



NEWSLETTER ON ATMOSPHERIC ELECTRICITY

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INTERNATIONAL COMMISSION ON ATMOSPHERIC ELECTRICITY
(IAMAS/IUGG)

AMS COMMITTEE
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ELECTRICITY

AGU COMMITTEE ON
ATMOSPHERIC AND
SPACE ELECTRICITY

EUROPEAN
GEOSCIENCES
UNION

SOCIETY OF
ATMOSPHERIC ELECTRICITY
OF JAPAN

photo: Oscar Van der Velde, Wageningen, Nederland.

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

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

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

<http://ae.atmos.uah.edu>

thanks to Monte Bateman’s help.

Contributions to the next issue of this Newsletter (May 2006) will be welcome and should be submitted to Serge Soula or Pierre Laroche before May 15, 2006, preferably under word attached documents. A reminder will be sent to all colleagues whose e-mail addresses are presently listed.



ANNOUNCEMENTS

OBITUARY : Ronald C. Taylor

Ronald Charles Taylor, 72, died Sept. 29 at Doctors Community Hospital in Lanham after a heart attack. He was a strong supporter of Atmospheric Electricity as head of the Physical Meteorology section at the US National Science Foundation for many years.

His death was announced in the The Washington Post (Saturday, October 8, 2005, Metro Section (B7)) :

Ronald Charles Taylor, 72, who helped direct funding of cutting-edge research in physical meteorology at the National Science Foundation, died Sept. 29 at Doctors Community Hospital in Lanham after a heart attack.

Dr. Taylor was the foundation's program director of meteorology from 1976 until his retirement in 1997. During his tenure, he managed the peer review process of grant proposals and made recommendations on funding projects.

He gained a reputation for supporting high-risk studies, sometimes outside the traditional world of academia, that led to developments of instrumentations to observe atmospheric electricity, said Eugene W. Bierly, Dr. Taylor's former supervisor at the National Science Foundation.

Dr. Taylor, who lived in College Park, was native of Port Huron, Mich. He graduated from the University of California at Los Angeles and received a doctorate in meteorology from the University of Hawaii in 1968.

He served as a meteorologist on a team of scientists working for the U.S. Weather Bureau at the Little America IV station in Antarctica in the 1950's.

He also taught at a number of universities, including the University of Maryland, where he was associate professor in meteorology at the Institute of Fluid Dynamics in the mid-1970's.

He was a fellow of the American Meteorological Society and a recipient in 1996 of its award for distinguished service to atmospheric sciences.

His marriage to Margaret T. Taylor ended in divorce.

Survivors include his longtime companion, Ming-Ying Wei of College Park; and a son from his marriage, David K. Taylor of Ann Arbor, Mich.

ICAE 2003 SPECIAL ISSUE

The Special Issue of Atmospheric Research devoted to the 2003 International Conference on Atmospheric Electricity (Versailles) is available with at this address :

<http://www.sciencedirect.com/science/journal/01698095> (volume 76)

Or directly :

http://www.sciencedirect.com/science?_ob=IssueURL&_tockey=%23TOC%235889%232005%23999239998%23603095%23FLA%23&_auth=y&view=c&acct=C000028798&version=1&urlVersion=0&userid=3521029&md5=c7f2fd4b330066fbc0d627818f71add8

The list of the 31 scientific papers has been published in the previous newsletter (May 2005) :
<http://www.atmospheric-electricity.org/newsletters/2005spring/vol16num1-may2005.pdf>

This Special Issue, dedicated to Marx Brook, opens with a tribute to this outstanding scientist. This article is authored by Paul Krehbiel, Marx's close collaborator and friend. Earle Williams helped Paul to increase and finalize the cited references. Now, a human error of the editor Elsevier came up with a reverse authorship in the paper version of this issue. Elsevier apologizes for this error. We point out that Paul Krehbiel is the principal author of this tribute.

NEWS

GOES-R Geostationary Lightning Mapper (GLM). The GLM request for proposals was issued by NASA in July. It is anticipated that two 18-month study contracts for approximately \$2M each will be awarded in the January timeframe. At the completion of the studies a single contractor will be selected to build multiple copies of the instrument with the first launch on the GOES-R satellite series expected in the 2012-2014 timeframe.

Tropical Rainfall Measuring Mission Extension- On September 29 NASA approved the Tropical Rainfall Measuring Mission (TRMM) Mission Extension Plan to continue TRMM science operations through FY 2009. Further extension may be considered at the end of that period by the Earth Science Senior Review process. The MSFC contribution to TRMM is the Lightning Imaging Sensor (LIS), which continues to collect global observations of lightning activity. To date the LIS science data and products have been distributed to more than 200 researchers in 20 countries.

Southern Thunder Workshop

At the Southern Thunder Project workshop held in Fort Worth, TX 25-27 July we had presentations addressing the following topics: 1) science and technology briefings on techniques to map total lightning; 2) owner-operator reports on existing systems operated by NASA, NSSL, and Vaisala; 3) operational use of total lightning data in NWS forecast offices; 4) results from prior short-duration scientific field programs and operational demonstrations of the value-added from total lightning data in an operational forecast office; and 5) a breakout discussion session to further develop a project plan to conduct the Southern Thunder Project, building upon ongoing government and university collaborations. The presentations and workshop summaries are available from the Short-term Prediction Research and Transition (SPoRT) Web site <http://weather.msfc.nasa.gov/sport/2005_southern_thunder_agenda.html>.



2005 AGU FALL MEETING

The fall meeting of AGU will be held on **5–9 December 2005**, at the Moscone Center West, 800 Howard Street, San Francisco.

Several sessions are organized for the section AE (Atmospheric and Space Electricity):

<http://www.agu.org/cgi-bin/sessions5?meeting=fm05&sec=AE>

6 oral sessions and 4 poster sessions on the the following topics:

- Effects of Thunderstorms on the Middle and Upper Atmosphere, Ionosphere, and Magnetosphere
- Physics of Lightning
- Terrestrial Gamma Ray Flashes, Relativistic Runaway Breakdown, and Related Phenomena
- Lightning, Meteorology, and Climate
- Cloud Physics and Thunderstorm Electrification: From Generator to Discharge
- Advances in Observation Systems for Tropospheric-Atmospheric Electricity Studies

2ND CONFERENCE ON THE METEOROLOGICAL APPLICATIONS OF LIGHTNING DATA

The AMS Annual Meeting will be held 29 January–2 February 2006 in Atlanta, Georgia at the Georgia World Congress Center. (<http://www.ametsoc.org/meet/annual/>).

As part of this meeting, the Second Conference on Meteorological Applications of Lightning Data, sponsored by the American Meteorological Society, and organized by the AMS Committee on Atmospheric Electricity, will be held. A description of the objectives of this conference is available on this address : <http://www.ametsoc.org/meet/ann/callforpapers.html#meteorological>

2006 EMC Zurich

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

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

Final paper submission deadline is **December 19, 2005**.

INTERNATIONAL LIS SCIENCE TEAM MEETING ANNOUNCEMENT

On September 29 the NASA Tropical Rainfall Measuring Mission (TRMM) was granted an extension of mission operations through 2009. As a result the Lighting Imaging Sensor (LIS) will be able to continue collecting observations of lightning from space. The LIS science team is planning an International Workshop in Huntsville, Alabama for late September to early October 2006 to review the scientific discoveries and accomplishments during the first 8 years of the mission and discuss possible new avenues of research with the LIS instrument. We invite researchers who have previously published studies using LIS, are currently working with the LIS data, or are interested in research opportunities with the LIS to share their findings and interests with other members of the science community. The contact for this Meeting is Hugh Christian at email: hugh.christian@nasa.gov

2006 EGU GENERAL ASSEMBLY

The General Assembly 2006 of **European Geosciences Union** will be held in Vienna, Austria, on **02 – 07 April 2006**. (<http://meetings.copernicus.org/egu2006/index.html>)

The dead lines are:

- **09 December 2005** for Support Applications
- **13 January 2006** for Receipt of Abstracts

A session **NH1.04 Lightning** (co-listed in AS) in the Natural Hazard section, will be organized. Claudia Adamo (claudia.adamo@ifa.rm.cnr.it) is Convener of this session, Hans Betz (Hans-Dieter.Betz@Physik.Uni-Muenchen.de) and Serge Soula (sous@aero.obs-mip.fr) are co-conveners.

You can find the information about the topics concerned by this session at this address : http://www.cosis.net/members/meetings/sessions/information.php?p_id=189&s_id=3311

The text of the session presentation:

Lightning is considered as the second natural hazard after flash floods for number of victims in human beings, that is why it matters to analyze the importance of its dangerousness. This section prefers to treat "Lightning" in the general meaning. Lightning can be studied and analyzed under

many points of view and each one of this has to be presented for giving us a larger representation? of this atmospheric phenomena and a deeper interpretation of its nature. In this way all the contribution topics about lightning are welcome. Contributions from atmospheric research regarding cloud physics and lightning, lightning physics, modeled studies on the electricity of the storms, lightning and global circuit, lightning in relation with middle atmosphere events are appreciated. In addition studies on lightning data, data center management, operative use of lightning data, lightning detection technologies and engineering of networks are welcome in order to merge different fields of knowledge for improving the quality of our work on lightning.

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

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

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

Both events will be held in Tucson, Arizona. For more information, please visit www.vaisala.com/ildc

ICLP 2006

The next ICLP (International Conference on Lightning Protection) will be held in Kanazawa, Japan, 18-22 September 2006.

The call for papers is enclosed. The deadline for submitting abstracts is 1 September 2005. Notification of acceptance will be by 15 November 2005.

The full text will be due by 1 March 2006.

Conference Office Address :

The Institute of Electrical Installation Engineers of Japan
1-12-5 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan

Tel: +81-3-5805-3375

Fax: +81-3-5805-3265

E-mail: info@iclp2006.net

URL: <http://www.iclp2006.net/>

Person in charge to contact: Naokata Natori, Yoshie Hiratsuka

13TH INTERNATIONAL CONFERENCE ON ATMOSPHERIC ELECTRICITY

**Announcement of
13th International Conference on Atmospheric Electricity**

August 13-17, 2007 □ Beijing, China

On behalf of the International Commission on Atmospheric Electricity (ICAE), we are honored to announce that the 13th International Conference on Atmospheric Electricity (13th ICAE) will be held in Beijing, China on August 13-17, 2007. Your interest and participation in the conference are extremely appreciated.

The Conference will be a unique opportunity to present and discuss the newest results and to assess the most relevant issues in atmospheric electricity and lightning physics. Young scientists are especially encouraged to attend the meeting and present the results of their research. The registration fee may be reduced for students and young scientists.

Most of the topics related to electricity in the atmosphere will be covered:

- Global circuit
- Ion and fair weather electricity
- Thunderstorm electrification
- Lightning physics
- Lightning and Meteorology - operational application and basic research
- Lightning and climate change
- Lightning discharge and atmospheric chemistry
- Electrical effects of thunderstorms on the middle and upper atmosphere
- Lightning detection technology
- Lightning protection and safety

Abstract submission will start on 1st July 2006. The overall information on the Conference will be available on the website of International Commission on Atmospheric Electricity (<http://www.atmospheric-electricity.org>) in December 2005.

Xiushu Qie Pierre Laroche
President of 13th ICAE President of ICAE

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RESEARCH ACTIVITY BY INSTITUTION

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

The Atmospheric Electricity Group (ELAT) has a new site on the web ([Http://www.cea.inpe.br/elat](http://www.cea.inpe.br/elat)) with real time lightning data in Brazil. Also, information on all aspects related to atmospheric electricity is available, including a Newsletter about news on lightning in Brazil and all over the world.

The last recent activities of ELAT includes the expansion of the Brazilian Lightning Network to cover the South region of the country, the beginning of the campaign to observe sprites and e-fields on balloon altitudes in the South of Brazil in January/February 2006, the first results of the comparison between the Brazilian network and the University of Munich network during a field campaign in the beginning of 2005 and, finally, the conclusion of two PhD Thesis on lightning activity in the Southeast region, with emphasis on urban effects, and in the North region, with emphasis on smoke from fire effects, on lightning activity and characteristics.

DANISH NATIONAL SPACE CENTER – DEPARTMENT OF SOLAR SYSTEM PHYSICS, (COPENHAGEN, DENMARK)

Torsten Neubert (neubert@spacecenter.dk)

ASIM

The Danish National Space Center (DNSC) has begun a Phase A study of a payload for the International Space Station to observe electrical discharges in the stratosphere and mesosphere – the sprites, jets and elves. The payload, the Atmosphere-Space Interactions Monitor (ASIM), is an instrument suite of 4 cameras and 4 photometers viewing towards the limb, and 2 cameras, 2 photometers and an x- and gamma-ray detector viewing towards the nadir. The limb instruments provide simultaneous recording of 4 emission bands, with the photometers providing high time resolution measurements. The nadir instruments provide simultaneous optical and x-ray observations of lightning, sprites, and x-rays. The ASIM consortium includes partners at Universidad de Valencia, Spain, University of Bergen, Norway, and University of Ferrara, Italy. Phase A ends in the spring of 2006.

CAL

The DNSC is co-ordinating an EU-funded Research Training Network Coupling of Atmospheric Layers (CAL). The network of 11 institutions throughout Europe, includes the enthusiastic participation of 11 young scientists (Ph.D. students and post docs) of which 8 are funded through the EU grant. The network studies sprites, jets and elves, and their effect on the atmosphere. It

includes annual measurement campaigns conducted over Southern Europe and modeling of atmospheric perturbations. Some of the results of the network studies include

- (1) Infra sound (thunder) from Sprites is observed up to 1000 km from the source. The clear Sprite signature in infrasound data allows studies of sprites past sunrise when atmospheric ionization properties change dramatically. It also allows estimates of the energy input to the atmosphere from sprites
- (2) A one-to-one correlation of sprites and perturbations to signal properties of VLF signals from ground-based transmitters, passing over the affected thunderstorm region. The observations suggest ionization enhancements at the lower edge of the ionosphere.
- (3) An almost absence of Jets and Elves over Southern Europe. During the 5 years observations have been conducted, only 2 elves have been observed, whereas hundreds of sprites have been documented. This is in contrast to space observations, where elves are most commonly observed. At this point in time it is not clear if this is caused by a lack of sensitivity of the instrumentation or if this is a feature of European thunderstorms.
- (4) For the first time (we think), direct observations of intra cloud lightning have been undertaken with simultaneous optical observations of sprites. The data are being analyzed, with first results submitted to JGR. The data suggest that the complete – and complex – electric field in the mesosphere following a discharge must be considered to understand the morphology of sprites, i.e. carrot sprites vs. column sprites.

The CAL network is now in its final year.

FINNISH METEOROLOGICAL INSTITUTE (Helsinki, Finland)

Flash cell analysis :

The idea of grouping ground flashes into "cells" has been developed for some years in the Finnish Meteorological Institute, and has now been matured into a publication (T. J. Tuomi and M. Larjavaara: Identification and analysis of flash cells in thunderstorms. Q. J. R. Meteorol. Soc. (2005), 131, pp. 1191-1214).

Spatial and temporal relations between successive flashes are analysed – not statistically but algorithmically – and the flashes are grouped into cells that hopefully correspond to the convective precipitation cells seen in radar images.

The existence of stray flashes (either those occurring in the stratified surroundings of convective cores, or just badly located) pose a challenge for finding the convective cores properly, ie. with the right size, development and lifetime. Therefore, in some cases two or more true cells may be merged into one, or a true cell may be split into several cells.

The method emphasizes the convective cores with high enough flash rate and filters out stray flashes.

While the usual time-resolved map display highlights the "frontal" nature of a thunderstorm, a cell-analysed display would show the longitudinal time development.

Tapio J. Tuomi (tapio.tuomi@fmi.fi)

FMA RESEARCH, INC./YUCCA RIDGE FIELD STATION, (Fort Collins, Colorado, USA)

The SPRITES 2005 campaign was conducted at the Yucca Ridge Field Station during the June-August period, with support from NSF, NASA and the Missile Defense Agency. Though the summer saw drought conditions, over 550 transient luminous events were eventually recorded. In attendance were the FMA Research staff, Walt Lyons, Tom Nelson and Laura Anderson, who operated a suite of four low-light camera systems and provided forecasting support. Also participating were Duke University (Steven Cummer, Nicolas Jauget) who operated a next generation ULF/ELF/VLF transient sensing system for testing real-time extraction of impulse charge moment changes from TLE parent lightning strokes. Also tested successfully was a new high speed image intensified camera. The excellent images of sprites and halos obtained will be presented by the Duke team at the upcoming AGU. Elizabeth Gerken from SRI International also used a sensitive PMT to monitor for possible ionospheric luminosity above thunderstorms. Utah State University (Mike Taylor, Matt Bailey) provided intensified TLE imagery including in the near infrared. In other activities, Lyons has been cooperating with Prof. Gary Huffines (University of Northern Colorado) to develop new display techniques for LMA/LDAR depictions of sprite-producing lightning discharges. And along with Craig Rodger (University of Otago) they continue their investigations of reported differences between land and salt water of large peak current negative CGs. Lyons will also join the NASA Lightning Advisory Panel for a November, 2005 meeting in which the potential implications of TLEs on Space Shuttle operations will be discussed. The award winning DVD, "The Hundred Year Hunt for the Red Spite" is available online (www.Sky-Fire.TV), with a portion of the proceeds going to the education activities of the AMS. Walt Lyons continues to serve as president of the American Meteorological Society, and is especially pleased that the 2nd Conference on Meteorological Applications of Lightning data will be held at the AMS Annual Meeting in Atlanta in January, 2006. (Lyons, W.A., L.M. Andersen, T.E. Nelson and G.R. Huffines, 2006: Characteristics of sprite-producing electrical storms in the STEPS 2000 domain. On line summary and CD, 2nd Conf on Meteorological Applications of Lightning Data, AMS, Atlanta, 19 pp.).

INDIAN INSTITUTE OF TROPICAL METEOROLOGY (Pune-411008, India)

The lightning activity of convective systems is sometimes a fruitful indicator of their precipitation production. In this contribution the authors present the lightning activity recorded by Boltek Storm Tracker a Lightning Detector on an exceptionally heavy rainfall days, 26-27 July 2005. The details about the sensor and its detection efficiency of the installed instrument at Pune are discussed. An examination of 24-hour display of 26 July 2005 shows that on this day 90% of the activity is confined to the WNW direction. The diurnal variation of stroke density shows two peaks, the first prominent peak (3.0/min/deg.) between 1400 to 1500 hrs (IST) and the second lower peak (2.0/min/deg.) between 2000 to 2100 hrs (IST). Comparison of the activity with the previous day i.e. (25 July 2005) suggested that on 26 July the activity was 1.5 times higher. The exceptional high flash density is the result of deep cloud system formed over Mumbai on the day. Under the favorable synoptic condition a mesoscale convective complex developed over east

Arabian sea near Mumbai latitude. Within the convective complex, the cloud systems of high vertical growths developed. The CAPE value was noticed as 3000 J/kg. Although there is no threshold of CAPE available for the thunderstorm occurrence over Mumbai in any case the noted CAPE value was higher and it is important for influencing the size and vertical distribution of hydrometeors that contribute to charge separation. The total flash count recorded on 26 July 2005 was nearly 1.6 times higher than on 25 July 2005. Increase in negative CG flashes count thus suggests that the cloud base on this day has been lower down which has been also confirmed from RS/RW data of Santacruz (Ref.: Kandalgaonkar et al., 2005, this issue)

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

Triggered lightning experiment by using both classical and altitude triggering technique has been conducted in the mid-latitude Plain of eastern China. Five negative lightning flashes (3 classical and 2 altitude), including 35 return strokes in total, have been successfully triggered during two mesoscale convective systems passing over the site. Only one classical triggered flash with 10 return strokes was intercepted by the lightning rod, and the current was measured. The current for 10 return strokes are 5-22kA. No significant differences in discharge intensity have been found between the two triggering technologies based on the E-field changes at 60m and 550m distances.

Electric characteristics of thunderstorms on the central Tibetan Plateau have been continually studied. The evolution of surface E-field and E-field changes produced by lightning flashes for 30 thunderstorms shows that the thunderstorms likely to show a triple charge structure. Among them 73% has a large-than-usual lower positive charge center (LPCC), and 27% has a normal triple charge structure, i.e the LPCC is weaker. Based on the characteristics of lightning flashes, the Plateau thunderstorms can be classified into three categories. 1. IC-dominated thunderstorms, i.e., all flashes are IC flashes. It takes 19% of all thunderstorms. 2. -CG-dominated thunderstorms, i.e., -CG flashes dominated in the late stage of the storm. It takes about 66.7%. 3. +CG-dominated thunderstorms, i.e., +CG flashes take more than 50% of all the flashes and occurred in the whole stages of the thunderstorm. This category takes 14.3% of all the thunderstorms.

CG lightning activity and its relationship with the horizontal and vertical precipitation structure, wind field structure, echo intensity and cloud top temperature in several cases of hailstorms has been checked by using the data from CG lightning location network, Doppler Radar, and TRMM satellite. It has been found that the lightning activity in hailstorms is very active and the flash rate can reach up to 55fl/min-183fl/min. There is a sharp increase in +CG flash rate before the hail fall. Most of the lightning flashes occurred in the echo region greater than 30dBZ and its immediate periphery. The occurrence probability of lightning in convective rain region is 10 times more than that in stratiform rain region.

The two recently developed methods in multifractal analysis, the Multifractal Detrended Fluctuation Analysis (MF-DFA) and Wavelet Transform Modulus Maxima (MF-WTMM), have been used to study the trend and cascade characteristics of lightning discharges. Both correlated and multifractal behaviors are found before strong lightning discharges in thunderstorm. The

multifractal spectrum is consisted with a modified version of the binomial multiplicative cascade multifractal model. The strong and fractal clustering property of lightning radiation pulses has been found, and the long-range persistence and nonlinear properties are evident in most of the lightning discharges.

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

A collaborative study (with R. Boldi, J. Bór. G. Sători, C. Price, E. Greenburg, Y. Takahashi, K. Yamamoto, T. Chronis, E. Anagnostou, D. Smith and L. Lopez) on the lightning type responsible for producing gamma radiation over thunderstorms is in final review. The main goal of this study is an explanation for why the giant positive polarity ground flashes that also produce sprites in the mesosphere are not the main producers of gamma radiation detected in recent years by the RHESSI satellite.

A proposal has been prepared for NASA hydrology to deploy the MIT C-band Doppler radar in Niamey, Niger, Africa for the AMMA (African Monsoon Multidisciplinary Analysis) campaign in Summer 2006. In preparation for this study, examination of lightning observations from the ZEUS network (installed and operated by the University of Connecticut) with Themis Chronis, Manos Anagnostou and Walt Petersen has been underway to identify connections with wave activity across Africa—African easterly waves and the global 5-day wave. A paper was presented by Themis Chronis on this topic in the session on Lightning and Climate at the IAMAS meeting in Beijing, China in August.

Following an invitation by Ute Ebert to present a talk on problems in lightning physics at the International Conference on Physics of Ionized Gases in Eindhoven, Netherlands, a paper has been prepared and submitted on polarity asymmetries in lightning. This includes a possible explanation for why positive ground flashes are predominantly single stroke with continuing current, whereas negative flashes are often multi-stroke. This explanation builds on the earlier MIT PhD results of Stan Heckman. The material was presented in a Division Seminar at Los Alamos in October.

Earle Williams participated in the thesis defenses of two students of Iara and Osmar Pinto at INPE: Kleber Naccarato (a study of the Sao Paulo, Brazil, lightning anomaly) and Widenei Fernandez (the effect of smoke on lightning characteristics in Rondonia, Brazil), at INPE in July. He also presented a review talk on total lightning precursors to weather hazard on the ground at a Workshop on Lightning in Rio de Janeiro. This event was followed by discussions on lightning detection and characterization with Rosangela Gin and Carlos Morales and students at FEI in Sao Paulo.

Earle Williams collaborated with Xiushu Qie and Zhong Wu on a comparison of thermodynamic conditions favorable to lightning in China and the United States. Numerous geographical/meteorological similarities were identified between the two regions. This study was also presented at the IAMAS meeting in Beijing.

A paper concerned with the effect of tree growth on the surface electric field and its implications for the previously inferred long-term decline of the global circuit (Harrison and Märcz (2003)) is now in press in Geophysical Research Letters. Ralph Markson and Stan Heckman are key collaborators. The conclusion of this work is that most if not all of the observed decline can be accounted for by the local effects of tree growth, rather than by a global effect.

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

A report has been submitted to the NASA ASAP (Advanced Satellite Aviation Products) program concerned with the use of DoD satellite assets for the detection and analysis of volcanic eruptions worldwide. Interest remains in the role of water substance in the electrification process and lightning activity in explosive eruptions. The earlier work entitled: *Total Water Contents in Volcanic Eruption Clouds and Implications for Electrification and Lightning* with Steve McNutt of the University of Alaska and presented initially at the International Workshop on Physics of Lightning in Guadeloupe is now in print in a book entitled *Recent Progress in Lightning Physics*.

Earle Williams is collaborating with Nick Varley at the University of Colima, Mexico on the recent lightning-producing eruptions over Colima volcano, documented with video imagery. Searches for these events in the NASA LIS data base (courtesy of Dennis Boccippio) have not produced intersections yet.

A paper has been completed on a study with the FAA program on Oceanic Convection in a study entitled: The Identification and Independent Verification of Hazardous Cells over Oceans using Satellite Visible and Infrared Observations, whose main purpose has been the identification of hazardous thunderstorms over oceans with VIS/IR imagery alone. This paper will be submitted to the Journal of Applied Meteorology.

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

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

NASA's Kennedy Space Center (KSC) Shuttle Launch Pad 39B recently went under review to verify effectiveness of the overhead shield wire (OHSW) air terminal design. Civilian members of the Review Committee included Richard Kithil Jr. (NLSI CEO), Vlad Rakov (Univ. of Florida), and Frank Fisher (Lightning Technologies Inc.). While the OHSW was designed for the Apollo Program, its effectiveness for the Shuttle Program was considered satisfactory. KSC experiences some 12-15 flashes/sq. km/yr.

NLSI hosted an Arizona visit of four Peruvian mining engineers from Barrick Gold Corp. to investigate efficiencies of various lightning detection equipments. The tour included discussions with Vaisala (Remus Zaharescu and Dennis Bell), WXLine Inc. (Christoph Zimmerman and Leon Byerly), and Mission Instruments (Ron Binford and Lee Lawry). Barrick's Alto Chicama mine is an open pit, heap leach operation at 4500m in the Andes mountains where electrical storms appear with little advanced warning.

Readers interested in issues surrounding Early Streamer Emission (ESE) air terminals should take note of a recent legal ruling from the United States District Court for Arizona, USA. The Court ruling prohibits ESE vendors from claiming the protective radius of ESEs exceeds that of Franklin Rods. The Order was issued pursuant to the Lanham Act which prohibits false advertising. ESE vendors may be liable for damages where their air terminals fail to perform as

claimed. For copies of the Court documents, email NLSI requesting same at: ESEinfo@lightningsafety.com

NLSI site assessments for lightning hazard mitigation for this period included: Weed Army Hospital, Ft. Irwin CA; Cottonwood Energies Beaumont TX; Eastern Alabama Medical Center Opelika AL; Metromont Pre-Cast Hiram GA; St. Clair County MI; City of Huntsville AL; Valero Refinery Delaware City DE; BAE Defense Systems Merrimack NH; NASA KSC FL; and Roche Pharmaceuticals Boulder CO.

Journal Paper Submission (Koshak): “Retrieving Storm Electric Fields from Aircraft Field Mill Data. Part I: Theory” was submitted to the American Meteorological Society (AMS) Journal of Atmospheric and Oceanic Technology (JTECH). The paper introduces a rigorous Lagrange Multiplier formalism for calibrating an aircraft electric field mill measurement system. It also introduces a Pitch Down Method (PDM) for completing an absolute calibration, and for independently checking relative calibrations.

Journal Paper Submission (Koshak, Mach, Christian, Stewart and Bateman): “Retrieving Storm Electric Fields from Aircraft Field Mill Data. Part II: Applications” was submitted to the American Meteorological Society (AMS) Journal of Atmospheric and Oceanic Technology (JTECH). The paper applies the methods introduced in Part I to complete a full calibration of a Citation aircraft equipped with 6 electric field mill sensors. Thunderstorm electric fields are retrieved and inter-compared with previous retrieval methods.

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

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

Dennis Boccippio has updated LIS/OTD Global Lightning Climatologies. The combined, gridded OTD and LIS global lightning climatology products have been updated to include all data from 1995-2004 (12 satellite-years). New gridded products have also been generated

including a high resolution (0.5 deg) annual cycle climatology, a monthly climatology, and a monthly time series product. For further information, contact Dennis.Boccippio@nasa.gov.

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

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

Maj. Mike Gauthier (USAF-AFIT/UAH), **Walt Petersen**, **Larry Carey** (TAMU) and **Richard Orville** (TAMU) had a paper accepted to GRL that further scrutinizes the Houston "lightning anomaly" using nine years of cloud-to-ground (CG) lightning data (1995-2003). The results indicate that the local Houston CG lightning anomaly, is a persistent feature, but statistically non-unique along the Gulf Coast. Findings also suggest that although the Houston area sees an increased frequency of lightning producing storms, storms occurring further inland appear to produce more lightning on an event basis. Although hypotheses invoking anthropogenic influences have been offered to explain the Houston flash density anomaly, it seems equally plausible that mesoscale influences along the coastline may also be important. The reference for the paper is:

Gauthier, M. L., W. A. Petersen, L. D. Carey, and R. E. Orville, 2005: Dissecting the anomaly: A closer look at the documented urban enhancement in summer-season ground flash densities in and around the Houston area. *Geophys. Res. Lett.*, in press

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

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

Walt Petersen, **Hugh Christian**, and **Steve Rutledge** (CSU) have submitted a paper to GRL that uses TRMM satellite lightning and radar observations to study the fundamental relationship between precipitation ice mass and lightning flash density. The results indicate 1) that the *globally-averaged* relationship between precipitation ice water path and lightning flash density is invariant between land, ocean and coastal regimes; and 2) to first order, the physical assumptions

of precipitation-based charging and mixed phase precipitation development are robust. From 2) it follows that lightning data may be a useful variable for inclusion in combined space borne algorithms to retrieve ice water content.

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

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

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

ONERA- ATMOSPHERIC ENVIRONMENT RESEARCH GROUP **(Chatillon, France)**

The PROFEO high resolution 3D lightning mapper is in its final stage of development (Patrice Blanchet Patrice.blanchet@onera.fr and Philippe Lalande Philippe.Lalande@onera.fr). On field installation will start in spring 2006. PROFEO used both DTOA and Interferometric technique. The equipment is a research prototype; it will survey an area of 200 km x 200 km in Paris district.

Extensive observations of long gap laboratory negative discharges had been performed by Philippe Lalande, Alain Broc (Alain.Broc@onera.fr), Patrice Blanchet and Isabelle L'Helgoualc'h with the high voltage facility of CEAT (Toulouse Aeronautical Test Centre). Tens of stepped leader optical and electromagnetic signals had been recorded. . **Phil Krider** camera was operated at the same time to provide calibrated optical measurement of the arc channel. Those data will be used to validate models of negative stepped leader electromagnetic radiation. The modeling of arc channel interaction with aircraft fuselage will be performed in the frame of a collaboration with EDF (Electricite de France) and CEAT. PhD student Laurent Chemartin (Laurent.Chemartin@onera.fr) will conduct a theoretical study of the sweeping process.

POLISH ACADEMY OF SCIENCES (Warsaw, Poland)

The atmospheric electricity research group at the Institute of Geophysics P. A. Sci. is continuing its further observations of the multiple c-g flash discharges phenomena and their rarely occurred bipolar cases in thunderstorms ([Piotr Baranski: baranski@igf.edu.pl](mailto:baranski@igf.edu.pl)). Moreover, the further examination of the fair weather electricity recordings in Swider and Hornsund is carried on ([Marek Kubicki: swider@igf.edu.pl](mailto:swider@igf.edu.pl)).

In this year we have joined to the COST P18 Action prepared by prof. Rajeev Thottappillil from Uppsala University and entitled "The Physics of Lightning Flash and Its Effects". Taking part in three working groups of that action we like to participate in an international scientific cooperation for further studying of the common items. Together with the Institute of Meteorology and Water Management in Warsaw (Pawel Bodzak), and Warsaw University of Technology (Marek Loboda) some general assessments of thunderstorm activity obtained from the SAFIR network system for 2002-2005 observations in Poland is carried on. These obtained results are submitted to the 28-th ICLP'2006 in Kanazawa, Japan. One of us Jerzy Berlinski (jberl@ise.pw.edu.pl) has presented during the IAGA'2005 (18-22 July, Tolouse, France) the new version (EFM-R1) of the constructed by himself electric field meter unit which may be used for monitoring electric signals in frequency range from DC to 1 Hz and intensity up to 10 kV/m.

Routine measurements of electric field, vertical air-earth current density, electrical conductivity and simultaneous observations of meteorological, radioactive and air pollution elements are carried out at Swider Geophysical Observatory. The recording data are published in year books (M.Kubicki, W. Kozłowski, B. Laurikainen) and used in our studies of the long term variations of electric field in our region. The examination of the 45-years recordings in Swider are used in the studies of possible response of electric field on variations of cosmic rays of galactic and solar origin (M. Kubicki, Z. Kobylnski, S. Michnowski).

Measurements of electric field, magnetic field components, ionospheric absorption and meteorological elements at Polish Polar Station in Hornsund, Spitsbergen are analyzed on the background of supplementary geophysical data taken from suitable data centers. Some further examples of possible influence of the solar wind and magnetic substorms on electric elements variations at the ground level are obtained (M. Kubicki, S. Michnowski, N. Nikiforova, N. Kleimenova, O. Kozyreva, S. Israelsson). The results show an example of the occurrence of the negative values of the measured electric field (in the fair-weather conditions) at midlatitude station in Swider during very extensive magnetic storm on the 30-th October, 2003. This fact is analyzed in detail and published in Geomagnetism and Aeronomia (2005).

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

Karen Aplin (k.l.aplin@rl.ac.uk)

Recent work at RAL has focused on the infra-red absorption properties of terrestrial atmospheric ions, and the electrical properties of Titan's atmosphere.

Further experiments have been carried out at the Molecular Spectroscopy Facility to measure the IR absorption of artificially produced hydrated cluster-ions. Results from varying the ion

concentration and relative humidity (to change the mean ion size) are currently being analysed by Dr Robert McPheat and Dr Karen Aplin. Experiments are planned to measure the size of this absorption in the terrestrial atmosphere.

Two students from the University of Birmingham are working with Karen Aplin on ion mobility spectra of Titan's lower atmosphere, by applying techniques developed for terrestrial ion instrumentation. Peter Stevens is estimating the ion mobility spectrum for different regions in Titan's atmosphere using a size-mobility relationship developed by H. Tammet. Nicholas Owen is applying an inversion method devised to obtain ion mobility spectra from terrestrial Gerdien condenser relaxation data, to the flat circular disc used for air conductivity measurement on the Huygens probe.

THE UNIVERSITY OF READING (Reading, UK)

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

Work continues in understanding the long term UK monitoring of atmospheric electricity. The measurements of the air-earth current density, initiated by C.T.R. Wilson in 1909 have been recovered and have recently been presented (Harrison and Ingram, 2005). This technique provided a simultaneous determination of the air-earth current and potential gradient, at about 1430 UT on fair weather days between 1909 and 1979. An analysis of the air conductivity derived from these measurements has shown that it is closely related to visibility observations obtained at the same site (Brazenor and Harrison, 2005).

A new instrument to measure the conduction and displacement components of the vertical air-earth current is now operational at the University of Reading's field site (Alec Bennett). The instrument comprises two collecting devices, both well insulated from the ground. One takes the form of an inverted metal pyramid, placed in a pit with its top flush with the surface. The other collecting plate surrounds the pyramid and is also level with the surface. The difference in geometry of the two collectors is used to distinguish between the displacement and conduction components of the total current measured by the two collectors. Initial results show directly observed displacement currents comparable with those calculated from changes in the measured potential gradient. A vertical conduction current density of approximately 1.5pAm^{-2} was observed, which was less variable than the displacement current.

The study of ion properties in the surface layer (Richard Wilding) has led to improvements in the ion mobility spectrometer (Harrison and Wilding, 2005). New measurements in coastal air have now been reported (Wilding and Harrison, 2005), in both recombination and attachment limited small ion conditions.

A continuing collaboration with Dr Ferenc Märcz of the Geodetic Institute of the Hungarian Academy of Sciences in Sopron, has led to the production of a new analysis of European PG measurements spanning the twentieth century (Märcz and Harrison, 2005). Further historical cosmic ray data, extending back before the advent of neutron counters, has also been presented (Aplin *et al*, 2005).

UNIVERSITY OF FLORIDA (Gainesville, Florida, USA)

A total of 11 lightning flashes were initiated from July 2 to August 7, 2005 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. Of these 11, 8 contained leader/return stroke sequences (a total of 13) and 3 were composed of the initial stage only. All flashes effectively transported negative charge to ground. Return-stroke peak currents ranged from approximately 6 kA to approximately 35 kA. Additionally, 6 natural negative lightning discharges that terminated on site or in its immediate vicinity were recorded by the multiple-station electric and magnetic field measuring network and by the new Thunderstorm Energetic Radiation Array (TERA). The first direct measurements of NO_x generated by rocket-triggered lightning were made in collaboration with Uppsala University, Sweden (M. Rahman, V. Cooray) and University of Colombo, Sri Lanka (P. Liyanage).

Ashwin Jhavar defended his Masters thesis titled “Triggered-Lightning Properties Inferred from Measured Currents and Very Close Magnetic Fields”.

J. Jerauld, V.A. Rakov, M.A. Uman, K.J. Rambo, and D.M. Jordan in collaboration with K.L. Cummins and J.A. Cramer of Vaisala Inc., authored a paper titled “An evaluation of the performance characteristics of the U.S. National Lightning Detection Network in Florida using rocket-triggered lightning”. The rocket-triggered lightning data were acquired in the summers of 2001-2003 at the International Center for Lightning Research and Testing (ICLRT), at Camp Blanding, Florida. During the three-year period, 37 flashes, containing a total of 159 (158 negative and 1 positive) strokes, were triggered at Camp Blanding. Directly measured currents were obtained for 122 of these strokes in 29 flashes. Camp Blanding and NLDN events were correlated using GPS time-stamps. The NLDN recorded 95 Camp Blanding strokes in 31 flashes. Of these 95, directly-measured currents were available for 70 strokes in 22 flashes. Flash and stroke detection efficiencies were estimated to be about 84% and 60%, respectively. Median location error was about 600 m, with larger location errors (greater than 2 km) being associated with strokes having smaller peak currents (5-10 kA). The median peak current estimation error was about -18%. There was a trend of improved stroke detection efficiency between 2001 and 2003. Results presented in the paper are probably applicable to subsequent strokes in natural negative downward lightning and to flashes initiated by upward leaders from tall structures. The paper is published in the JGR.

UNIVERSITY OF FRENCH POLYNESIA– LABORATOIRE TERRE-OCÉAN (French Polynesia)

A study investigates the relationship between the charge Q_i of the first impulse corona and the associated inception voltage U_i for a 1 m point-plane airgap submitted to impulse voltages. Experimental studies under both polarities are reported; the Q_i-U_i characteristics obtained allow empirical quadratic relationships between these two quantities to be derived. A physical interpretation is proposed by considering the established characteristics of the first impulse corona. The Gauss' and Ampere-Maxwell's laws can be applied and the quadratic Q_i-U_i relationship is justified by the present model. (Ref. : Ortéga, et al., 2005, this issue).

Lightning localisation system in Tahiti:

Tahiti is often struck by lightning and local electric field detectors have checked off a mean value of 80 thunder days per year (over 7 years). Because lightning strokes cause troubles to the local public electricity company, Electricité De Tahiti (*EDT*), we have set up a lightning location system called *LIFT* (Localisation des Impacts Foudre à Tahiti), to send off warnings about thunderstorm occurrences. *LIFT* consists in 3 magnetic direction-finding detectors connected together via a network. The triangulation obtained from the raw data has not given satisfactory results. Accordingly, two correction functions have been applied to the azimuth recorded by the detectors. One is inherent to each detector (inclination, environment) and another one seems to be linked to the channel tortuousness. The improvement of the localisation confirmed by *LIS* and *WWLLN* data and personal observations has allowed us to built up a warning system able to reliably detect intense thunderstorm in sensitive places. With some further improvement, *LIFT* could become an interesting device to study ocean tropical lightning. (Ref. : "Lightning localisation system in Tahiti", SIPDA – 20-25 November 2005 Sao Paulo).

UNIVERSITE PAUL SABATIER - LABORATOIRE D'AEROLOGIE, (Toulouse, France)

Study of the electrical activity of thunderstorms with the model Méso-NH :

Christelle Barthe (barc@aero.obs-mip.fr) presented recently her PhD thesis about this study. She realized this work in collaboration with Jean-Pierre Pinty (pinjp@aero.obs-mip.fr). The electrical scheme of Méso-NH consists of three parts: the electrical charges separation, the electric field computation and the production of lightning flashes. The non-inductive process is the main mechanism to electrify the cloud. The inductive mechanism becomes efficient when there is an intense electric field in the cloud. When the electric field in the cloud is higher than a threshold value, a lightning flash is triggered and propagates following a bidirectional leader. Branches are generated with a stochastic algorithm and they obey a fractal law deduced from dielectric breakdown models.

Relationships between dynamics, microphysics and electricity have been underlined with different cases. Budgets of production and neutralization of charge are realized with a tropical squall line in 2D. Simulations of supercellular and multicellular storms have been done in 3D with sensitivity tests on the electrification and on the lightning flash schemes. Then, NO_x production by lightning flashes has been illustrated on the 10 July STERAO storm.

Marie-Pierre Boussaton (boum@aero.obs-mip.fr) defended her thesis last September, about Interactions between lightning activity, microphysics, and pollution in thunderstorms. She prepared this thesis work under the responsibility of Sylvain Coquillat (coqs@aero.obs-mip.fr). The first part of this study deals with the electrical activity of hailstorms. Numerous cases are analysed from lightning and radar data. Hailstorms typically produce a high number of lightning flashes except for several atypical cases. The +CG and CG proportions are very variable between storms. In the second part, the possible influence of atmospheric pollution on lightning production is considered. A laboratory experiment points out an effect of water contaminants on the characteristics of corona microdischarges from raindrops. Moreover, a large scale study realised for 12 summers shows a maximum in the production of CG lightning over the Paris city, which could be explained by an effect of pollutants and/or an effect of the urban heat island. Finally, a videosonde dedicated to in situ microphysical observations has been developed in

Laboratoire d'Aérogologie. A ground intercomparison experiment demonstrates a good performance of the instrument.

Oscar Van der Velde (vdvo@aero.obs-mip.fr) prepares a PhD thesis in WP5 of the European CAL (Coupling of Atmospheric Layers) project to characterize the physics of the thunderstorms which produce TLEs. This work also involves Serge Soula (sous@aero.obs-mip.fr). The aspects of meteorological environments, cloud system structure, microphysics, dynamics, and electrical activity are considered. During the observation campaign of the summer 2003 more than 100 sprites were observed. The different types of lightning activity directly associated with carrot- and column-type sprites have been studied in detail for one night with 15 recorded sprites, with data of two lightning detection systems and a broadband ELF/VLF receiver operated by the University of Crete/Stanford. A paper has been submitted to the Journal of Geophysical Research – Atmospheres in November 2005. Using data from the other sprite cases of 2003 and 2005 the study continues. A campaign of observation was conducted by the young scientists of the CAL project during the summer of 2005 over France and northern Spain. The main observations of this campaign are available on the website : <http://www.eurosprite.net/>.

Joan Montana (monj@aero.obs-mip.fr) from the University Polytechnical of Catalogna (Terrassa, Catalogna) visits our laboratory for a period of six months. He works about studies of the relationships between lightning activity and other components of the physics of the thunderstorms, especially in the cases of hailstorms. He participates also in studies about the characterization of the thunderstorms producing sprites for the CAL project, especially in cases of the 2003 and 2005 campaigns occurring over the northern Spain.



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

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