of Lightning Physics and Protection Engineering (LLPPE) of Chinese Academy of Meteorological Sciences (CAMS) has implemented several key projects as summarized below.

- Construction of the National Lightning Detecting Information Processing and Application Center

A national lightning detection information processing system has been developed for providing technique for public service of the lightning detection products. Meanwhile, a lightning detection data analyses system has also been developed, which can be used to analyze the temporal and spatial distribution characteristics of lightning activities, and to bring products of the national lightning intensity distribution, lightning density distribution etc.

- Developments and experiments of the Lightning Nowcasting and Warning System

A lightning Nowcasting and Warning System (CAMS_LNWS) was devised. This system integrates real time detecting information of lightning locating and surface electric field, the data from the meso-scale meteorological detection network and observation data such as satellite and radar. In CAMS_LNWS, the techniques of multi-parameter integration, region recognition, tracking, extrapolate algorithm and decision trees are used. The CAMS_LNWS can provide the potential prediction, nowcasting and warning of lightning activities with several selective ways such as lightning occurrence probability, the moving trend of lightning activity region, the lightning risk grade in key region, and so on.

- Study of lightning disaster in China

A national lightning disaster database, which includes the environment, cause, damage of the lightning strike and region, profession, age of the casualty etc., has been designed and set up. At the present stage, the database has documented the national lightning disaster data from 1997 to 2006. The preliminary statistical results show that the average casualty caused by lightning was over 880 and the death was about 450 every year in China. Among the casualties, farm workers account for 93%, urban residents 7%. For part of the casualties, their locations are specific. Based on

these data, it is found that in terms of locations, farmland accounts for 32% as the largest category, buildings 23%, open fields 13%, water related fields 10% and under-tree fields 8% respectively.

- Natural lightning observation and artificially triggered lightning experiment

LLPPE, collaborated with several scientific research institutes and local meteorological bureau, has conducted field lightning observation and artificially triggered lightning experiment. The field experiment was carried out in Conghua Guangdong province and the synthesis observation data of electric, magnetic, radiation, current and optics of natural and artificially triggered lightning were obtained. Up to now, 18 lightning has been successfully triggered. With these data, studies on lightning physical processes and lightning protection methods are under way.

Laboratory of Middle Atmosphere and Global Environment Observation(LAGEO), Institute of Atmospheric Physics, Chinese Academy of Sciences (CAS) (Beijing 100029, China)

Organization of ICAE2007: LAGEO, Institute of Atmospheric Physics, organized the 13th International Conference on Atmospheric Electricity in Beijing during August 13-18, 2007, which is sponsored by the International Commission on Atmospheric Electricity. The Conference has been a great success thanks to all the participants and all the chairpersons of the Session. A short summary is issued together with this Newsletter.

Severe Weather and Lightning Observation during 2008 Beijing Olympic Games: Institute of Atmospheric Physics is located about 1km southwest of the main Stadium of 2008 Beijing Olympic Games, and has launched an integrative observation on the atmospheric environment and severe weather in vicinity of the Stadium supported by the CAS since the summer of 2007. A dual-linear polarization Doppler radar and several lightning sensors, including fast antenna, slow antenna, field mill, and a VHF short-baseline TOA system and so on, have been involved into the program as part of the severe weather observation. Ten sets of fast and slow antenna systems will be integrated into a detection network surrounding the Radar station and the Stadium next May.

Ground-based Observation on Red Sprites: The first observation on Red Sprites was conducted in Shandong province of China during the summer of 2007, and 17 sprites above two thunderstorms were observed in the southeastern coast of Shandong. All the observed sprites occurred in cluster, and shaped as columniform with angel-like wings, carrot and dancing sprites. The duration of the sprites varied from a minimum of 20ms to a maximum of 80ms with a geometric mean of 30ms. The vertical luminous length of the sprites is smaller than the horizontal extension. The most luminous part of the sprites is about 70km in vertical.

Shandong Artificially Triggering Lightning Experiment (SHATLE) was

carried out continuously in the summer of 2007 cooperated with Lanzhou Group in Cold and Arid Regions Environmental and Engineering Research Institute, Chinese Academy of Sciences. The purpose of the experiment is to clarify the discharge intensity and its correlation to dynamic and microphysical processes in the severe Mesoscale Convective System that occurs quite often in the region from June to August [Qie et al., 2007]. Eight negative flashes including 31 return strokes have been artificially triggered with the rocket-wire technique. Two quite intense return strokes were triggered by using the classical triggering method in the summer of 2006 and 2007 with the peak current of return stroke of about 40 kA.

Induced Voltage in the Horizontal Conductor by the Lightning: Characteristics of induced voltage in horizontal conductor due to a natural lightning were analyzed by J. Yang et al.. Effect of various parameters on the induced voltage was examined with numerical simulation. The induced voltage varied from a minimum of 4.56kV to a maximum of 18.6kV with a geometric mean of 11.2 kV. The geometric mean of the half-peak width and the down time of the induced voltage were 0.87μs and 2.9μs, respectively. The simulated results showed that the induced voltage on both ends of the horizontal conductor would increase with increasing return stroke velocity and also increase with increasing height of the horizontal conductor. The voltage would also increase with increasing the matched grounding impedance on both ends of the horizontal conductor but the relationship was nonlinear.

Lightning Characteristics of Hail Clouds: The characteristics of CG lightning polarity, spatial and temporal distribution of ten hailstorms are analyzed statistically [Feng et al., 2007]. The results show that the mean proportion of positive CG accounting for total CG lightning is 57.39%, which is much higher than the climatic normal value(13.48%). The hail-falling is often reported in the region of dense positive CG lightning. The peak negative CG flash rate usually occurs 0 to 20 minutes earlier than hailstone falling, but the peak positive CG flash rate usually is late or simultaneous for the occurrence of hailstones. The change of priority polarity of CG lightning often indicates the advent of severe weather such as hail, strong wind and heavy precipitation. The ratio of IC to CG lightning and IC flash density in hailstorms are far higher than the usual thunderstorm.

LIGHTNING RESEARCH GROUP OF GIFU UNIVERSITY (GIFU, JAPAN)

Mainly, two research projects are under way. One is to study at what conditions and how lightning flashes hit on a windmill and its lightning protection tower during Japanese winter thunderstorms. In 2005 and 2006 winter seasons, a total of 27 lightning flashes that stroke on those facilities were documented The mainly involved observation items include the measurement of multi-station electric field, multi-station electric field changes, electric current, and high-speed optical imaging.

Based on those data, several papers are being prepared. In 2007 winter season, a similar observation experiment is scheduled. Another is to study the dominant positive electric field phenomenon observed in Tibetan thunderstorms, with the cooperation of scientists from Chinese Academy of Meteorological Sciences, Chinese Academy of Sciences, and Tibet University of China. Observation data including thunderstorm electric field at the ground and lightning electric changes were obtained in 2005, 2006 and 2007 summer seasons. Analysis of these data is under way.

Lightning Research Group of Osaka University (LRGOU) (Osaka, Japan)

Lightning Research Group of Osaka University (LRGOU) has been conducting several projects of thunderstorm observations.

The first project is the manufacturing of an operational Ku broad band RADAR. The bandwidth of this RADAR is 80MHz, and because of this broad band rapid volume scanning within one minute can be accomplished. They are planning its operation at JAXA rocket launching site on the Tanegashim Island to evaluate the applicability for practical use such as forecasting the thunderstorm occurrence and heavy precipitation.

The second project is the field campaign around Darwin, Australia. They equiped three Broadband Digital Interferometers (BDITFs) with a few kilometers base lines to have three dimensional images of VHF pulse locations associated with lighting discharges. The 2007 campaign is scheduled from early November through mid December, and they are expecting the comprehensive analysis with BOM (Bureau of Meteorology of Australia) RADAR data to understand the relationship between the initiation of discharges and precipitation particles. They are trying to make contributions in understanding the charge distributions inside thunderclouds.

The third project is the field campaign at the Hokuriku Coast, a well known area of active winter thunderstorms. In this campaign LRGOU are engaged in the measurement of radiation bursts like gamma ray and runaway electron associated with upward lighting initiated from the top of the tall objects on the ground. For this purpose they are going to deploy NaI scintillator and a plastic scinttilator near a tall wind mill. The campaign is scheduled from late November through January, 2008. This project is a cooperated project with Gifu University.

LRGOU is also carrying out the continuous thunderstorm observations around Osaka-Kobe area, and the suburb at Nagoya with Broadband Interferometers. These BDITFs are quasi permanent operation to monitor lightning discharges during thunderstorms.

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

The MIT Doppler radar was operated again from July-September in Niamey, Niger, Africa (with time out to participate in the International Conf. on Atmospheric Electricity in Beijing in August). Focus has continued on the electrified dust storms, and the larger scale issue of the dust transport out of the African continent. The dust-raising gust fronts are currently being searched from space with Cloudsat and Calipso satellite observations, in collaboration with Simone Tanelli at JPL. African sprites received less attention this season because of the Conference and a shorter-than-usual storm season in Niger. The radar data were also used in a study of the spatial and temporal incidence of malaria within the city of Niamey.

A collaborative study (with T. Chronis, E. Anagnostou and W. Petersen) on the relationship between lightning (observed with the UConn ZEUS network in Africa) and developing tropical cyclones off the west coast of Africa, was recently published in EOS (October 2, 2007). A lightning-Hovmoller diagram was a key diagnostic tool. The results showed a strong tendency for lightning to persist over the Atlantic Ocean in those storm systems that did transition to tropical cyclones/hurricanes. This result suggests an important role in the vertical development of the convection in the concentration of angular momentum to form the hurricane.

National Lightning Safety Institute (NLSI) (Louisville, Colorado, USA)

Several new lightning protection Codes and Standards have made their appearance:

1. Mexico. Published by ANCE – Asociacion de Normalizacion y Certificacion, Mexico DF, it is called *NMX-J-549-ANCE-2005, Systema de Protecccion Contra Tormentas Electricas – Especificaciones, Materiales y Metodos de Medicion (Protection Against Lightning – Specifications, Materials and Methods of Measure)*.
2. Australia. Published by Standards Australia/Standards New Zealand, it is called *AS/NZS 1768:2007 Lightning Protection.*
3. USA. Published by Underwriters Laboratories, it is called *UL 96a Standard for Installation Requirements for Lightning Protection Systems.*
4. USA. Published by National Fire Protection Association, it is called *NFPA-780-2008, Standard for the Installation of Lightning Protection Systems.*

The Insurance Information Institute (III) New York has released a study describing increased insurance claims by homeowners from lightning effects. In 2006 claims and payouts amounted to USD$ 882.2 millions. The number of paid claims was 256,000. Average cost per claim was $3446. These figures do not include any deductible amounts. The III study was limited only to homeowners. Commercial,

industrial, and government sectors lightning losses bring estimated annual USA costs to the $5-6 billion range. See the detailed NLSI study at:
www.lightningsafety.com/nlsi_lls/nlsi_annual_usa_losses.htm

NLSI has attempted to organize the various lightning protection and safety defenses into a procedural and systematic arrangement. The topics are grouped as below:

RISK MANAGEMENT OF THE LIGHTNING HAZARD

According to *www.lightningsafety.com*

FOR PEOPLE	*FOR FACILITIES & STRUCTURES*
Early Detection	Air Terminals
Notification	Bonding
Safe Shelter	Shielding
Re-Evaluate Threat	Earthing/Grounding
Resume Activities	Surge Protection
Policies & Procedures	Maintenance
Education & Training	Inspection & Testing

OBSERVATION DEVELOPMENT GROUP OF THE UK MET OFFICE – VLF ARRIVAL TIME DIFFERENCE (ATD) LIGHTNING LOCATION NETWORK

Alec Bennett (alec.bennett@metoffice.gov.uk)

The UK Met Office VLF arrival time difference (ATD) long range lightning location network has been operating successfully for nearly 20 years. The range includes all of Europe, North Africa, the North Atlantic and most of South America. Recent expansions and improvements to the network have increased the range of detectable lightning to now include all of South America, Africa and central Asia. The improved network (now called ATDnet) has been operating offline in parallel to the original system for testing, but will replace the current operational system by early next year. Research continues on improving the observed day-night detection efficiency differences and further characterization of the spatial uncertainties in flash location.

Tel Aviv University (TAU) and The Open University of Israel (OUI)

Colin Price, Yoav Yair and Mustafa Asfur are continuing the analysis of the possible correlation between east-African lightning activity and the onset of African-Easterly-Waves (AEWs), which under certain conditions generate Atlantic ocean hurricanes. Results for the 2005 and 2006 seasons have been published

recently (GRL, 34, L09805, doi:10.1029/2006GL028884.) The WWLLN data for the 2007 season is being analyzed.

Yoav Yair (OUI), Colin Price (TAU) and TAU students Michal Ganot, Roy Yaniv and Na'ama Reicher are continuing the 4th winter sprite campaign, with optical measurements conducted with three WATEC cameras. The 2007/8 measurements will involve calibration and spectral studies of the properties of winter sprites over the Mediterranean Sea. Additionally, ELF and VLF data is being continuously recorded to support the optical measurements, by students Eran Greenberg and Yuvel Reuveni. A new aspect of this year's sprite campaign is the attempt for simultaneous observations from two sites, involving Caryn Ehrlich and student Elyakom Vadislavski from the Hebrew University of Jerusalem (HUJI). This endeavor is aimed at getting stereoscopic images of sprites with a hope to decipher their 3D structure.

Reuven Aviv (Tel-Hai Academic College), Yoav Yair (OUI) and Gilad Ravid (Ben-Gurion University of the Negev) are continuing the simulations and analysis of the network behavior of different thunderstorm cells within a storm, which are laterally separated by tens or hundreds of km. Lightning activity is compared to a set of coupled leaky integrate-and-fire oscillators. Results show that lightning can reach transient synchronization and exhibit a small-world network attributes. The simulation results are compared with real-life lightning data obtained from lightning-location systems such as LPATS and LINET.

Colin Price is coordinating the European Union FLASH project (http://www.flash-eu.tau.ac.il) that is trying to better understand and forecast flash floods across the Mediterranean region. This project involves researchers from Israel, Spain, Italy, Greece and Cyprus. As part of FLASH, the ZEUS lightning data are being used by Colin Price and Moriah Kohen to investigate the statistics of Mediterranean storms. Yoav Yair and Barry Lynn (OUI) are working in the framework of the FLASH project to establish a new lightning "Power Index" to be used in forecast models such as WRF and MM5. This index reflects the charge-separation capabilities in each grid point of the model by computing the ice, graupel, liquid water content and vertical updraft in the layer between 0 and -20C. Initial comparisons with actual measured lightning show a promising positive correlation. The ability of the Power Index to be used as a forecast tool is evaluated during the 2007/8 winter season.

UNIVERSITE DE TOULOUSE - LABORATOIRE D'AEROLOGIE (Toulouse, France)

During the summer and autumn of 2007, a campaign for sprite observation was conducted in Europe with several cameras located on various sites in France (Pic du Midi, Corsica, CRA Lannemezan , Toulouse), in Spain (La Molina), and in Hungary

(Sopron). Serge Soula and Oscar van der Velde participated to this campaign. Now, more than 200 sprites were observed with one or two cameras during this period and some examples can be seen on the blog of Eurosprite: http://eurosprite.blogspot.com/.
Oscar van der Velde is achieving his PhD and will defend soon his work at the University of Toulouse. His research deals with the relation between the sprite morphology and the characteristics of the associated lightning activity, the conditions of sprite production in terms of storm activity, case studies of gigantic jet.
Our group will participate to the ASIM project from 2008, in collaboration with Joan Montanya from Technological University of Catalonia.

UNIVERSITY OF FLORIDA (Gainesville, Florida, USA)

Two negative lightning flashes were triggered in 2007 at the International Center for Lightning Research and Testing (ICLRT) at Camp Blanding, Florida, operated jointly by the University of Florida and the Florida Institute of Technology. One of them contained two leader/return stroke sequences and the other was composed of the initial stage only. Return-stroke peak currents were approximately 12 and 45 kA. Additionally, seven natural negative lightning discharges that terminated on site of in its immediate vicinity were recorded by the multiple-station electric and magnetic field measuring network and/or by the Thunderstorm Energetic Radiation Array (TERA). In summer 2007, the electric field measuring station on the University of Florida campus in Gainesville, Florida, was expanded to include electric field derivative (dE/dt), high frequency (HF) and very high frequency (VHF) electric field measurements. The wideband electric field measurement system has a useful frequency bandwidth of 16 Hz to 10 MHz. The upper frequency bandwidth of the dE/dt measurement system is 17 MHz. The HF and VHF measurement systems have their center frequencies at 5 MHz (with a bandwidth of 4.7 MHz to 5.4 MHz) and 36 MHz (with a bandwidth of 34 MHz to 38 MHz), respectively. The sampling rate is 100 MHz. As of today, over 2000 four-channel records of lightning discharges on 14 thunderstorm days were acquired. Many narrow bipolar pulses (NBPs) and pronounced preliminary breakdown pulse trains (both followed and not followed by strokes to ground) were observed among other lightning events. The Gainesville dataset includes five positive cloud-to-ground discharges (two of which contained multiple strokes) and one bipolar flash (composed of three negative strokes followed by a positive stroke and then by a negative one). Three natural lightning flashes and one triggered-lightning flash were recorded both at Camp Blanding and in Gainesville (separated by a distance of about 45 km).

Jason Jerauld defended his Ph.D. dissertation titled “Properties of Natural Cloud-to-Ground Lightning Inferred from Multiple-Station Measurements of Close Electric and Magnetic Fields and Field Derivatives”.

G. Maslowski (Rzeszow University of Technology, Poland) and V.A. Rakov authored a paper titled “Equivalency of lightning return stroke models employing lumped and distributed current sources”. They showed that any “engineering” return-stroke model can be expressed, using an appropriate continuity equation, in terms of either lumped or distributed current sources with the resultant longitudinal current distribution along the channel being the same. This property can be viewed as the duality of “engineering” models. The paper is published in the IEEE Trans. on EMC.

Y. Baba (Doshisha University, Japan) and V.A. Rakov authored a paper titled “Electromagnetic fields at the top of a building associated with nearby lightning return strokes”. They have calculated, using the finite-difference time domain (FDTD) method for solving Maxwell’s equations, the vertical electric field E and azimuthal magnetic field H due to lightning return strokes in the presence or absence of a building at the field point. Strikes to both flat ground and tall objects were considered. The magnitude of H is not much influenced by the presence of building at the field point, while the magnitude of E becomes significantly enhanced (by a factor of typically 1.5 to 3). The magnitude of E at the ground level in the immediate vicinity of building is reduced relative to the case of no building, with this shielding effect becoming negligible at horizontal distances from the building exceeding twice the height of the building. The paper is published in the IEEE Trans. on EMC.

RECENT PUBLICATIONS

This list of references is not exhaustive. It includes only papers published during the last six months provided by the authors or found from an on-line research in journal websites. Some references of papers very soon published have been provided by their authors and included in the list. The papers in review process, the papers from Proceedings of Conference are not included.

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