http://www.icae.jp

Newsletter on Atmospheric Electricity

Vol. 21 · No 2 · Nov 2010

INTERNATIONAL COMMISSION ON ATMOSPHERIC ELECTRICITY (IAMAS/IUGG)

AMS COMMITTEE ON ATMOSPHERIC ELECTRICITY

AGU COMMITTEE ON ATMOSPHERIC AND SPACE ELECTRICITY

EUROPEAN GEOSCIENCES UNION

SOCIETY OF ATMOSPHERIC ELECTRICITY OF JAPAN

***Comment on the photo above**: Image of a gigantic jet at its leading jet phase, above a thunderstorm east of Réunion Island. The de-interlaced image is issued from a video made by Patrice Huet with a CCD Sony camera KPC-350 BH (1/3" EX-VIEW HAD CCD) equipped with a 3.5-8 mm f/1.4 lens used at 3.5 mm. Its horizontal and vertical fields of view (FOV) were 70° and 50°, respectively.*

Greetings from the IAMAS General-secretariat

Let me take this opportunity to express my appreciation to the officers of International Commission of Atmospheric Electricity (ICAE) of IAMAS for their sustained information efforts through a regular and detailed newsletter. My thanks are extended to all authors of the informative contributions, be they members of ICAE or other scientists with interest and expertise in atmospheric electricity.

For IAMAS as a whole, the XXVth IUGG-assembly will be the highlight in 2011. ICAE is taking the lead in the joint symposium J-M12 (www.iugg2011.com/program-iamas.asp). One month later ICAE is organizing its own quadrennial symposium in Brazil. It was noted ***IAMAS-SG Hans Volkert in symbolic global action*** that the close temporal proximity is not ideal; a change of routine for 2015 would be much appreciated.

With the advent of satellite based lightning detection from geostationary satellites during the coming decade the scope of ICAE is likely to grow. The general-secretariat of IAMAS sends its best wishes for a continuation of the dedicated and successful work undertaken within ICAE.

ANNOUNCEMENTS

AWARDS

E. Philip KRIDER and **Martin A. UMAN** won Karl Berger Award from the scientific committee of International Conference on Lightning Protection (ICLP) during the 30th ICLP for their distinguished achievements in the science and engineering of lightning research, developing new fields in theory and practice, modelling and measurements. Congratulations, Dr.Krider and Dr.Uman !

NEW BOOKS

The paperback version of the book **"The Art and Science of Lightning Protection"** authored by Martin Uman (hardcopy version, 2008) with one correction has been published by Cambridge University Press for $36, much cheaper than the hardcopy version.

CONFERENCES

2010 AGU Fall Meeting

The fall meeting of AGU will be held on 13-17 December 2010, at the Moscone Center West, 800 Howard Street, San Francisco. There will be several sessions associated with atmospheric electricity. For detail, please visit http://www.agu.org/meetings/fm10/.

Progress in Electromagnetics Research Symposium (PIERS) 2011

PIERS 2011 will be held in Marrakesh, Morocco, 20-23 March, 2011. There will be a lightning session in this symposium. For detail, please visit http://www.piers.org/piers2011Marrakesh/submit/welcome.html.

European Geosciences Union General Assembly 2011

The EGU 2011 will be held in Vienna, Austria, 03 – 08 April 2011. There will be a lightning session shown below. For detail, please visit http://meetings.copernicus.org/egu2011/home.html.

NH1.4/AS4.4 Lightning: physics, detection and atmospheric effects

Convener: Yoav Yair
Co-Conveners: Serge Soula, Colin Price, Hans D. Betz, Yukihiro Takahashi

Lightning is the energetic manifestation of electrical breakdown, occurring after charge separation processes operating on micro and macro-scales, leading to strong electric fields within thunderstorms. Lightning is associated with severe weather, torrential rains and flash floods. It has significant effects on various atmospheric layers and drives the fair-weather electric field.

This session seeks contributions from research in atmospheric electricity regarding cloud physics and lightning, meteorology of thunderstorms, lightning discharge physics, modeling of the electricity of thunderstorms, lightning and the global circuit, atmospheric chemical effects of lightning and lightning in relation with middle atmospheric transient luminous events. The session also welcomes contributions on lightning detection networks and sensors from ground and space, presenting results of global and local surveys, also considering future lightning patterns in an era of climate change and urban effects on lightning.

The real-time capabilities of present-day lightning detection systems provide a potential for using lightning data for now-casting and verification of weather forecasts. The session welcomes new ideas and practical methods for utilizing lightning data.

14th International Conference on Atmospheric Electricity

More than 260 abstracts have been received so far. To encourage more participation, the deadline for abstract submission has been extended to Nov.30th, 2010. For detailed information, please visit the conference website http:// www.icae2011.net.br.

XXV IUGG General Assembly 2011

XXV IUGG General Assembly will be held at Melbourne Convention & Exhibition Centre, Melbourne, Australia, 28 June - 7 July 2011. ICAE, under IAMAS, is helping to organize the following session. For detail, please visit http://www.iugg2011.com/program-iamas.asp.

Thunderstorms: from troposphere to mesosphere and beyond

Organisers: IAMAS (ICAE), IAGA (Division II)
Lead Convenors: Colin Price (Israel), Fernanda T. São Sabbas (Brazil)
Co-convenors: Gabriella Satori (Hungary), Elisabeth Blanc (France)

Scope: Thunderstorms are an important component of the Earth's weather and climate. While thunderstorms can be associated with severe weather, and associated natural hazards, they also impact global atmospheric circulation, atmospheric chemistry and the global electric circuit. Thunderstorms are also related to the recently discovered Transient Luminous Events (TLEs) and Terrestrial Gamma Ray Flashes (TGFs) in the upper atmosphere. TGFs show the large energy exchanges between the Earth's atmospheric layers. Global thunderstorm activity is modulated by solar forcing on many spatial and temporal scales, from local to global, and from daily to inter-annual scales. Thunderstorms are also a source of gravity waves and infrasound.

This session welcomes papers in all aspects related to the meteorology and climatology of thunderstorms, their dynamical and electrodynamical coupling to different layers of the atmosphere, including ionospheric and magnetospheric effects, and similar processes on other planets.

ANNOUNCEMENTS

XXX URSI General Assembly and Scientific Symposium

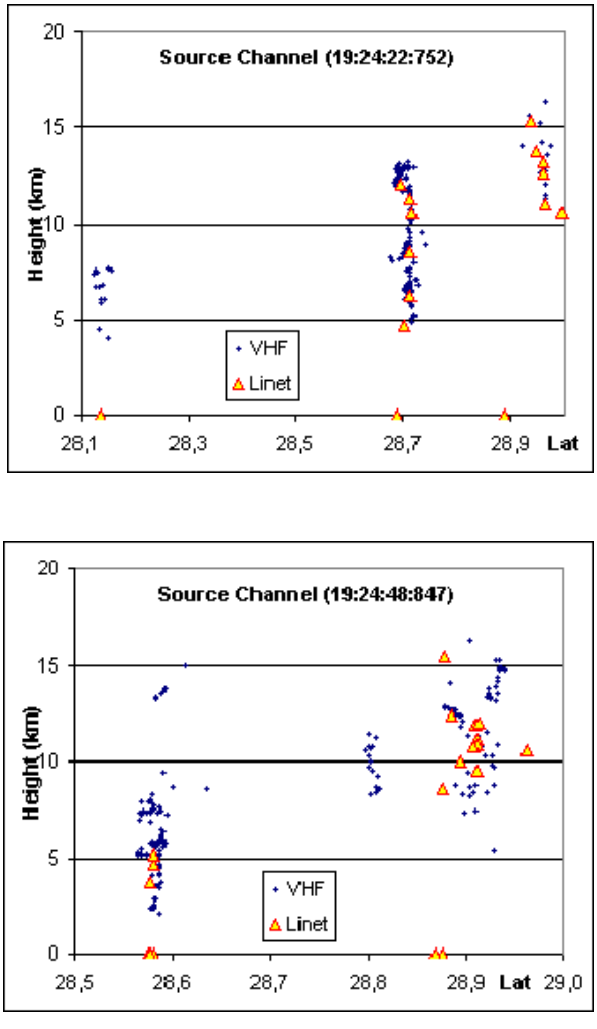
XXX URSI General Assembly will be held in Istanbul, Turkey 13-25 August 2011. There will be lightning session during this assembly. For detail, please visit http://www.ursigass2011.org/.

Atmospheric Electricity Group – Physics Department University of Munich, Germany

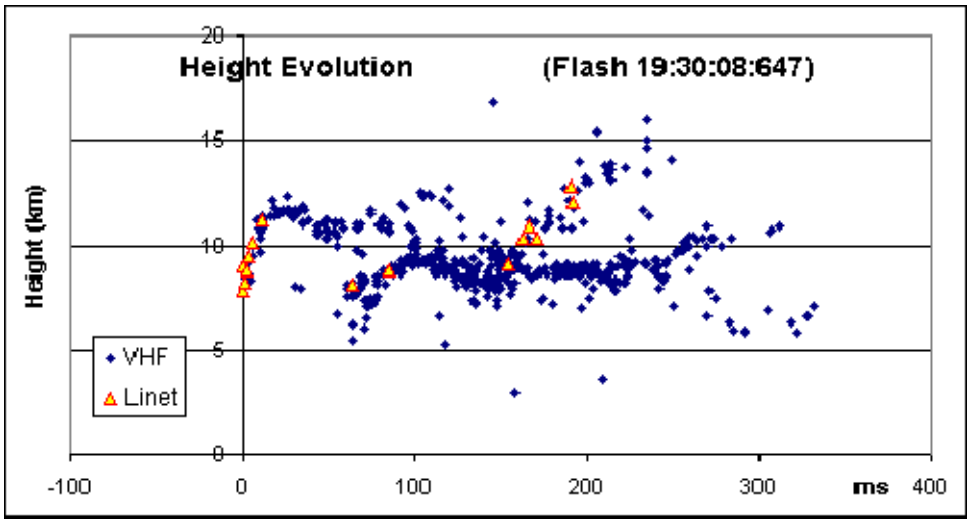
Hans D. Betz: hans-dieter.betz@physik.uni-muenchen.de

As early as in 2004 the newly developed 3D lightning detection network LINET allowed measurements of cloud strokes (IC) with determination of emission heights, solely with simple VLF/LF techniques. 3D scans with the high-resolution radar of DLR (POLDIRAD) have verified that the heights coincide with regions of highest reflectivity, but a specific stroke-by-stroke analysis was not at hand. In order to attain better understanding of the stroke heights, a co-operation with the University of Mississippi was established and a 7-sensor LINET system could be set up at Kennedy Space Center in Florida. Thus, during summer 2010 a comparison with the high-resolution VHF network LDAR2 (4DLSS) operated by NASA became feasible.

It turned out that LINET stroke-heights fit perfectly into channels, which were defined by radio source points from LDAR, no matter whether these channels were located in lower (~4 km) or higher (~15 km) altitudes, and independent of whether the discharge was a ground flash or a cloud flash. In fact, the accuracy of LINET heights was mostly better than ~10%. Furthermore, earlier observations from comparisons with 2D VHF systems (Safir) could be confirmed: in a substantial fraction of discharges the first measurable signal is an IC stroke, where the VHF system does not record any prior activity.



Comparison of VLF/LF and VHF lighting data: the graphs illustrate 3 flashes on 11 July 2010, the height evolution as a function of time, and the positions of LDAR sources and LINET strokes. Obviously, VLF/LF data from LINET is well suited to depict cloud activity with both remarkable efficiency and location accuracy, markedly without use of any complex VHF technology. Of course, the tasks remain to clarify both discharge initiation and advent of many strong current pulses in reasonably long channel segments of cloud discharges that give rise to substantial VLF/LF emission, tentatively labelled IC strokes.



Atmospheric Electricity Research Group at the Institute of Geophysics, Pol. Acad. Sci. (Warsaw, Poland)

The thundercloud and lightning research group in Warsaw (baranski@igf.edu.pl, jwisz@igf.edu.pl, marek.loboda@ee.pw.edu.pl, morawski@cbk.waw.pl) this year was mainly engaged in the analysis of multi-stations E-field recordings from our Local Lightning Detection Network (LLDN) in the Warsaw region, successfully obtained during the first field campaign in the summer of 2009 (see Fig. 1). Some results of this work concerning evaluation of the electric charge structure of multiple cloud-to-ground (CG) lightning flashes recorded by the LLDN were presented at the 30th International Conference on Lightning Protection – ICLP 2010 in Cagliari, Italy – September 13th-17th, 2010. Further research on the characteristics of the considered multiple CG lightning flashes activity have been made recently and is the main topic in our submission to the 14th ICAE in Rio de Janerio, Brazil. We have also worked on new research grant applications to obtain financial support for the continuation of the next LLDN campaign with additional H-field antennas and wireless transfer of recorded lightning data from stations to the central CPU database.

The Geophysical Observatory in Swider (51°6.9' N, 21°15.18' E) continues measurements of the vertical component of the electric field and the electrical conductivity as well as simultaneous meteorological and air pollution observations (swider@igf.edu.pl). The electric and meteorological observations are also run at the Institute's polar station in Hornsund, Spitsbergen (77°0.0' N, 15°22.2' E). The electrical parameters and their relation to solar wind changes are studied by professor Stanislaw Michnowski in collaboration with Russian colleagues (N.G. Kleimenova: kleimen@ifz.ru, and O.V. Kozyreva).

A paper containing initial results on the development of new high-resolution model of the global atmospheric electric circuit (EGATEC) has been recently published in JGR-Atmospheres, doi:10.1029/2009JD013341. A. Odzimek (aodzimek@igf.edu.pl), Marek Kubicki and Mark Lester of the University of Leicester, U.K., have been working on this model.

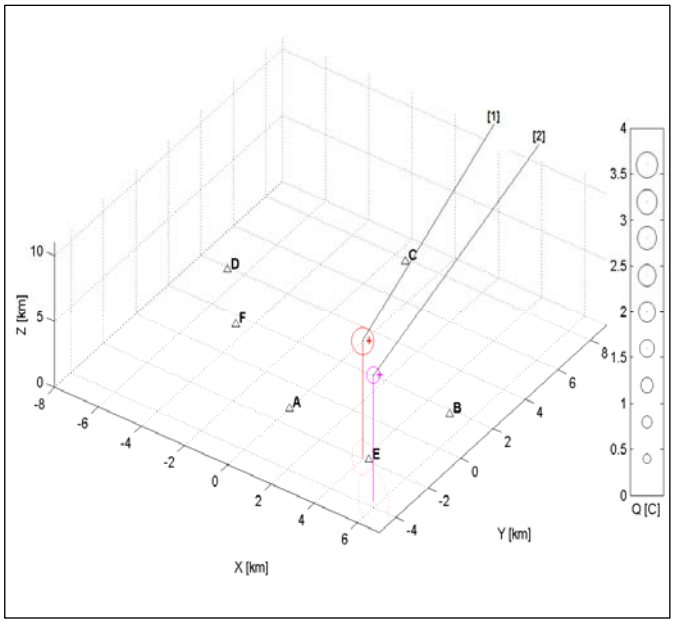


Fig. 1. Example of identification of the electric charge structure of positive multiple CG lightning flash recorded by LLDN in Warsaw during a thunderstorm on 25 June 2009. The first stroke of this flash (in red) was detected at 16:11:57.155491 UTC and the second one (in magenta) at 16:11:57.177478 UTC. Both were recognized as continuing current (CC) stages having charge sources equal to (3.65±0.59) C and (1.37±0.37) C, at heights, i.e. the z coordinate, (8.8±0.7) km and (9.6±0.6) km, respectively. Capital letters A, B, C, D, E and F with small triangles denote locations of the LLDN stations, and the red and magenta ellipses on XY plane indicate errors of the evaluated x and y coordinates of the charge sources of these CC strokes. The goodness of the (x,y,z,Q) parameter fit was determined by calculating the χ^2 parameter which was equal to 2.5 for the first and 3.6 for the second stroke.

Department of Physics, University of Shkodra, Albania (Florian Mandija)

Nowadays the atmospheric group is assembling all the data measured during monitoring campaign carried out in the period June 2008 – September 2010. In this monitoring campaign there are measured continuously both the concentrations of cluster ions and aerosol particles. Measured ions clusters belong to nanometer class, whilst aerosol particles belong to sub-micrometer and micrometer classes. All necessary data and statistical interpretations, like monthly variations of their concentrations will be presented in the XIV International Conference on Atmospheric Electricity. Ion and aerosol number concentrations are measured in diverse locations, like urban centre of Shkodra City, in Shkodra Lake, near Adriatic Sea, in mountains and several rural areas. But the most important objective was the determination of monthly variation of ion and aerosol concentrations in the inner part of the Shkodra City. Measurements in this site were realized in the distance about 55 m from the main roads of the city, covered by high buildings.

Figure 1. Map of monitoring area

Another investigation which is actually in progress is also PM monitoring in above mentioned locations. This monitoring campaign is in progress from May 2009 until now. There were carried out measurements in several sites of Shkodra City and in other nearby rural locations. In this study we have made source apportionment of particulate matter in this urban centre, and also have determined local and regional background. Overall results are given in the figure 2.

Also the determination of diurnal variation of PMx concentrations has taken an important interest in our PM monitoring. PM measurements on the different sites in the Shkodra Lake give e clear picture of the influence of Shkodra city and other smaller rural centers on the local background, as well as can be concluded for the transport process form urban centre to neighbor areas. Further analyses were made by Chemistry Department, where there are estimated the presence of diverse heavy metals in dust filters of measuring instruments. The final results of this monitoring campaign and relevant conclusions are still in publishing process in several scientific journals.

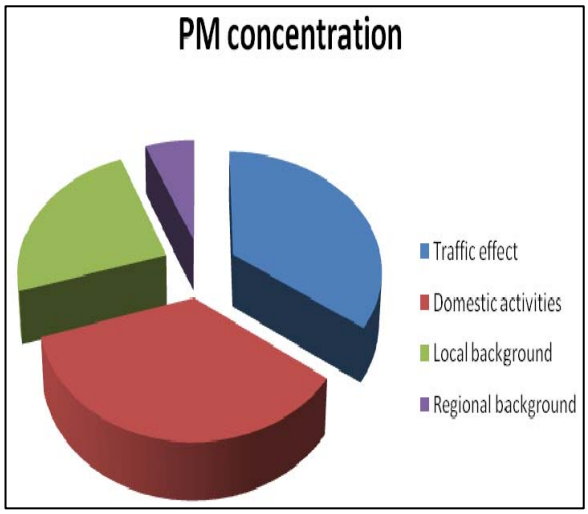


Figure 2. PM source contributions

Geoelectromagnetic Monitoring Laboratory of Borok Geophysical Observatory, Schmidt Institute of Physics of the Earth, the Russian Academy of Sciences

Borok Geophysical Observatory [58°04′N, 38°14′E] is the unique middle-latitude geophysical observatory in the European part of Russia, making the continuous observations of different geophysical and meteorological fields under conditions of "geoelectromagnetic preservation area" with low level of anthropogenic pollutions. The GemM Laboratory takes continuous observations of air electric field, atmosphere electric current, meteorological fields (temperature, air pressure, humidity, wind, precipitation). The sodar (Doppler acoustic sounder) continuously measures wind speed at various heights above the ground and the thermodynamic structure of the lower atmosphere layer.

The current researches of the GemM Laboratory team are focused on the development of the global electric circuit concept. The head of the laboratory is D. Sc. (phys. & math.) S.V. Anisimov. The dynamic and fractal characteristics of air electric pulsations are obtained. The problems of formation of spatial characteristics of air electric structures are considered. The electric active layers in the planetary boundary layer are discovered and mechanisms of their formation are analyzed. The electrode layer in surface atmosphere is

investigated. The researches are based on the continuous measurements and regular field observations of air electrical and meteorological parameters.

In 2010 the GemM Laboratory was equipped with a radon seismic ground station to measure volume activity of Rn^{220} and Rn^{222} in ground air. These radioactive gases coming from the ground refer to main ionization sources in the surface atmosphere, as well as cosmic rays coming from the near-Earth space. The first measurements in summer 2010 displayed that the mean value of Rn^{222} volume activity is ~500Bk/m^3 in the ground air and ~100Bk/m^3 in the near ground atmosphere, what is typical for central Russia. The volume activity of Rn^{220} is negligibly small almost always. The diurnal variations of Rn^{222} concentration are feebly marked.

The field observations of air electricity were taking from May till September 2010. Six electrostatic fluxmeters ("field mills") specially designed to long-term precision measurements were installed in a field at different altitudes (from a ground level up to 1 m) and at a distance of 5 m from each other. This installation allows obtaining structure functions of air electric field pulsations together with air electric field altitude profile.

Using the Borok Geophysical Observatory database and the results of seasonal field observations, characteristic morphological properties of atmospheric electric field variations were researched over the time scale range a second to a year (N.M. Shikhova and S.V. Anisimov). The statistical processing of amplitude-time series of 1998-2010 observations was carried out; statistical properties of these variations were analyzed. The experimental research of electric field and current pulsations allows finding their interrelation with turbulent intermixing and transport of a space charge in the boundary layer. The analysis of energy and fractal parameters of electric field dynamics shows, that electric field pulsations possess property of self-similarity in most cases. The self-similarity characteristics are closely connected with variability of meteorological parameters of the atmospheric boundary layer.

Research of a dynamic component of a boundary layer electric field is carried out in terms of numerical modeling of spatially nonhomogenous turbulent transport of a space charge (S.V. Anisimov and S.V. Galichenko). Modeling of air electric field dynamics is executed by means of a test structures method. Observation data of air electric field intensity, the vertical profiles of a wind speed and direction, the heights of the inversion layer are used as input model parameters. It is shown, that evolution of a vertical profile of electric field in lower atmosphere is defined by formation or destruction of electric active layers. Basic parameters of spatial-temporal modeling distributions of a space charge density are analyzed. Estimations of interrelation of air electric field dynamics and trends of meteorological parameters are adduced for boundary layer conditions.

The approximate analytical solution of the classical (non-turbulent) electrode effect problem is found by the original method (the principal investigator is PhD E.M. Dmitriev). It is shown that a finding approximate solution is an exact solution in fact for real surface atmosphere under good weather conditions. This non-turbulent electrode effect problem solution is used to evaluate the approximate solution of the turbulent electrode effect problem by the method of multiple scales. The approximate solution efficiently describes weak turbulence in terms of the boundary layer located near a ground surface. The results can be applied in near real time calculations of electrode effect parameters under weak turbulence in a process of the surface

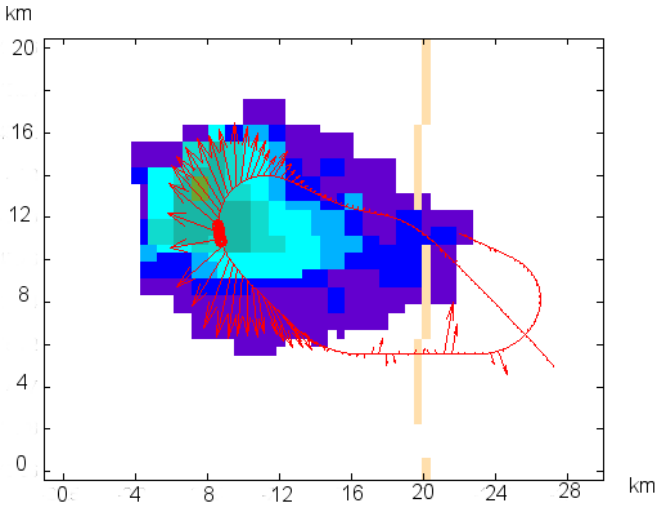
atmosphere electrical state monitoring.

O.N.E.R.A the French Aerospace Lab

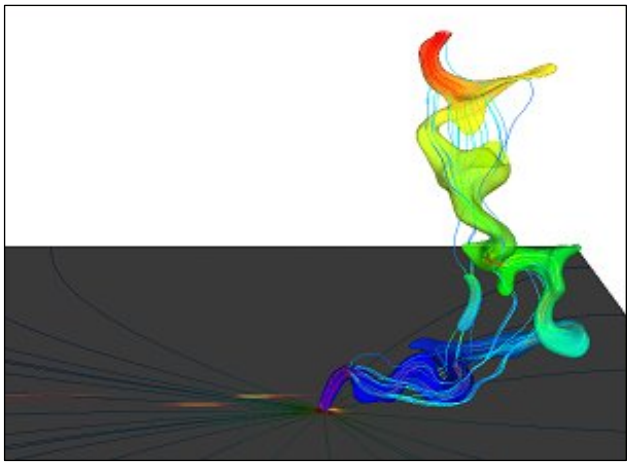
Pierre Laroche (Pierre.laroche@onera.fr)

The Onera Research Group on Lightning and Plasma, headed by Philippe Lalande (Philippe.Lalande@onera.fr), carries on studies on atmospheric electricity and on interaction of lightning with aircraft. During summer 2010, a bizjet aircraft has been instrumented with 8 field mills in order to remotely detect and analyze the electrical atmospheric field produced by convective clouds in their early electrification development. Alain Delannoy (alain.delannoy@onera.fr) and Patrice Blanchet (Patrice.blanchet@onera.fr) set up and calibrate the instrumentation on the aircraft. The aircraft was flown around developing Cu-Cg, and coherent measurements were obtained.

Laurent Chemartin (Laurent.Chemartin@onera.fr) and Philippe Lalande continue the modeling of electrical arc-material interaction. The numerical simulation is validated with laboratory arc experiment. This modeling relies on a specific application of the MHD code Saturn^{TM}. Thermal and mechanical effects are taken into account in the description of the damages produced on the composite surface of an aircraft by the attachment and the sweeping of the continuous arc of a lightning channel. PhD student Bruno Peyrou (Bruno.Peyrou@onera.fr) is currently developing a physical model of the propagation of a subsequent return stroke or recoil streamer within the continuous arc channel of a lightning flash.



The red arrow indicates the direction and magnitude of the horizontal field (maximum value ~12kV/m) at 6250m AMSL superimposed on the trajectory of the aircraft and the precipitation radar echo at about 2500m AMSL.



Computation of a 6000K iso surface of a 50cm arc attached on a metallic plate. The electrical potential of the arc is color coded from 0 to ~ 400V.

University of Florida (Gainesville, FL)

A total of 13 negative lightning flashes were triggered in 2010 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. Twelve of them contained leader/return stroke sequences (a total of 58) and one was composed of the initial stage only. Additionally, two natural negative lightning discharges that terminated on site or in its immediate vicinity were recorded at Camp Blanding by the multiple-station electric and magnetic field measuring network and/or by the Thunderstorm Energetic Radiation Array (TERA). Both triggered and natural lightning flashes were also recorded at the Lightning Observatory in Gainesville (LOG).

A. Nag and V.A. Rakov authored two companion papers titled "Compact intracloud lightning discharges: 1. Mechanism of electromagnetic radiation and modeling" and "Compact intracloud lightning discharges: 2. Estimation of electrical parameters". On the basis of experimental evidence of multiple reflections and modeling, the authors infer that, from the electromagnetic point of view, the compact intracloud lightning discharge (CID) is essentially a bouncing-wave phenomenon. Reflections, occurring at CID channel ends, influence the magnitude of the overall CID electric field waveform and are responsible for its fine structure, as well as, by inference, for "noisiness" of dE/dt waveforms and for accompanying HF-VHF bursts. From modeling the CID as a wave traveling on an elevated vertical transmission line and comparing model-predicted electric fields with measurements, they estimated that the effective current reflection coefficients at channel ends should be in the range of 0 to −0.5, that the wave propagation speed ranges from 0.3 to 3 × 10^8 m/s, and the channel length is less than 1000 m. They estimated electrical parameters of 48 located CIDs using their measured electric fields and vertical Hertzian dipole approximation. For nine events, they estimated channel lengths from observed reflection signatures in measured dE/dt waveforms and assumed propagation speeds between 2 × 10^8 m/s and 3 × 10^8 m/s, which limit the range of allowed values. For a speed of 2.5 × 10^8 m/s (average value), the resultant geometric mean values (GM) of peak current, zero-to-peak current risetime, and charge transfer in the first 5 us are 143 kA, 5.4 us, and 303 mC, respectively. The GM peak radiated power and energy radiated in the first 5 us are 29 GW and 24 kJ, respectively. The papers are published in JGR-Atmospheres.

J. Schoene, M.A. Uman, and V.A. Rakov authored a paper titled "Return stroke peak current versus charge transfer in rocket-triggered lightning". The authors, examined data on 117 return strokes in 31 rocket-and-wire-triggered lightning flashes acquired during experiments conducted from 1999 through 2004 at Camp Blanding, Florida, in order to compare the peak currents of the lightning return strokes with the corresponding charges transferred during various time intervals within 1 ms after return stroke initiation. They find that the determination coefficient for lightning return stroke peak current versus the corresponding charge transfer decreases with increasing the duration of the charge transfer starting from return stroke onset. Their results support the view that (1) the charge deposited on the lower portion of the leader channel determines the current peak and that (2) the charge transferred at later times is increasingly unrelated to both the

current peak and the charge deposited on the lower channel section. Additionally, they find that the relation between triggered-lightning peak current and charge transfer to 50 us in Florida is essentially the same as that for subsequent strokes in natural lightning in Switzerland, further confirming the view that triggered-lightning strokes are very similar to subsequent strokes in natural lightning. The paper is published in JGR - Atmospheres.

Laboratory of Lightning Physics and Protection Engineering (LiP&P), Chinese Academy of Meteorological Sciences, Beijing, China

Attachment Processes of Two Natural Downward Lightning Flashes Striking on High Structures: The attachment process is very important for understanding lightning physics and developing lightning protection technique. But it is very difficult to obtain the propagation characteristics of leaders in the attachment process of natural CG lightning for the spatial and temporal randomicity of natural lightning events. To study the attachment process of discharges, a field observation experiment of lightning flashes occurring on high structures was conducted in the summer of 2009, at Guangzhou, Guangdong Province, China. Two downward negative lightning flashes, which stroke on high structures and are numbered as L01 and L02, have been analyzed. L01 stroke on a 610 m TV Tower and L02 on a 432 m structure. Figure 1 gives some high-speed camera records of L01. Figure 2 describes the 2D spatial position and propagation velocities of the main channel of downward-moving leader and two branches of upward-moving leader of L02. The analysis shows that: (1) Both lightning discharges exhibit long upward connecting leader with their lengths of longer than 450 m for L01 and of about 177 m for L02, respectively; (2) The upward-moving leader of L01 only has a single channel, while that of L02 has two branches; (3) For each event the average 2D progression velocity of upward-moving leader is of the order of 10^5 m/s; (4) There are no obvious difference between the 2D progression velocities of the upward-moving leader and the downward-moving leader during the last several hundreds of microseconds before the return stroke; (5) There exists a downward propagation optical phenomenon with a velocity of about 3.4×10^7 m/s at the bottom several tens of meters channel of L01 (below the junction point) after the connection of upward and downward moving leaders. This downward propagation appears to support the presence of the bidirectional extension of the return-stroke channel from the junction point.

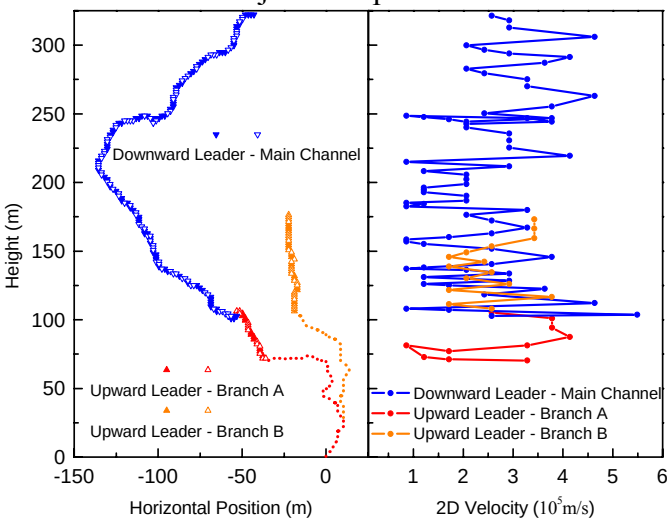
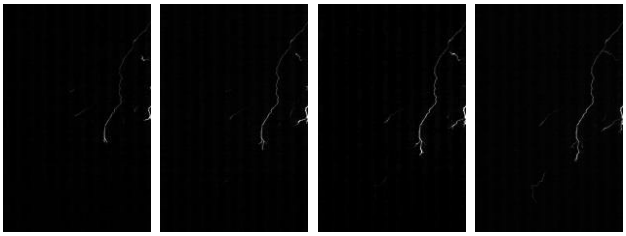


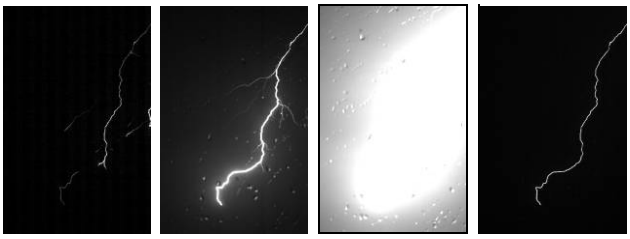
Fig.2 The 2D spatial positions (Left) and propagation velocities (Right) of the main channel

of downward-moving leader and two branches of upward-moving leader of L02. Position (0, 0) is set at the strike point on the construction crane of the West Tower.

Emission of Light and VLF perturbations from Electromagnetic pulse Sources (ELVES): Numerical simulations and theoretical analysis are used to study the characteristics of ELVES horizontally expanding at super velocity of light. Simultaneously, a new equation of ELVES horizontal expansion velocity is put forward. The results derived from both simulation and the new equation show that ELVES horizontally expands at a rate faster than the speed of light at altitude of 89km. The maximum of horizontally expanding velocity is faster than 3c (c is the speed of light). The horizontally expanding velocity of ELVES decreases with time and horizontal radial distance, and gradually tends to the speed of light. The simulation results show that the lightning discharge current waveforms have few influences on the horizontally expanding velocity and it mainly influences the intensity of optical emission of ELVES.



(a) -0.5 ms (b) -0.4 ms (c) -0.3 ms (d) -0.2 ms



(e) -0.1 ms (f) 0.0 ms (g) 0.1 ms (h) 0.5 ms

Fig. 1 High-speed camera records of L01. In frame a-e, luminosities are enhanced for a better view.

An exploration of electric structure simulation in a meso-scale model: For simulating the evolution of electric structure in real weather systems and forecasting lightning activity at future, a charging parameterization of non-inductive mechanism and an improved simply discharging parameterization were added to Global and Regional Assimilation and PrEdiction System (GRAPES) meso-scale model, developed by CAMS, with 0.1°×0.1° in horizontal resolution and 60s in integration time step. A thunderstorm, occurring in North China, was simulated for case study. The charge structure, simulated by the model, corresponded with the dipole vertical structure and the center of the main charge region was located between 7 km to 8 km. The net charge intensity in main charge region was kept in magnitude of 10^{-1}~10^{0} nC/m^3 after discharging. At the same time, a judgment was adopted to classify Cloud-to-Ground (CG) discharges from all simulated discharges and the result was approximately agreed with the observation from the CG location network.

Study of Lightning Casualties and Damages in China: Lightning-related fatalities, injuries and property damages reported in China from 1997 to

2009 are summarized by using the National Lightning Hazards Database. Therefore, characteristics of the incidents including 5033 deaths, 4670 injuries and 61614 damage reports are analyzed. For the spatial distribution of lightning disasters in China, the eastern costal and southern areas have more frequent lightning disasters than the western areas（Fig. 3, Fig. 4）. Lightning disasters mainly occur in summer months from July to September while fewer damages occur in winter months from October to March, which correlate significantly with the temporal variability of lightning frequency in China. Lightning-related casualties and damages in China have increased for the period of 1997 to 2007, and then began to decrease since 2008. The national fatalities and injuries per million people per year are 0.31 and 0.28, respectively. Rural people account for 51% and 29% of all lightning fatalities and injuries, which makes residents in agricultural and rural area the major lightning victims. Characteristics of lightning disasters and correlative factors are also studied, including hazard affected industries and locations. The results show that civil industry has the worst property loss and farmland is the largest category in lightning-caused casualty locations.

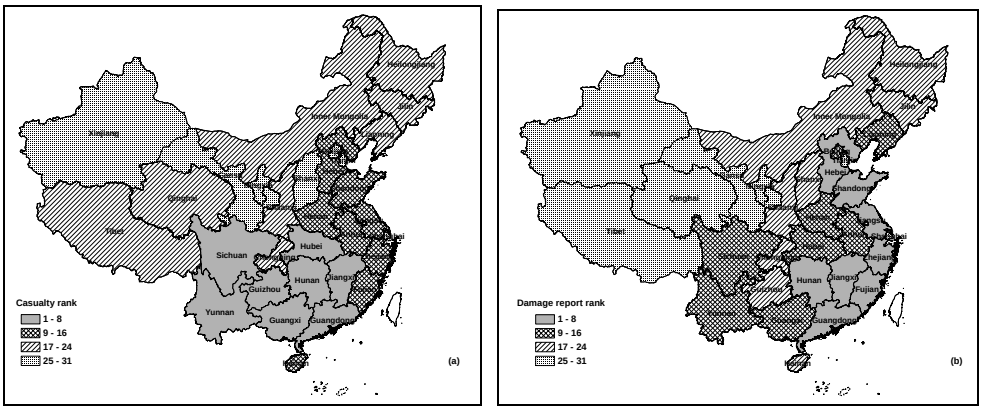


Fig. 3 The rank of each province in number of lightning-related casualties (a) and damage reports (b) in Mainland China from 1997 to 2009.

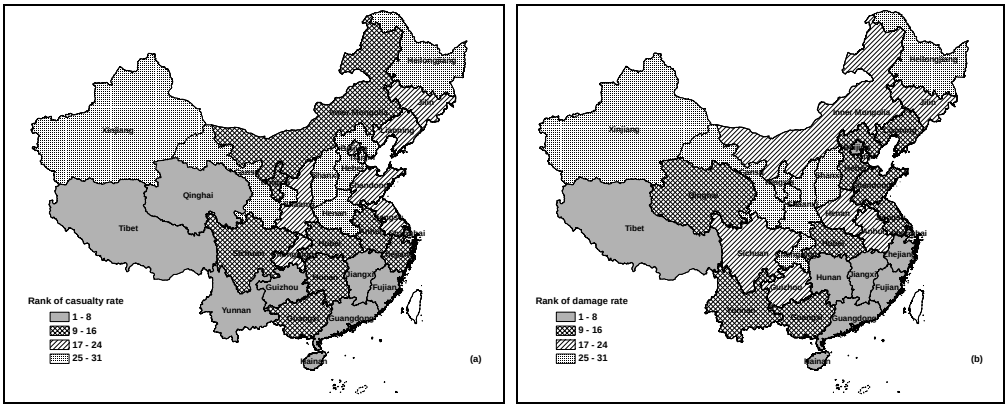
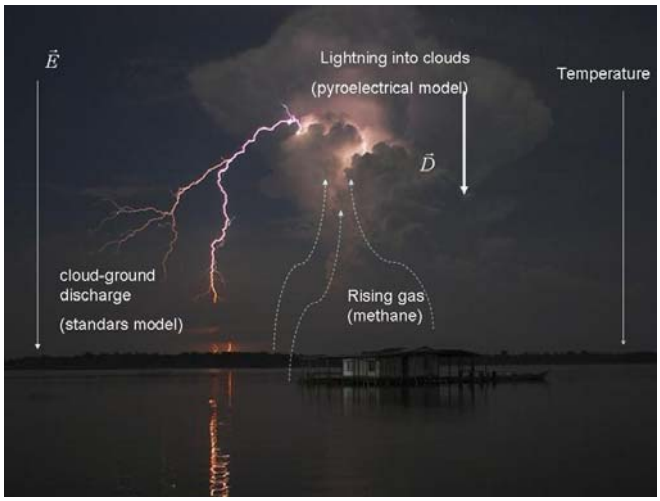


Fig. 4 The rank of each province in the rate of lightning-related casualties (a) and damage reports (b) in Mainland China from 1997 to 2009.

New Result about the lightning of the Catatumbo River (Venezuela)

The manifestations of the atmospheric electric activity are common in the whole region of the deltas of the rivers Catatumbo and Brave, to the south of the Maracaibo lake (Venezuela). Standing out among such meteors the persistent occurrence of a deaf lightning, well-known as the Catatumbo Lightning or Maracaibo Lighthouse" whose radiance and brightness is such that it can be appreciated from hundreds of kilometers of distance, most of southwestern Venezuela, the river Magdalena in Colombia and from the Caribbean sea, during almost the whole year .The area of occurrence of the Lightning of the Catatumbo doesn't vary from its first mention written in 1597. The naturalistic Alexander von Humboldt the phenomenon like electric ...explosions that are as phosphorescent radiances describes..." and geographer Agustín Codazzi (1841) points out him as a continuous lightning for almost every night of the year, even in the period of drought. The phenomenon is presented in two regions very located to the west of the Brave and Catatumbo river, to the interior of the swamps. From the observation points it was visualized the Lightning of the Catatumbo like gleams cloud-cloud and the phosphorescent splendor (lightning) in regions of the well located sky and persistently during the whole night. Also observed sporadic rays cloud-earth in other addresses of the sky that didn't present the magnitude, persistence and cuasiperiodicidad of the other discharges. The extension of the swamps,



permanently flooded, makes think that the gas methane should play an important list in the processes microfísicos that take place in the clouds of the region. We have recently completed a quantitative analytical model to characterize the persistence and frequency of the Catatumbo River Lightning. This theoretical microphysical model of thundercloud electrification that incorporates the influence of an aerosol with electrical self-polarization (pyroelectric), like methane. We estimate the water and methane dipole contribution to the internal electric field. We obtain that the water contribution to the internal electric field due to the electrical displacement vector generated by the atmospheric electric field of the Earth, is not enough to produce a typical discharge; the methane increases the electric field inside thunderclouds and facilitates the electrical charge generation and separation process.

References: www.revistas.luz.edu.ve/index.php/cien/article/view/5426
Also see: http://www.facyt.uc.edu.ve/relampago/

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.

Ab Kadir M.Z.A., I. Cotton. 2010. Application of the insulator coordination gap models and effect of line design to backflashover studies. International Journal of Electrical Power & Energy Systems, Volume 32, Issue 5, Pages 443-449.

Abarca S. F., K. L. Corbosiero, T. J. Galarneau Jr. 2010. An evaluation of the Worldwide Lightning Location Network (WWLLN) using the National Lightning Detection Network (NLDN) as ground truth. J. Geophys. Res., 115, D18206, doi:10.1029/2009JD013411.

Alemu Tadesse, Emmanouil N. Anagnostou. 2010. African convective system characteristics determined through tracking analysis. Atmospheric Research, Volume 98, Issues 2-4, Pages 468-477.

Aleš Berkopec, Tomaž Slivnik. 2010. Estimation of W0/WT ratio for cloud-to-ground lightnings. Journal of Electrostatics, Volume 68, Issue 4, Pages 337-344.

Ashesh Gunwantrao Wankhede, Vinod R. Agrawal, Dinesh R. Sariya. 2010. An injury subjacent to lac ornament in a case of lightning. Forensic Science International, Volume 195, Issues 1-3, Pages e9-e12.

Babich L. P., E. I. Bochkov, E. N. Donskoi, I. M. Kutsyk. 2010. Source of prolonged bursts of high-energy gamma rays detected in thunderstorm atmosphere in Japan at the coastal area of the Sea of Japan and on high mountaintop. J. Geophys. Res., 115, A09317, doi:10.1029/2009JA015017.

Babich L. P., E. I. Bochkov, I. M. Kutsyk, R. A. Roussel-Dupré. 2010. Localization of the source of terrestrial neutron bursts detected in thunderstorm atmosphere. J. Geophys. Res., 115, A00E28, doi:10.1029/2009JA014750.

Bekteshi, F. Mandija. 2010. The determination of heavy metals in dust air of Shkodra City, Scientific Bulletin of Shkodra University, Vol.60, 34-38.

Bjørn Gitle Hauge. 2010. Investigation & analysis of transient luminous phenomena in the low atmosphere of Hessdalen valley, Norway. Acta Astronautica, Volume 67, Issues 11-12, Pages 1443-1450.

Briggs M. S., et al. 2010. First results on terrestrial gamma ray flashes from the Fermi Gamma-ray Burst Monitor. J. Geophys. Res., 115, A07323, doi:10.1029/2009JA015242.

Bushati J., F. Mandija, N. Frasheri. 2010. ICT application for monitoring air pollution in the area of Shkodra Lake, Proceedings of Balwois 2010 Conference, Ohrid, Machedonia.

Carlson B. E., N. G. Lehtinen, U. S. Inan. 2010. Terrestrial gamma ray flash production by active lightning leader channels. J. Geophys. Res., 115, A10324, doi:10.1029/2010JA015647.

Chang Hong-Chan, Fu-Hsien Chen, Cheng-Chien Kuo, Tai-Hsiang Chen. 2011. Energy dispatching analysis of lightning surges on underground cables in a cable connection station. Energy Conversion and Management, Volume 52, Issue 1, Pages 693-702.

Chang S. C., C. L. Kuo, L. J. Lee, et al. 2010. ISUAL far-ultraviolet events, elves, and lightning current. J. Geophys. Res., 115, A00E46, doi:10.1029/2009JA014861.

Chanrion O., T. Neubert. 2010. Production of

RECENT PUBLICATIONS

runaway electrons by negative streamer discharges. J. Geophys. Res., 115, A00E32, doi:10.1029/2009JA014774.

Chou J. K., et al. 2010. Gigantic jets with negative and positive polarity streamers. J. Geophys. Res., 115, A00E45, doi:10.1029/2009JA014831.

Christodoulou C.A., L. Ekonomou, G.P. Fotis, I.F. Gonos, I.A. Stathopulos. 2010. Assessment of surge arrester failure rate and application studies in Hellenic high voltage transmission lines. Electric Power Systems Research, Volume 80, Issue 2, Pages 176-183.

Cohen M. B., U. S. Inan, R. K. Said, et al. 2010. A lightning discharge producing a beam of relativistic electrons into space. Geophys. Res. Lett., 37, L18806, doi:10.1029/2010GL044481.

Den Outer P. N., H. Slaper, J. Kaurola, A. Lindfors, et al. 2010. Reconstructing of erythemal ultraviolet radiation levels in Europe for the past 4 decades. J. Geophys. Res., 115, D10102, doi:10.1029/2009JD012827.

Dubrovin D., S. Nijdam, E. M. van Veldhuizen, et al. 2010. Sprite discharges on Venus and Jupiter-like planets: A laboratory investigation. J. Geophys. Res., 115, A00E34, doi:10.1029/2009JA014851.

Dwyer J. R., D. M. Smith. 2010. Comment on "'Seed' electrons from muon decay for runaway mechanism in the terrestrial gamma ray flash production," by Gerson S. Paiva, Antonio C. Pavão, and Cristiano C. Bastos. J. Geophys. Res., 115, D10207, doi:10.1029/2009JD012255.

Ebert U., S. Nijdam, C. Li, A. Luque, T. Briels, E. van Veldhuizen. 2010. Review of recent results on streamer discharges and discussion of their relevance for sprites and lightning. J. Geophys. Res., 115, A00E43, doi:10.1029/2009JA014867.

Eldo E. Ávila, Rodrigo E. Bürgesser, Nesvit E. Castellano, et al. 2010. Correlations between deep convection and lightning activity on a global scale. Journal of Atmospheric and Solar-Terrestrial Physics, Volume 72, Issues 14-15, Pages 1114-1121.

Elisabeth Blanc. 2010. Space observations of Transient Luminous Events and associated emissions in the upper atmosphere above thunderstorm areas. Comptes Rendus Geoscience, Volume 342, Issues 4-5, Pages 312-322.

Elisabetta Renni, Elisabeth Krausmann, Valerio Cozzani. 2010. Industrial accidents triggered by lightning. Journal of Hazardous Materials, Volume 184, Issues 1-3, Pages 42-48.

Emilio Chuvieco, Inmaculada Aguado, Marta Yebra, et. al. 2010. Development of a framework for fire risk assessment using remote sensing and geographic information system technologies. Ecological Modelling, Volume 221, Issue 1, Pages 46-58.

Farges T., E. Blanc. 2010. Characteristics of infrasound from lightning and sprites near thunderstorm areas. J. Geophys. Res., 115, A00E31, doi:10.1029/2009JA014700.

Gjesteland T., N. Østgaard, P. H. Connell, J. Stadsnes, G. J. Fishman. 2010. Effects of dead time losses on terrestrial gamma ray flash measurements with the Burst and Transient Source Experiment. J. Geophys. Res., 115, A00E21, doi:10.1029/2009JA014578.

Gordillo-Vazquez F. J. 2010. Vibrational kinetics of air plasmas induced by sprites. J. Geophys. Res., 115, A00E25, doi:10.1029/2009JA014688.

RECENT PUBLICATIONS

Gordillo-Vázquez F. J., A. Luque. 2010. Electrical conductivity in sprite streamer channels. Geophys. Res. Lett., 37, L16809, doi:10.1029/2010GL044349.

Gurnett D. A., D. D. Morgan, L. J. Granroth, et al. 2010. Non-detection of impulsive radio signals from lightning in Martian dust storms using the radar receiver on the Mars Express spacecraft. Geophys. Res. Lett., 37, L17802, doi:10.1029/2010GL044368.

Hager W. W., B. C. Aslan, R. G. Sonnenfeld, et al. 2010. Three-dimensional charge structure of a mountain thunderstorm. J. Geophys. Res., 115, D12119, doi:10.1029/2009JD013241.

Haldoupis C., N. Amvrosiadi, B. R. T. Cotts, et al. 2010. More evidence for a one-to-one correlation between Sprites and Early VLF perturbations. J. Geophys. Res., 115, A07304, doi:10.1029/2009JA015165.

Hansen A. E., H. E. Fuelberg, K. E. Pickering. 2010. Vertical distributions of lightning sources and flashes over Kennedy Space Center, Florida. J. Geophys. Res., 115, D14203, doi:10.1029/2009JD013143.

Hayakawa, M., K. Ohta, V. M. Sorokin, et al. 2010. Interpretation in terms of gyrotropic waves of Schumann-resonance-like line emissions observed at Nakatsugawa in possible association with nearby Japanese earthquakes. J. Atmos. Solar-terr. Phys., vol. 72, 1292-1298.

Heavner M. J., J. S. Morrill, C. Siefring, et al. 2010. Near-ultraviolet and blue spectral observations of sprites in the 320–460nm region: N2 (2PG) emissions. J. Geophys. Res., 115, A00E44, doi:10.1029/2009JA014858.

Inan U. S., S. A. Cummer, R. A. Marshall. 2010. A survey of ELF and VLF research on lightning-ionosphere interactions and causative discharges. J. Geophys. Res., 115, A00E36, doi:10.1029/2009JA014775.

Jarvis M.J. 2010. The ineffectiveness of Joule heating in the stratosphere. Journal of Atmospheric and Solar-Terrestrial Physics, Volume 72, Issues 14-15, Pages 1110-1113.

Jenkins G., et al. 2010. Coastal observations of weather features in Senegal during the African Monsoon Multidisciplinary Analysis Special Observing Period 3. J. Geophys. Res., 115, D18108, doi:10.1029/2009JD013022.

Jonathan D. Hill, Martin A. Uman, Michael Stapleton, et al. 2010. Attempts to create ball lightning with triggered lightning. Journal of Atmospheric and Solar-Terrestrial Physics, Volume 72, Issue 13, Pages 913-925.

Kanmae T., H. C. Stenbaek-Nielsen, M. G. McHarg, R. K. Haaland. 2010. Observation of blue sprite spectra at 10,000 fps. Geophys. Res. Lett., 37, L13808, doi:10.1029/2010GL043739.

Kanmae T., H. C. Stenbaek-Nielsen, M. G. McHarg, R. K. Haaland. 2010. Observation of sprite streamer head's spectra at 10,000fps. J. Geophys. Res., 115, A00E48, doi:10.1029/2009JA014546.

Karampelas P., L. Ekonomou, S. Panetsos, G.E. Chatzarakis. 2011. LPAT: An interactive simulation tool for assessing the lightning performance of Hellenic high voltage transmission lines. Applied Soft Computing, Volume 11, Issue 1, Pages 1380-1387.

Kudintseva, I. G., A. P., Nickolaenko, M. Hayakawa. 2010. Transient Electric Field in the Mesosphere above a Γ-shape Lightning Stroke. Survey Geophys., vol. 31, 427-448.

Kumar P. Ramesh, A.K. Kamra. 2010. Lightning activity variations over three islands in a tropical monsoon region. Atmospheric

Research, Volume 98, Issues 2-4, Pages 309-316.

Lal D.M., S.D. Pawar. 2011. Effect of urbanization on lightning over four metropolitan cities of India. Atmospheric Environment, Volume 45, Issue 1, Pages 191-196.

Lang T. J., W. A. Lyons, S. A. Rutledge, et al. 2010. Transient luminous events above two mesoscale convective systems: Storm structure and evolution. J. Geophys. Res., 115, A00E22, doi:10.1029/2009JA014500.

Lee L.-J., et al. 2010. Controlling synoptic-scale factors for the distribution of transient luminous events. J. Geophys. Res., 115, A00E54, doi:10.1029/2009JA014823.

Lee S.-K., C. Wang, D. B. Enfield. 2010. On the impact of central Pacific warming events on Atlantic tropical storm activity. Geophys. Res. Lett., 37, L17702, doi:10.1029/2010GL044459.

Liliana Arevalo, Vernon Cooray. 2010. 'The mesh method' in lightning protection standards. Journal of Electrostatics, Volume 68, Issue 4, Pages 311-314.

Liou Y.-A., S.K. Kar. 2010. Study of cloud-to-ground lightning and precipitation and their seasonal and geographical characteristics over Taiwan. Atmospheric Research, Volume 95, Issues 2-3, Pages 115-122.

Lu G., R. J. Blakeslee, J. Li, D. M. Smith, X.-M. Shao, et al. 2010. Lightning mapping observation of a terrestrial gamma-ray flash. Geophys. Res. Lett., 37, L11806, doi:10.1029/2010GL043494.

Mandija F., F. Vila. 2010. Estimation of aerosol emission rate and transport mechanism in some locations of Shkodra Lake, International Conference of Albanian and Montenegro Academy; Lake of Shkodra – Status and Prespectives, Shkoder and Podgorica.

Mandija F., J. Bushati. 2010. An overview on air quality standards in some populated centers near Shkodra Lake, International Conference; Introducing RAMSAR principles towards integrated management of Lake Shkodra/Skadar & Buna/Bojana River natural resources, Shkoder, Albania.

Mandija F., Trepçi M. 2010. Electric and magnetic fields on electric substations in Shkodra City. Scientific Bulletin of Shkodra University, Vol.60, 14-21.

Marshall R. A., U. S. Inan. 2010. Two-dimensional frequency domain modeling of lightning EMP-induced perturbations to VLF transmitter signals. J. Geophys. Res., 115, A00E29, doi:10.1029/2009JA014761.

Marzinotto M., C. Mazzetti. 2010. Overvoltage attenuation in power cable lines—A simplified estimation method. Electric Power Systems Research, Volume 80, Issue 5, Pages 506-513.

McHarg M. G., H. C. Stenbaek-Nielsen, T. Kanmae, R. K. Haaland. 2010. Streamer tip splitting in sprites. J. Geophys. Res., 115, A00E53, doi:10.1029/2009JA014850.

Michael L. Gauthier, Walter A. Petersen, Lawrence D. Carey. 2010. Cell mergers and their impact on cloud-to-ground lightning over the Houston area. Atmospheric Research, Volume 96, Issue 4, Pages 626-632.

Mohamed Nayel, Zhao Jie, Jinliang He. 2010. Significant parameters affecting a lightning stroke to a horizontal conductor. Journal of Electrostatics, Volume 68, Issue 5, Pages 439-444.

Mullayarov V.A., V.I. Kozlov, A.A. Toropov, R.R.

RECENT PUBLICATIONS

Karimov. 2010. Some results of observations of positive lightning discharges and relative phenomena in the east of Siberia. Journal of Atmospheric and Solar-Terrestrial Physics, Volume 72, Issues 5-6, Pages 409-418.

Nag A., V. A. Rakov, D. Tsalikis, J. A. Cramer. 2010. On phenomenology of compact intracloud lightning discharges. J. Geophys. Res., 115, D14115, doi:10.1029/2009JD012957.

Nag A., V. A. Rakov. 2010. Compact intracloud lightning discharges: 1. Mechanism of electromagnetic radiation and modeling. J. Geophys. Res., 115, D20102, doi:10.1029/2010JD014235.

Nag A., V. A. Rakov. 2010. Compact intracloud lightning discharges: 2 Estimation of electrical parameters. J. Geophys. Res., 115, D20103, doi:10.1029/2010JD014237.

NaitAmor, S., M. A. AlAbdoadaim, M. B. Cohen, et. al. 2010. VLF observations of ionospheric disturbances in association with TLEs from the EuroSprite 2007 campaign. J. Geophys. Res., 115, A00E47, doi:10.1029/2009JA015026.

Nakamura T., M. Sekiguchi, Y. Hobara, M. Hayakawa. 2010. A comparison of different source location methods for ELF transients by using the parent lightning discharges with known positions. J. Geophys. Res., 115, A00E39, doi:10.1029/2009JA014992.

Nakamura, T., M. Sekiguchi, Y. Hobara, M. Hayakawa. 2010. A comparison of different source location methods for ELF transients by using the parent lightning discharges with knownpositions. J. Geophys. Res., vol. 115, A00E39, doi:10. 1029/2009JA014992.

Nedjah O., A.M. Hussein, S. Krishnan, R. Sotudeh. 2010. Comparative study of adaptive techniques for denoising CN Tower lightning current derivative signals. Digital Signal Processing, Volume 20, Issue 2, Pages 607-618.

Newsome R. T., U. S. Inan. 2010. Free-running ground-based photometric array imaging of transient luminous events. J. Geophys. Res., 115, A00E41, doi:10.1029/2009JA014834.

Nickolaenko, A. P., M. Hayakawa, Y. Hobara. 2010. Q-bursts: Natural ELF Radio Transients. Survey Geophys., vol. 31, 409-425.

Noor Azlinda Ahmad, M. Fernando, Z.A. Baharudin, et al. 2010. Characteristics of narrow bipolar pulses observed in Malaysia. Journal of Atmospheric and Solar-Terrestrial Physics, Volume 72, Issues 5-6, Pages 534-540.

Noor Azlinda Ahmad, M. Fernando, Z.A. Baharudin, et al. 2010. The first electric field pulse of cloud and cloud-to-ground lightning discharges. Journal of Atmospheric and Solar-Terrestrial Physics, Volume 72, Issues 2-3, Pages 143-150.

Odzimek A., M. Lester, M. Kubicki. 2010. EGATEC: A new high-resolution engineering model of the global atmospheric electric circuit—Currents in the lower atmosphere. J. Geophys. Res., 115, D18207, doi:10.1029/2009JD013341.

Opaits D. F., M. N. Shneider, P. J. Howard, R. B. Miles, G. M. Milikh. 2010. Study of streamers in gradient density air: Table top modeling of red sprites. Geophys. Res. Lett., 37, L14801, doi:10.1029/2010GL043996.

Pasko V. P. 2010. Recent advances in theory of transient luminous events. J. Geophys. Res., 115, A00E35, doi:10.1029/2009JA014860.

Petar Sarajčev, Ivan Sarajčev, Ranko Goić. 2010. Transient EMF induced in LV cables due to

wind turbine direct lightning strike. Electric Power Systems Research, Volume 80, Issue 4, Pages 489-494.

Pineda N., P. Esteban, L. Trapero, X. Soler, C. Beck. 2010. Circulation types related to lightning activity over Catalonia and the Principality of Andorra. Physics and Chemistry of the Earth, Parts A/B/C, Volume 35, Issues 9-12, Pages 469-476.

Rakov V.A. 2010. Parameters of rocket-triggered lightning. International Journal of Plasma Environmental Science and Technology (IJPEST), Vol. 4, No. 1, 80-85.

Reuveni Y., C. Price, E. Greenberg, A. Shuval. 2010. Natural atmospheric noise statistics from VLF measurements in the eastern Mediterranean. Radio Sci., 45, RS5015, doi:10.1029/2009RS004336.

Rycroft M. J., A. Odzimek. 2010. Effects of lightning and sprites on the ionospheric potential, and threshold effects on sprite initiation, obtained using an analog model of the global atmospheric electric circuit. J. Geophys. Res., 115, A00E37, doi:10.1029/2009JA014758.

São Sabbas F. T., et al. 2010. Observations of prolific transient luminous event production above a mesoscale convective system in Argentina during the Sprite2006 Campaign in Brazil. J. Geophys. Res., 115, A00E58, doi:10.1029/2009JA014857.

Saraiva A. C. V., M. M. F. Saba, O. Pinto Jr., et al. 2010. A comparative study of negative cloud-to-ground lightning characteristics in São Paulo (Brazil) and Arizona (United States) based on high-speed video observations. J. Geophys. Res., 115, D11102, doi:10.1029/2009JD012604.

Schoene J., M.A. Uman, V.A. Rakov. 2010. Return stroke peak current vs. charge transfer in rocket-triggered lightning. J. Geophys. Res., 115, D12107, doi:10.1029/2009JD013066.

Shao X.-M., T. Hamlin, D. M. Smith. 2010. A closer examination of terrestrial gamma-ray flash-related lightning processes. J. Geophys. Res., 115, A00E30, doi:10.1029/2009JA014835.

Shneider M. N., G. M. Milikh. 2010. Analysis of UV flashes of millisecond scale detected by a low-orbit satellite. J. Geophys. Res., 115, A00E23, doi:10.1029/2009JA014685.

Siefring C. L., J. S. Morrill, D. D. Sentman, M. J. Heavner. 2010. Simultaneous near-infrared and visible observations of sprites and acoustic-gravity waves during the EXL98 campaign. J. Geophys. Res., 115, A00E57, doi:10.1029/2009JA014862.

Slavko Vujević, Dino Lovrić. 2010. Exponential approximation of the Heidler function for the reproduction of lightning current waveshapes. Electric Power Systems Research, Volume 80, Issue 10, Pages 1293-1298.

Smith D. M., B. J. Hazelton, B. W. Grefenstette, et al. 2010. Terrestrial gamma ray flashes correlated to storm phase and tropopause height. J. Geophys. Res., 115, A00E49, doi:10.1029/2009JA014853.

Soula S., O. van der Velde, J. Palmiéri, O. Chanrion, et al. 2010. Characteristics and conditions of production of transient luminous events observed over a maritime storm. J. Geophys. Res., 115, D16118, doi:10.1029/2009JD012066.

Soula, S., O. van der Velde, J. Palmieri, J. Montanyà, et al. 2010. Characteristics and conditions of production of transient luminous events observed over a maritime storm. J. Geophys. Res., 115, D16118,

doi:10.1029/2009JD012066.

Splitt M. E., S. M. Lazarus, D. Barnes, et al. 2010. Thunderstorm characteristics associated with RHESSI identified terrestrial gamma ray flashes. J. Geophys. Res., 115, A00E38, doi:10.1029/2009JA014622.

Stano G. T., H. E. Fuelberg, W. P. Roeder. 2010. Developing empirical lightning cessation forecast guidance for the Cape Canaveral Air Force Station and Kennedy Space Center. J. Geophys. Res., 115, D09205, doi:10.1029/2009JD013034.

Stolzenburg M., T. C. Marshall, P. R. Krehbiel. 2010. Duration and extent of large electric fields in a thunderstorm anvil cloud after the last lightning. J. Geophys. Res., 115, D19202, doi:10.1029/2010JD014057.

Surkov V.V., Y. Matsudo, M. Hayakawa, S.V. Goncharov. 2010. Estimation of lightning and sprite parameters based on observation of sprite-producing lightning power spectra. Journal of Atmospheric and Solar-Terrestrial Physics, Volume 72, Issues 5-6, Pages 448-456.

Takahashi Y., et al. 2010. Absolute optical energy of sprites and its relationship to charge moment of parent lightning discharge based on measurement by ISUAL/AP. J. Geophys. Res., 115, A00E55, doi:10.1029/2009JA014814.

Tamás Kovács, Tamás Turányi. 2010. Chemical reactions in the Titan's troposphere during lightning. Icarus, Volume 207, Issue 2, Pages 938-947.

Tavakoli M.R. Bank, B. Vahidi. 2010. Shielding failure rate calculation by means of downward and upward lightning leader movement models: Effect of environmental conditions. Journal of Electrostatics, Volume 68, Issue 3, Pages 275-283.

Tavakoli M.R. Bank, B. Vahidi. 2010. Statistical analysis of the lightning performance of high voltage OHLs using dynamic simulation of lightning leaders movements. International Journal of Electrical Power & Energy Systems, Volume 32, Issue 9, Pages 1024-1030.

Torchigin V.P., A.V. Torchigin. 2010. On phenomenon of light radiation from miniature balls immersed in water. Physics Letters A, Volume 374, Issue 4, Pages 588-591.

Toshio Ogawa, Masayuki Komatsu. 2010. Propagation velocity of VLF EM waves from lightning discharges producing Q-bursts observed in the range 10–15Mm. Atmospheric Research, Volume 95, Issue 1, Pages 101-107.

Usoskin I. G., G. A. Kovaltsov, I. A. Mironova. 2010. Cosmic ray induced ionization model CRAC: CRII: An extension to the upper atmosphere. J. Geophys. Res., 115, D10302, doi:10.1029/2009JD013142.

Van der Velde O. A., J. Montanyà, S. Soula, N. Pineda, J. Bech. 2010. Spatial and temporal evolution of horizontally extensive lightning discharges associated with sprite-producing positive cloud-to-ground flashes in northeastern Spain. J. Geophys. Res., 115, A00E56, doi:10.1029/2009JA014773.

Van der Velde, O. A., J. Montanyà, S. Soula, N. Pineda, and J. Bech. 2010. Spatial and temporal evolution of horizontally extensive lightning discharges associated with sprite-producing positive cloud-to-ground flashes in northeastern Spain. J. Geophys. Res., 115, A00E56, doi:10.1029/2009JA014773.

Vernon Cooray, Joseph Dwyer, V. Rakov,

RECENT PUBLICATIONS

Mahbubur Rahman. 2010. On the mechanism of X-ray production by dart leaders of lightning flashes. Journal of Atmospheric and Solar-Terrestrial Physics, Volume 72, Issues 11-12, Pages 848-855.

Visacro S., M. H. Murta Vale, G. Correa, A. Teixeira. 2010. Early phase of lightning currents measured in a short tower associated with direct and nearby lightning strikes. J. Geophys. Res., 115, D16104, doi:10.1029/2010JD014097.

Wang Yonghe, Mike Flannigan, Kerry Anderson. 2010. Correlations between forest fires in British Columbia, Canada, and sea surface temperature of the Pacific Ocean. Ecological Modelling, Volume 221, Issue 1, Pages 122-129.

William R. Cotton, George Bryan, Susan C. van den Heever. 2011. Cumulonimbus Clouds and Severe Convective Storms. International Geophysics, Volume 99, Chapter 8, Pages 315-454.

Williams E. R. 2010. Origin and context of C.T.R. Wilson's ideas on electron runaway in thunderclouds. J. Geophys. Res., 115, A00E50, doi:10.1029/2009JA014581.

Zhang Wenjuan, Qing Ming, Ming Ma, Yijun Zhang. 2010. Lightning Casualties and Damages in China from 1997 to 2009. Natural Hazards, DOI 10.1007/s11069-010-9628-0.

Zheng Dong, Yijun Zhang, Qing Meng, Weitao Lu, Min Zhong. 2010. Lightning activity and electrical structure in a thunderstorm that continued for more than 24h. Atmospheric Research, Volume 97, Issues 1-2, Pages 241-256.

Zhou Helin, Nelson Theethayi, Gerhard Diendorfer, Rajeev Thottappillil, Vladimir A. Rakov. 2010. On estimation of the effective height of towers on mountaintops in lightning incidence studies. Journal of Electrostatics, Volume 68, Issue 5, Pages 415-418.

Zhu B., H. Zhou, M. Ma, F. Lv, S. Tao. 2010. Estimation of channel characteristics of narrow bipolar events based on the transmission-line model, J. Geophys. Res., 115, D19105, doi:10.1029/2009JD012021.

Reminder

Newsletter on Atmospheric Electricity presents twice a year (May and November) to the members of our community with the following information:

- announcements concerning people from atmospheric electricity community, especially awards, new books...,
- announcements about conferences, meetings, symposia, workshops in our field of interest,
- brief synthetic reports about the research activities conducted by the various organizations working in atmospheric electricity throughout the world, and presented by the groups where this research is performed, and
- a list of recent publications. In this last item will be listed the references of the papers published in our field of interest during the past six months by the research groups, or to be published very soon, that wish to release this information, but we do not include the contributions in the proceedings of the Conferences.

No publication of scientific paper is done in this Newsletter. We urge all the groups interested to submit a short text (one page maximum with photos eventually) on their research, their results or their projects, along with a list of references of their papers published during the past six months. This list will appear in the last item. Any information about meetings, conferences or others which we would not be aware of will be welcome.

Newsletter on Atmospheric Electricity is now routinely provided on the web site of ICAE (http://www.icae.jp), and on the web site maintained by Monte Bateman http://ae.nsstc.uah.edu/.

In order to make our news letter more attractive and informative, it will be appreciated if you could include up to two photos or figures in your contribution!

Call for contributions to the newsletter

All issues of this newsletter are open for general contributions. If you would like to contribute any science highlight or workshop report, please contact Daohong Wang (wang@gifu-u.ac.jp) preferably by e-mail as an attached word document. The deadline for **2011 spring** issue of the newsletter is **May 15, 2011**.

Editor:
Daohong Wang
Secretary of ICAE
E-mail:wang@gifu-u.ac.jp
Tel: 81-58-293-2702
Fax: 81-58-232-1894

Compiler:
Wenjuan Zhang
Laboratory of Lightning Physics and Protection Engineering
Beijing, China
zhangwj@cams.cma.gov.cn

Newsletters on Atmospheric Electricity are supported by International Commission on Atmospheric Electricity, IUGG/IAMAS.