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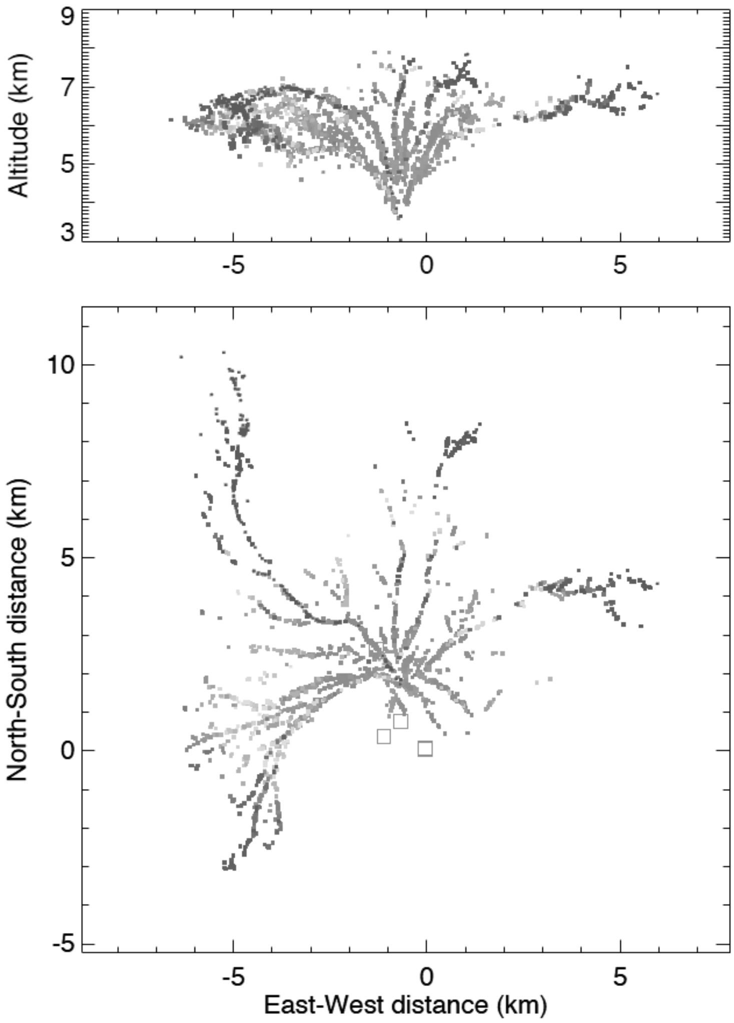
AMS COMMITTEE ON ATMOSPHERIC ELECTRICITY

AGU COMMITTEE ON ATMOSPHERIC AND SPACE ELECTRICITY

EUROPEAN GEOSCIENCES UNION

SOCIETY OF ATMOSPHERIC ELECTRICITY OF JAPAN



Comment on the photo above: **Side and top views of a rocket-triggered lightning flash on August 3, 2010, mapped by the Lightning Mapping Array of Langmuir Laboratory.VHF sources associated with positive and negative breakdown are colored in time from red (earlier) to blue (later). Positive leaders of the flash extended into the mid-level negative charge region situated between 5 to 7 km altitude. Multiple dart leaders occurred through the channel to ground, retracing the paths of positive breakdown. The figure and the caption are contributed by Harald Edens and Ken Eack, NMT Langmuir Laboratory.**

ANNOUNCEMENTS

During the 14th ICAE conference in **Rio de Janeiro, Brazil** two Commission meetings were held. After a series of procedures, **Oklahoma, USA** has been chosen as the venue of the next ICAE conference (15th conference), which will be held in **June 2014**. Also during these meetings, David Sentman was elected as a new commission member.

The present composition of ICAE committee is as follows:

Officers:
President: Zen Kawasaki (Japan, Professor of Egypt-Japan University of Science and Technology)
Secretary: Daohong Wang (China, Associate Professor of Gifu University of Japan)

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

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

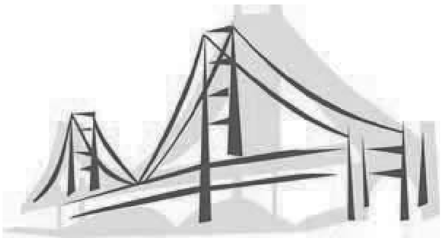
Summary of 14th ICAE

With efforts from many of our colleagues, especially those from Brazilian institute of space research, we, as a scientific community, have successfully accomplished our once every four year event, the 14th ICAE in Rio de Janeiro, Brazil. The conference involved the presence of 191 participants from 24 countries. 80 oral and 200 poster presentations dealt with the following topics: global circuit, fair weather electricity and atmospheric ions, thunderstorm electrification, lightning physics, lightning and meteorology, lightning and climate change, lightning and atmospheric chemistry, electrical effects of thunderstorms on the middle and upper atmosphere, lightning detection technologies and their application to power systems on the ground, planetary physics and lightning hazard and mitigation. In addition, nine overview presentations treated the key developments and the new and persistent challenges in the field. More details about the conference including videos of the overviews are available in the conference website: www.icae2011.net.br. The journal Atmospheric Research will publish a special issue about the conference. The manuscripts for the special issue of Atmospheric Research should be submitted to Elsevier Editorial System (EES) until December 15 through a specific link in the journal website to be divulgate soon.

ANNOUNCEMENTS

CONFERENCES

2011 AGU Fall Meeting



The fall meeting of AGU will be held on 5-9 December 2011, 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/fm11/.

22nd International Lightning Detection Conference (ILDC) and 4th International Lightning Meteorology Conference (ILMC)

Vaisala will host its 2012 International Lightning Detection Conference and International Lightning Meteorology Conference (ILDC/ILMC) on 2-5 April 2012 in Broomfield, Colorado. The call for papers is open until 5 December 2011, and conference registration is now open as well. Early bird prices are valid through 1 February 2012. Click the link below for more information, and register to attend today. www.vaisala.com/ildc

31st International Conference on Lightning Protection (ICLP) Vienna, Austria, Sept. 2-7, 2012

On behalf of the organizing committee we invite you to attend the 2012 edition of the International Conference on Lightning Protection. The ICLP 2012 conference continues the tradition of the preceding ICLP conferences, the last ones held in Cagliari, Italy and Uppsala, Sweden.

ICLP 2012 will be hosted jointly by the Austrian Electrotechnical Association (OVE) and the Vienna University of Technology (TU Vienna). The conference venue will be the campus of the University, located in the Vienna city center and easily reachable by public transport.

ICLP 2012 offers a platform for the exchange of scientific and technical information related to lightning phenomena. Contributions are sought on all topics related to lightning physics, study of lightning protection of buildings, electric power systems, electronic systems as well as methods for improving protection of people, animals and properties against the effects of lightning.

Preferred Topics:

- Lightning discharge
- Lightning occurrence characteristics
- Lightning electromagnetic impulse (LEMP) and lightning-induced effects
- Lightning attachment
- Lightning down-conductors and earthing
- Lightning protection of power systems
- Lightning protection of electronic systems
- Lightning protection of renewable energy systems
- Lightning deleterious effects
- Practical lightning protection problems
- Lightning protection and lightning testing standards
- Lightning safety, medicine and education

Important Dates:

Proposals for special sessions/workshops	**Dec 01st, 2011**
Deadline for extended abstracts	**Jan 15th, 2012**

For more information please visit the conference web site: http://www.aldis.at/iclp2012/

2011-2012 CHUVA-GLM VALE Field campaign

During the months of November of 2011 and March of 2012, the third field campaign of CHUVA (***C**loud processes of t**H**e main precipitation systems in Brazil: A contrib**U**tion to cloud resol**V**ing modeling and to the GPM (Glob**A**l Precipitation Measurement)*) will take place at Vale do Paraiba in São Paulo (Brazil). This project aims to detail the different precipitation regimes found in Brazil and its physical processes to support the Global Precipitation Mission program. To depict the raining systems, CHUVA uses a XPOL Doppler Radar, 2 Mini-Rain Radars, 6 optical disdrometers, 10 rain gauges, 6 field mills, 1 microwave radiometer MP3000, 1 Lidar, a GPS network for water vapor retrievals, radiosondes, 1 automatic weather station and flux tower.

The third field experiment, the so called CHUVA-Geostationary Lightning Mapper (GLM) Vale do Paraiba (VALE), is a joint project coordinated by Instituto Nacional de Pesquisas Espaciais (INPE) and Universidade de São Paulo (USP), with collaboration of NOAA, NASA and EUMETSAT that in addition to characterize the precipitating systems observed in Southeast Brazil, it will collect lightning proxy data for the upcoming geostationary lightning imagers (GOES-R GLM and MTG LI). Furthermore, it will investigate the development of thunderstorm in the tropics, and for the first time it will provide a comprehensive inter comparison between 11 ground-based lightning networks and TRMM-LIS.

Figure 1 - LMA and LINET antennas installed at Ribeirao Pires site.

The CHUVA-GLM VALE headquarter is based at Universidade Vale Paraibana (UNIVAP) in Sao Jose dos Campos (~90 km from Sao Paulo), where the X-Pol mobile radar was installed. During these 5 months of field campaign, several scientists and students will collect meteorological data, make weather forecasting and monitor the development of thunderstorms that will be available on the project website (http://chuvaproject.cptec.inpe.br) . Real time data from the 11-LLS, 4 radars and satellites are being monitored and archived in the project data base, and it can be visualized at http://sigma.cptec.inpe.br/sosvale/. Earle Williams (MIT) is participating in the experiment and is physically based in Sao Jose dos Campos helping us with the first analysis of the data. Steve Goodman (NOAA/NESDIS) will visit the experiment in December.

Figure 2 presents the first thunderstorms activities on 2011-11-07 and 2011-11-14 as monitored by the SPLMA network while Figure 3 shows one X-POL radar PPI and a correspondent 260^{o} azimuth RHI with a few LMA sources on November 11, 2011, 15:51UTC.

For more information please visit http://chuvaproject.cptec.inpe.br/portal/en/index.html, or contact Rachel Albrecht (rachel.albrecht@cptec.inpe.br) and/or Carlos Morales (morales@model.iag.usp.br).

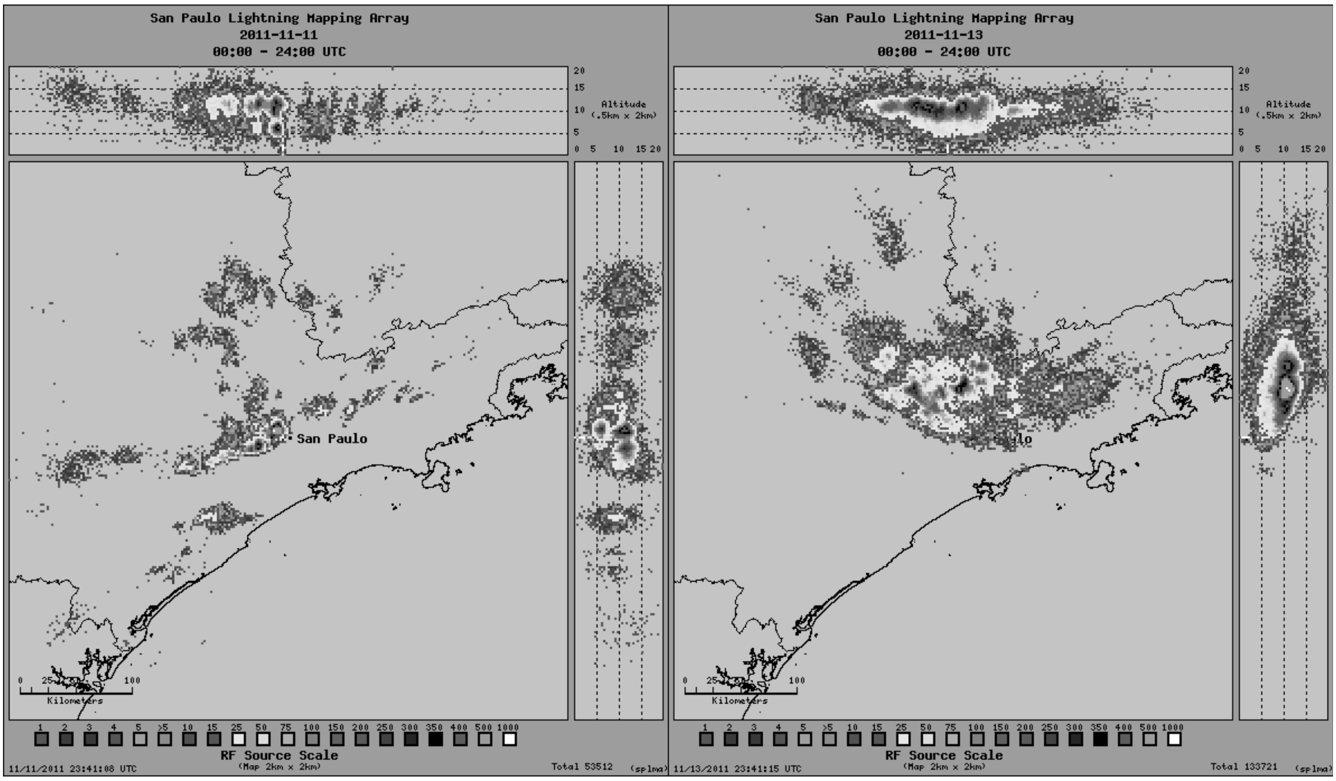


Figure 2 - Daily LMA source counts around 500 km of SPLMA. Credits: John Hall (http://branch.nsstc.nasa.gov/PUBLIC/SPLMA/)

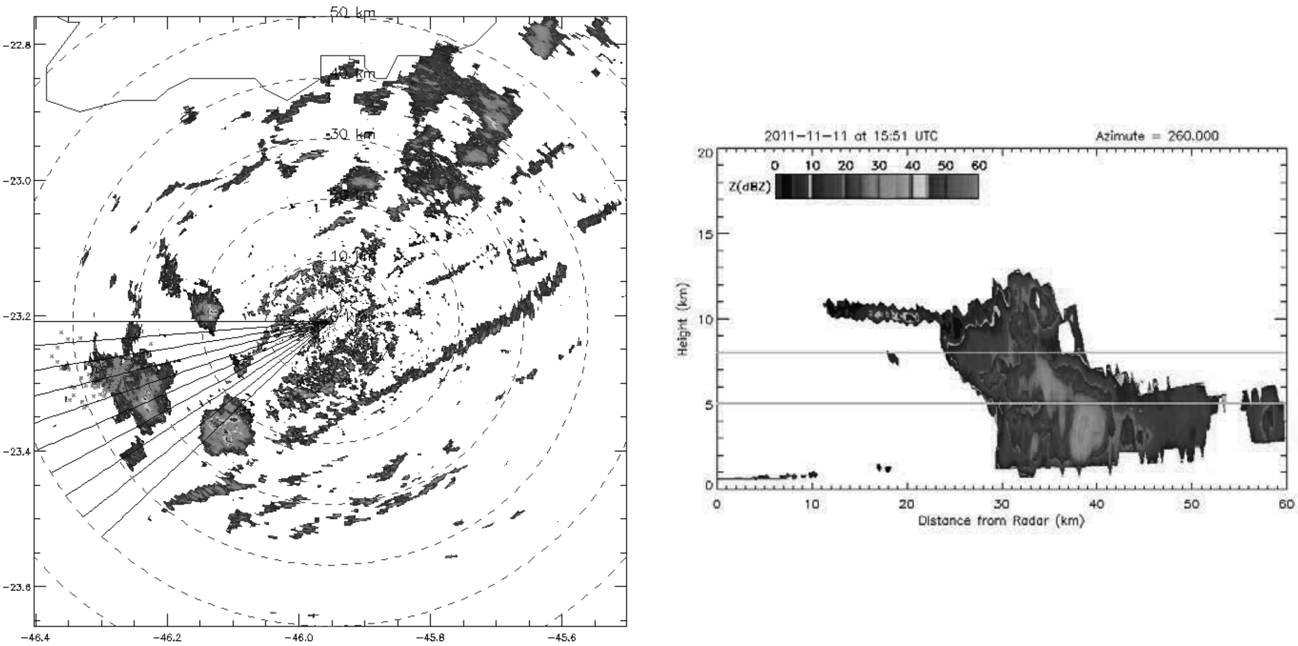
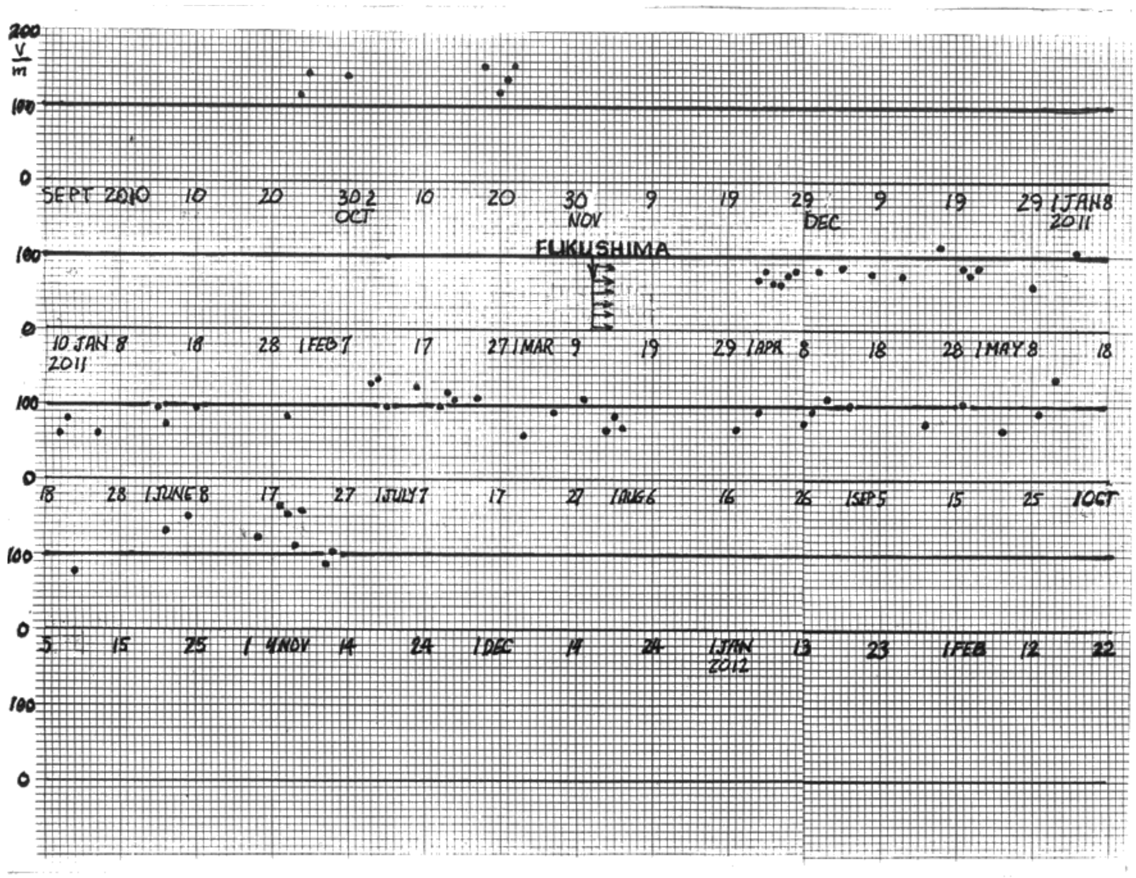


Figure 3 CHUVA X-POL radar PPI and RHI of a thunderstorm on 11 November 2011 15:51 UTC.

Apparent Decrease of Fair-Weather Electric Field in the Eastern United States Due to Fallout from Fukushima Nuclear Accident

Airborne Research Associates, Weston, Massachusetts
Ralph Markson, rmarkson@comcast.net

As part of a 40 year ongoing study of the magnitude and variation of the global circuit, measurements of fair-weather electric field and ionospheric potential have been made by ARA using ground based, aircraft and balloon electric field sensors. In April of this year when ground level measurements were resumed at Weston, Massachusetts (near Boston) after a winter break, it was found that the electric field measured in the same location with the same instrument as in the past was about half of what it had been in the past going back many years and decades. Normally it is in the range 120-160 V/m while in April 2011 it was mostly in the 60-85 V/m range. In the past making these measurements under fair-weather conditions the electric field intensity has never been less than 100 V/m. The 2011 measurements began on 2 April, 21 days after the Fukushima nuclear accident in Japan. It seemed possible that this decrease in electric field was due to an increase in conductivity on and close to the ground due to fallout from Fukushima. Nuclear radiation monitoring by Massachusetts authorities detected increased radiation in rainwater after the Fukushima accident. There were also reports of large increases in radiation in milk following Fukushima. Our electric field measurements have been continued from April 2011 until the present (November 2011) and show a slow recovery to near the normal past average of about 135 V/m at this time. These measurements are shown in the attached figure.



If fallout from Japan had reached the eastern United States, it seemed that this would have occurred in other countries and affected electric fields elsewhere, thus a notice was sent out to members of ICAE to report any anomalous changes in electric field following Fukushima. A report has been published of a decrease to 10% of the pre-accident level, but this was at a station only 140 km from the accident (GRL 38, doi:10.1029/2011GL048511, 2011, 12 Aug 2011). While a few ICAE reports came in on possible E-field changes, these were not clearly associated with the Fukushima accident and probably due to local conditions at the sensor site. It seems that the only reported substantial variations both in magnitude and duration were from the Weston measurements.

These measurements are made in the middle of a large grass athletic field about 250 meters in diameter adjacent to the ARA facility. It has been established that the trees at the edges of the field will not affect electric field intensity at the location of the measurements. The sensor is an electrometer with a 500 uC Polonium radioactive probe 1 meter above the ground. This same instrumentation has been used in past measurements. It has been calibrated and compared to other electrometer systems.

Data are only obtained under atmospheric electrical fair-weather conditions which mean no clouds at any level or less than 20% scattered cumulus clouds. Data are not obtained at night or before 10 am local time because radon emitted from the ground at night and morning, when there is little ventilation and eddy diffusion, will decrease electric field intensity. Similarly, any fog and haze near the ground will increase the field by lowering conductivity. When there is a layer of cloud or haze aloft, this will lower the electric field near the ground by reducing the air-earth current density and cause an increase in electric field through the lower conductivity layer aloft which is compensated by a decrease in electric field near the ground. From considerable experience, atmospheric electrically fair-weather days can be selected; only days with no or few clouds and no haze near the ground or aloft have been used in this study.

The electric field data have been "normalized" as a function of the UT of the measurement by assuming the Carnegie curve diurnal variation represents the average fair-weather electric field. Thus a measurement made at 19 UT, the maximum of the Carnegie curve, would be reduced by 19% while a measurement made at 03 UT, the minimum of the Carnegie curve, would be increased by 14%.

Why would electric fields be affected at Weston and not at other global locations? A Google search shows that radiation from Fukushima evidently was observed at different world-wide locations. A major reason probably is that it is difficult to make a reliable electric field measurement with ground based equipment due to changes in local conductivity caused by anthropogenic and natural meteorological factors. It is also possible that the wind and rainfall patterns happened to bring fallout to the ground in Massachusetts as well as several other states in the US where this was reported. Perhaps the global circulation did not carry much radiation further eastward across the Atlantic Ocean.

In recent aircraft meteorological research, the ARA aircraft, equipped with electric field, conductivity, gamma radiation and aerosol systems, we have found that nuclear radiation is being carried by aerosols. The nuclear source is unknown but we know that nuclear radiation can be transported in this manner.

The Electric Field Time History graph summarizes our measurements: the heavy horizontal line is 100 V/m and the date is shown below the 0 V/m line. The measurements indicate that in September and October 2010 the average normalized fair-weather electric field intensity was about 135 V/m which is consistent with hundreds of past measurements by ARA as well as the Carnegie data. After Fukushima in April and May 2011 the average was about 75V/m. Starting in early June 2011 there was an apparent recovery to a maximum of 135 V/m at the end of June, but then in July the magnitude dropped back to as low as 60 V/m. The average stayed below 100 V/m until mid-October and early November when there was a rapid recovery to about the normal level in the 140-150 V/m range; however in mid-November the level has dropped back to about 100 V/m.

The reasons for these variations are not known. One possibility is that variation of the global convective electrical generator was the cause -- an analysis of global lightning variation would be a way to investigate this. Another possibility is that variations in global circulation and rainfall cause or contribute to the observed fair-weather electric field variations. It is also possible that there have been additional significant releases of radiation at different times from Fukushima and/or other damaged nuclear facilities in Japan. It has been widely reported that the Japanese government and Tokyo Electric have not released information about nuclear radiation releases.

The reported monitoring of fair-weather electric field intensity as described above will be continued as much as possible in the future although winter weather and snow will inhibit such measurements during the coming winter season.

RESEARCH ACTIVITY BY INSTITUTIONS

Atmospheric Electricity Group (ELAT), Brazilian Institute of Space Research (Sao José dos Campos – Brazil)

The main recent activity of the ELAT group is the participation in the CHUVA project. The primary science objective for the international CHUVA project is to combine measurements of total lightning activity, lightning channel mapping and detailed information on the locations of cloud charge regions of thunderstorms with the planned observations of the CHUVA (Cloud processes of tHe main precipitation systems in Brazil: A contribUtion to cloud resolVing modeling and to the GPM (GlobAl Precipitation Measurement) field campaign. The ongoing campaign will be planned to extend until March 2011 in the vicinity of São José dos Campos and São Paulo, with Brazilian, US, and European government, university and industry participants.

ELAT participation will focus on the comparison and validation of cloud-to-ground and total lightning measurements provided by ground-based regional 2-D and 3-D total lightning mapping networks. The lightning network data will be collected in conjunction with electric field mills, field change sensors and high speed cameras.

Atmospheric Electricity Research Group, Institute of Geophysics, Polish Academy of Sciences (Warsaw, Poland)

The group has recently taken up studying the effects of thermal convection on fair-weather atmospheric electricity parameters in the planetary boundary layer. These effects are considered to be important at locations such as Swider observation station (51°6.9’ N, 21°15.18’ E). The effects are mostly pronounced during summer at mid-day. Marek Kubicki (swider@igf.edu.pl) has been developing a 1-D model of the planetary boundary layer with non-local closure, suplemented by ion balance equations. Boundary conditions at ground level have been taken from measurements taken at Swider; for example, the convection current density at ground level has been measured by a screened Wilson antenna (Fig. 1). So far the model calculations included vertical profiles of concentrations and fluxes of light and heavy ions and aerosol particles and convection current density (Fig. 2). These have been studied for the conditions of high and low initial aerosol concentrations, and free and forced convection. It is anticipated that in future this model can be used to estimate the role of local convection generator characteristic for land stations and affecting the fair-weather electric field observed there.

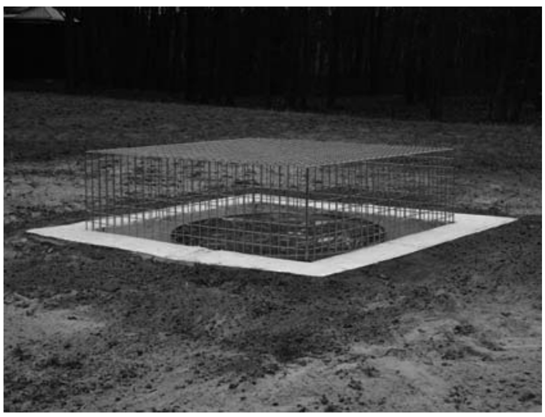


Figure. 1. Screened Wilson antenna prepared for the purpose of convection current density measurements at Swider station.

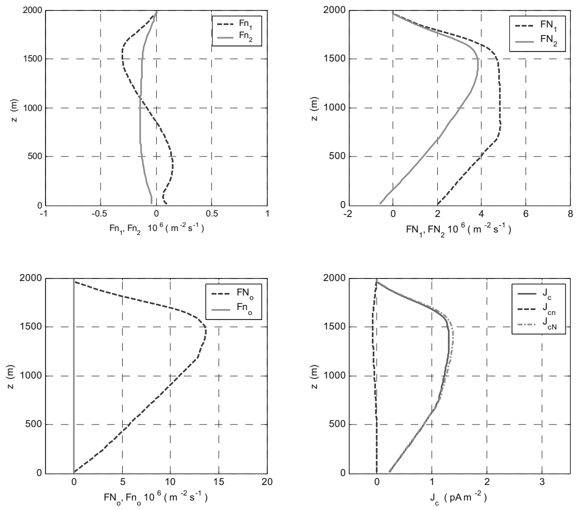


Figure 2. Model vertical profiles of the fluxes of light ($n_{1,2}$) and heavy ($N_{1,2}$) ions, small (n_0) and large (N_0) aerosol particles and of convection current density (J_c) during free convection. Initial model results have been published in the 14th ICAE conference proceedings.

Piotr Baranski (baranski@igf.edu.pl) and collaborators have continued detailed analysis of multiple cloud-to-ground lightning stroke E-field signatures obtained from the Local Lightning Detection Network (LLDN) in the Warsaw region in the summer of 2009. Main results of their work were presented in two poster presentations during the 14th ICAE conference in Rio de Janerio and in extended contributions to the conference proceedings (by Baranski et al. and Maslowski et al.), and in a paper accepted for publication in the special issue of Atmospheric Research for the 30th ICLP 2010 conference in Cagliari, Italy (Baranski et al., doi:10.1016/j.atmosres.2011.10.011).

Centro de Modelado Científico (CMC), Universidad del Zulia (Maracaibo, Venezuela)

Lightning in Northwestern South America: Observations and Modeling

Currently our research activity on atmospheric electricity has dealt with lightning activity in northwestern South America. The results of these works have identified several factors help trigger the formation of thunderstorms in this zone of the planet and its variability. Among these we can find the joint influence of the Inter-Tropical Convergence Zone, the Caribbean Low Level Jet and the orography. In particular, an important phenomenon called Relámpago del Catatumbo (Catatumbo Lightning) which occurs all over Maracaibo Lake basin (MLB) is studied. This zone has been reported to be the hottest flash density rate spot in the world with 181 flashes/km²/year. Preliminary observations from LIS granule data show a yearly unimodal behavior. Annual minima appear in January and maxima in September. This can be extrapolated to the northwestern region of South America in which a “lightning corridor” forms roughly between 7N-10N latitude and 70W-80W longitude. Retrospective Modeling using WRF is being carried out and some results have already been obtained. These indicate a seasonal dependence in the region between lightning activity, Convective Available Potential Energy (CAPE) and the intensity of winds. Throughout the year, the wind circulation (counterclockwise) in the MLB advects moisture and energy, defining a region with the basin’s highest convective activity. The highest monthly CAPE for the 1998-2008 period happens in 2005, a very active hurricane year, with a peak of 2427 J/kg and very weak mean meridional surface winds. In contrast, CAPE’s climatology for January and September in the black square region in Figure 2 presents the mean values 600 J/kg and 1800 J/kg, respectively.

Field campaigns in southern Maracaibo Lake indicate that most lightning activity is intra-cloud (IC) and also data from the Boltek Stormtracker lightning detector installed at CMC in Maracaibo indicates that approximately 52 % of all lightning detected in the MLB is IC+. New data from this detector is available and being processed at the moment. Along with the installation of the Boltek instrument for measuring electric activity in western Venezuela, our group is currently engaged in the design, production and installation of remote sensing devices for measuring meteorological variables on the surface and along air columns, all of which will enhance our current disposition of in situ data. Several observations have confirmed that in the peak events of the Catatumbo Lightnings the discharge rate can be as high as 50 per minute. More expeditions to the zone are expected to be carried out next year.

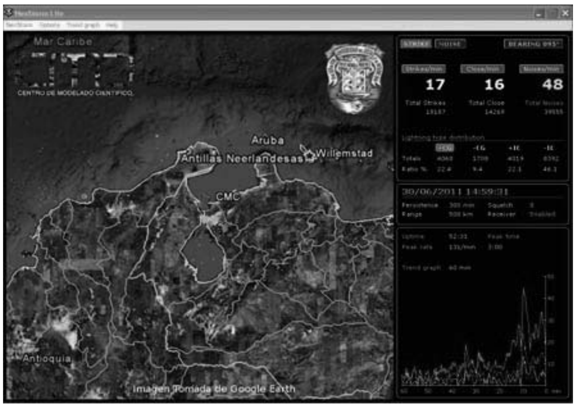


Figure 1. *Flash occurrence map.*

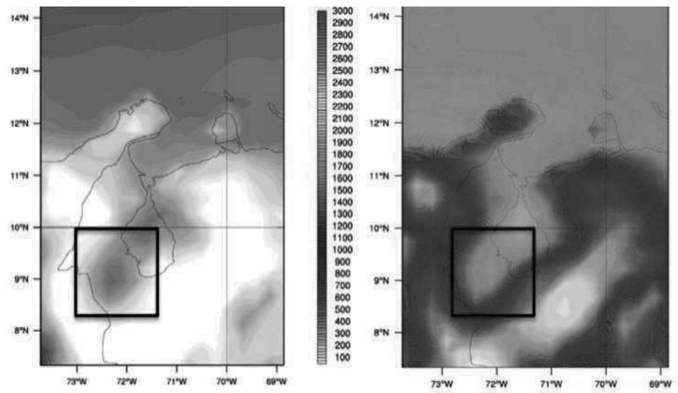


Figure 2. *CAPE climatology for January (left) and September (right)*

Indian Institute of Tropical Meteorology, Pune- India
Air Ion Spectrometer Laboratory, I & O T Division

Devendraa Siingh, devendraasiingh@tropmet.res.in

During the 24th Indian Antarctic Expedition we have been measured the ion concentration of different category (small-, intermediate-, and large) from Gerdian Ion Counter Battery (Figure 1), aerosol size distribution from SMPS, air-earth current density from plate antenna in 2004 - 2005. Data of ion concentrations and aerosol size distributions have been analyzed and published in International Journal. We have been also participating in different field experiment for the measurements of ion and aerosol from time to time.. Along with the field experiments we are continuously monitoring ion mobility distribution of the ambient air at our station Pune (India). Our group's also working on the problem of solar activity, lightning and climate issues, Global electric circuit, Thunderstorm and lightning, sprites etc. One of the colleagues (Mrs M.N.

Kulkarni) is working on modeling of the global electric circuit. Few published results I am given here.

Simultaneous measurements of mobility spectra of atmospheric ions in the mobility range of 2.29 to 2.98 × 10^{-4} cm^2 V^{-1} s^{-1} and of size distribution of atmospheric aerosol particles in the size range of 3 – 700 nm and 500 – 20,000 nm diameters have been made at Maitri, Antarctica (70^0 45' 52'' S, 11^0 44' 2.7''E; 130 m above mean sea level) on January 17 and February 18, 2005. All mobility spectra show four modes, one each for small/cluster ions, intermediate ions, light large ions and heavy large ions. Aerosol size distributions are consistent with the ion mobility spectra. The small ions generated by cosmic rays and the nucleation mode particles generated by photochemical reactions grow in size by condensation of volatile trace gases on them and produce the cluster and intermediate ion modes and the Aitken particle mode in ion/particle spectra. Particles in the size range of 9 – 26 nm have been estimated to grow at the rate of 1.9 nm h^{-1} on February 18, 2005. Size distributions of aerosol particles associated with the continental air masses are bimodal with two modes at 39 and 85 nm in Aitken range. Attachment of small ions to particles in this bimodal distribution of Aitken particles is proposed to result in the light and heavy large ion modes.

Figure: 1. Gerdian Ion Counter Battery installed at the Indian Antarctic station Maitri deigned and fabricated by IITM Workshop.

Institute of Physics, Jagiellonian University, Krakow, Poland

Zenon Nieckarz (zenon.nieckarz@uj.edu.pl)

Two topics regarding thunderstorm activity have been investigated. The first is a study of the relationship between lightning dipole moment and lightning peak current and the influence of local thunderstorm activity on the efficiency of identification of ELF impulses as lightning (Nieckarz et. al. 2011). A new method of automatic detection of ELF signatures of cloud-to-ground lightning occurring at distances of a few thousands km from a broadband ELF receiver has been developed.

The second topic concerns comparisons of the results of standard meteorological observation of thunderstorm activity (days with thunderstorm) and indices of lightning activity. This was studied previously on global (Nieckarz et. al., Monthly Weather Review, 2009) and, currently on regional scale (central Europe). In addition, the size of thunderstorm area as a potential hazard has been investigated. This research project has been funded by Polish National Science Center (NCN).

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

The characteristics of rocket-triggered lightning flash: Propagation characteristics of upward positive leaders (UPLs) in the initial stage of rocket-triggered lightning flashes were analyzed. The average 2-D speed of the leader was 1.0×10^5 m/s with partial speeds ranging from 2.0×10^4 to 1.8×10^5 m/s between 130 to 730 m above ground. The currents at the early stage showed unipolar impulse waveforms and the corresponding electric field changes were stepped. Thirty one current pulses in a rocket-triggered lightning were analyzed in detail. It was found that the ratio of the E-field pulse magnitude to the current pulse magnitude for M component was smaller than that for return stroke. Large amplitude ICC pulses in the initial stage showed similar current and E-field waveforms to those large M components following the return strokes. A stroke-M pulse (RM) was found, and it exhibited two peaks with the secondary peak being larger and about 27.2 μs later than the first. The RM mechanism may due to the occurrence of leader-return stroke and M component in the upper channel branches and the superposition of them in the lower common channel.

Simulation on thunderstorm electrification: A regional thunderstorm model, coupled with two primary non-inductive electrification mechanism Takahashi1978 and Saunders1991 schemes, has been developed based on the newest version of RAMSV6.0. The simulation of a real thunderstorm exhibited the tripole charge structure in both schemes when the electric field reached to breakdown value.

Transient Luminous Events (TLEs) and their parent thunderstorm: Twenty-nine sprites were observed during four years from 2007 to 2010 with one most sprite productive storm on 1–2 August 2007 which produced 16 sprites. The results show that most sprites appeared in groups and in shape of carrot. Most sprites occurred frequently when the cloud top brightness temperature is getting warm and radar reflectivity is becoming weak with characteristics of sharp decrease of negative cloud-to-ground lightning (CGs) and slight increase of positive CGs.

Lightning activity of leading line trailing and stratiform mesoscale convective system (LLTS-MCS): Data from the Beijing SAFIR 3000 lightning detection system and Doppler radar provided some insights into the three-dimensional total lightning structure and evolution of a LLTS-MCS over Beijing. The majority of CG flashes occurred in the convective region of the radar echo, particularly in the leading line area. The distribution of the CG flashes indicated that the storm present the tilted dipole structure by the wind shear or the tripole charge structure.

RESEARCH ACTIVITY BY INSTITUTIONS

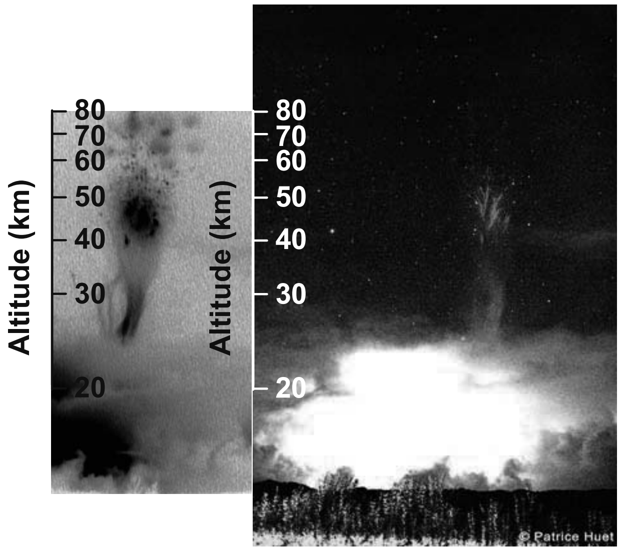
Laboratoire d'Aérologie, Université de Toulouse, Toulouse, France

The joint modeling group of Laboratoire d'Aérologie, University of Toulouse (Jean-Pierre Pinty (pinjp@aero.obs-mip.fr) and Michel Chong (chom@aero.obs-mip.fr)) and Laboratoire de l'Atmosphère et des Cyclones, Saint Denis de la Réunion (Christelle Barthe) is continuously improving an electrical scheme which was developed some times ago in the mesoscale cloud-resolving model MesoNH. The recently added features are the physics of the positive and negative ions for a better closure of the electrical charge budget and a simplification of the lightning flash scheme in order to produce a parallelizable code for run in multiprocessor environments. The model is tested against the well-known STERAO and EULINOX case studies. A paper of Barthe et al. "CELLS v1.0: updated and parallelized version ...", is submitted to Geosci. Model Dev. (an EGU publication). It is accessible in the online open discussion library: http://www.geosci-model-dev-discuss.net/4/2849/2011/gmdd-4-2849-2011.pdf

One of our research topics focuses on relationships between lightning activity and cloud microphysics and dynamics in order to evaluate the potentiality of lightning data for providing valuable new information in the forecast of high precipitating events. The building of analysis methods is based on available radar and CG observations for two events in the Paris region (France). First results show a linear relationships and a good correlation between CG lightning rates and volumes of radar reflectivity higher than 40 dBZ. As the non-inductive charge mechanism is admitted as the main origin of thunderclouds electrification, the links between ice and CG lightning are also studied. The results present linear relationships between CG flash rates and: precipitating ice masses, precipitating ice mass fluxes, and product of precipitating and non-precipitating ice mass fluxes. This method is currently tested on other events in the same region and on events that occurred in the southern France (in preparation of Hymex campaign).

Participants: Magalie Buguet (magalie.buguet@aero.obs-mip.fr), Michel Chong, Sylvain Coquillat (coqs@aero.obs-mipfr), Serge Soula, and with the collaboration of Christelle Barthe (LACy) and Olivier Bousquet (CNRM, Météo France).

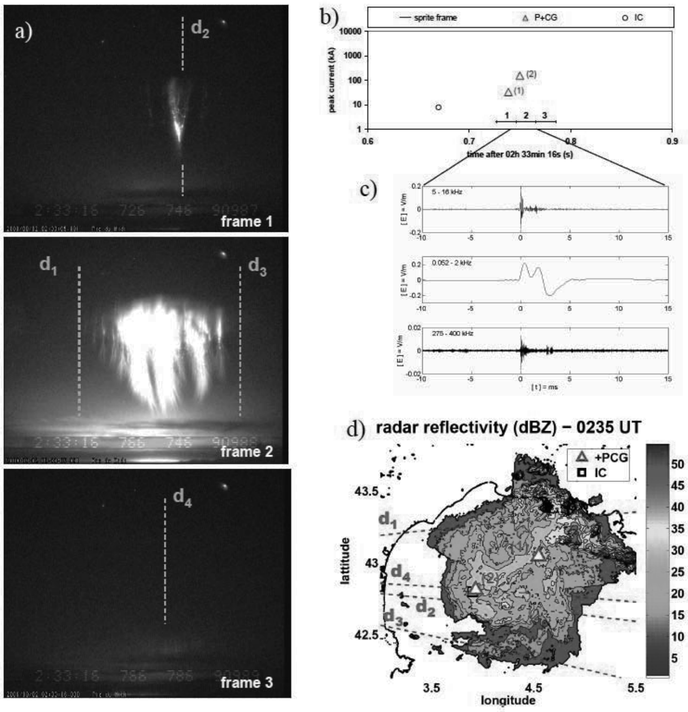
On 7 March 2010, five gigantic jets (GJ) have been recorded by Patrice Huet with video and color photograph cameras above an isolated storm (coldest cloud top temperature ~ -81°C) east of Réunion Island. The conditions of production and the luminous characteristics have been analyzed by the University of Toulouse (Serge Soula, serge.soula@aero.obs-mip.fr) in the frame of collaboration with the Technological University of Catalonia, Spain (Joan Montanya and Oscar van der Velde), the photographer (Patrice Huet), University of La Réunion, France (Christelle Barthe), and the Geodetic and Geophysical Research Institute, Hungary (József Bór) – (Soula et al., 2011). Thanks to the close distance of observation (~ 50 km), the luminosity within the cloud and within the GJ channels is analyzed in unprecedented detail. The set of images show the lower channels (~20-40 km altitude) produce blue luminosity which decreases with altitude and becomes more and more diffuse with time. On the other hand, the transition region (around 40-65 km) consists of bright red luminous beads slowly going up (~ 10^4 m s^{-1}), retracing the initial leading jet channels. The trailing jet of the GJs exhibits a clear analogy with the continuing current of the cloud-to-ground flashes. A French link to see the videos: http://www.sciencesetavenir.fr/fondamental/20111018.OBS2768/des-jets-geants-au-dessus-d-un-orage.html.



Left: Inverted color image from the video of the brightest gigantic jet. Right: color photo (exposure time 20 s) of the same event. The vertical scale is estimated at the distance of the gigantic jet (~ 45 km in the present case) by taking into account the effect of perspective. (© Patrice huet).

The University of Toulouse (Serge Soula) takes part in the TLE observation campaigns (Eurosprite) with several cameras deployed in France sites and in collaboration with several European Research Institutes: Danish Technolgical University (Torsten Neubert and Olivier Chanrion), Technological University of Catalonia (Joan Montanya and Oscar van der Velde), University of bath (Martin Fukllekrug), Atmospheric Science and Climate Institute (Enrico Arnone)... Multi-instrumental analyses of the observations allow performing studies in a wide domain of atmospheric physics. As an example, large sprite events observed during the night of 01-02 September, 2009 have been analysed under several aspects. A specific signature with a long duration signal (> 5 ms) and a double jump in the same polarity (positive charge going down) was observed for the electric field in ELF range in the cases of the very large sprites. It confirms the presence of a large current in the sprite body.

Via the PEACH project (Projet en Electricité Atmosphérique pour la Campagne Hymex), our group is involved in the HyMeX program (www.hymex.org), which aims at better understanding and quantifying the hydrological cycle associated with the Mediterranean basin with a particular attention to the high precipitating events involved in the South of France during autumn. This project is based on observational-based and modeling-based studies of the electrical activity and one of its objectives is to explore the potential contribution of lightning detection for a better prediction of the storm systems in that specific region. The PEACH team will rely on various observing systems (lightning operational networks ATDnet, ZEUS, LINET, and EUCLID; radar operational network ARAMIS of Météo France; VHF mapper LMA of New Mexico Tech; research LINET system of DLR; infrasonic array of CEA; ground electric field mills and induction rings of LA; and research radars) and on modeling (Meso-NH model with electrical scheme of LA).

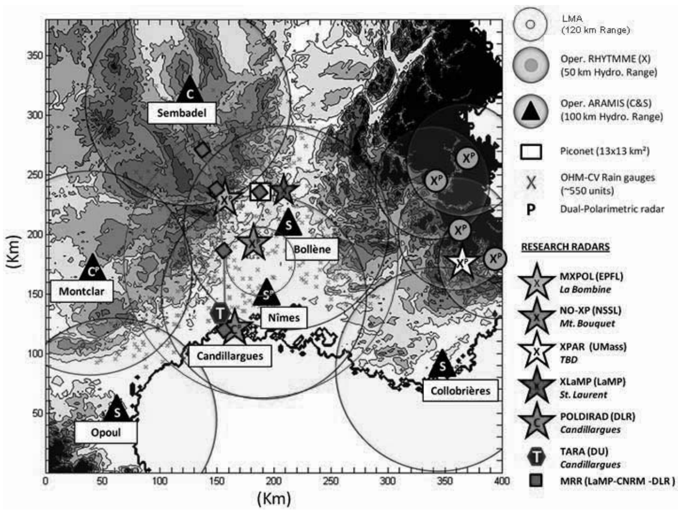


(a) Three successive frames during the sprite events at 2h 33min 16s. The lines d_{1-4} corresponds with the lines of sight of different elements of the sprite events. (b) Chronology of the sequence including the peak current of the flashes and the video frames shown in (a). (c) Variation of the electric field radiated in broad band (ELF to MF), detected at 1280 km in Bath (UK). (t=0 corresponds with the P+CG parent flash detection at 2h 33min 16.750s). (d) Radar reflectivity field in F_2 at 0235 UT including the sprite lines of sight (d_{1-4}) and the P+CG flashes (red triangle).

The involvement of our team in the experimental setup is twofold. First, we are currently developping induction rings for measuring the electric charge of precipation (Sylvain Coquillat and Jean-Michel Martin) which will be used with electric field observation (Serge Soula and Jean-Michel Martin) as references for calibrating the real case modeling with Meso-NH (Jean-Pierre Pinty and Michel Chong). These ground observation will be deployed in the South of France in the HpicoNet network (Gilles Molinié, LTHE, Grenoble, see the figure below) and along a transect across the Cévennes hills (see next figure).

Second, Sylvain Coquillat and Eric Defer (LERMA, Observatoire de Paris) bring their logistical support to the New Mexico Tech team for searching the best sites where the LMA stations will be deployed.

Left: HPicoNet multi measurement station over the roof of the Lavilledieu school (Ardèche). Right: Measurement of the electric charge of precipitation with a new induction ring.
http://www.lthe.fr/PagePerso/molinie/HPICONET_EN/Welcome.html



Left: Area where intensive observation will be concentrated in multiple ways during period September to November 2012. The red circles feature the location and the maximum distance of detection of the LMA, the red line with red squares corresponds to the transect across the Cévennes where electric ground measurements will be performed.

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

Brief summary of the 2011 GCOELD (Guangdong Comprehensive Observation Experiment on Lightning Discharge)

The 2011 GCOELD had been conducted from May to August in this year. This experiment mainly contained the following contents: artificially triggering lightning; development and testing of devices integrating the measurement of optical and electromagnetic signals of lightning discharge; comprehensive observation on optics, electricity, magnetics and radiation of the discharge of triggered lightning and natural lightning; lightning protection testing on wireless communication devices, network terminating units, 10-kV distribution wires, surge protection devices (SPD) and wind generators; comprehensive observation on attachment process of the lightning striking on high building.

Fig.1 Lightning flash triggered at 180026 on 30 July 2011. This lightning directly stroke the iron tower mounted with wire communication transmitting equipment. The wind generator is shown in the right of this photograph.

During the 2011 GCOELD, a total of 13 lightning flashes were successfully triggered, including 11 classical triggered lightning flashes and 2 altitude triggered lightning flashes. Two of them were triggered on a new 21-m iron tower which was built in July this year and used to act as a wireless communication tower in the experiment. Eleven of the 13 flashes were obtained their entire current waveforms in two recording channels with large and small measuring ranges, respectively. The newly-developed observation-integrated devices helped to get a batch of high-quality measuring data on optical and electromagnetic signals of triggered lightning and natural lightning. It was the first time in China to conduct the lightning protection testing on wireless communication system. We obtained multiple waveforms of shunt current and induced current and voltage on all kinds of lines and some network terminating units produced by two times of triggered lightning flashes directly striking the tower and more than 20 near-distance natural lightning flashes. The waveforms of induced current and residual voltage in two types of SPDs containing voltage switching type and voltage limiting type were acquired in triggered lightning flashes and natural lightning flashes and have been made preliminary analysis and comparison. Because of the destruction of collection and transmission systems in other measuring positions by triggered lightning, only the waveforms of the introduced voltage and current, produced by one triggered lightning flash, on the front extreme of simulation transformer connected with 10-kV distribution wires was recorded. A 2-kW power wind generator was installed in GCOELD, and we recorded the induced voltage and induced current on the power lines and the control circuit in two triggering lightning performances and several natural lightning discharge processes. In a station built on the roof of the building of Guangdong Meteorological Bureau, a total of 12 natural lightning flashes striking the high building were shot by several high-speed cameras with different sampling rates and a normal digital camera. Their electromagnetic waveforms were also recorded synchronously.

Compared with the GCOELD which had been performed form 2006 to 2010, we cared more about the lightning protection testing in 2011 and concentrated more resources to improve the measuring reliability and accuracy.

Study on discharge height of lightning narrow bipolar events

Discharge heights of thousands of narrow bipolar events (NBEs) observed in Guangzhou and Chongqing of China were calculated using time delays between the direct wave signals of NBEs and their ionospheric reflection pairs. The result showed that most +NBEs occurred between 8 and 16 km while most –NBEs occurred between 16 and 19 km. Very few –NBEs were above 19 km or below 14 km and no NBE was above 20 km. It was inferred that +NBEs were produced between main negative charge layer and upper positive charge layer while –NBEs were produced between upper positive charge layer and negative screening charge layer at the cloud top.

Variations of NBE discharge heights in two thunderstorms were analyzed. One was shown in Figure 2. It was concluded that: First, NBEs seem to be able to occur in any position between corresponding charge layers, making height variations very large in most periods of a thunderstorm, especially for +NBEs. However, at the end of a thunderstorm, when elevations of charge layers were probably decreasing, heights of NBEs were also decreasing and usually had small variations. Second, discharge heights of +NBEs were generally higher when –NBEs were occurring at the same period. This indicated that when –NBEs were occurring, updraft was stronger, lifting charge layers responsible for +NBE production to a larger altitude. Third, –NBEs were always higher than +NBEs at the same moment, supporting the conclusion that +NBEs were below the upper positive charge layer while –NBEs were above the upper positive charge layer.

Differences in height distributions in Guangzhou and Chongqing were analyzed and a hypothesis was put forward that both +NBEs and –NBEs could only be produced above certain height. Such hypothesis was consistent with many phenomena, and it also had some predictions. To further test this hypothesis, observations of NBEs of both polarities should be carried out in different regions over the world. Special attention should be paid to the discharge height of –NBEs, studies of which are still scarce.

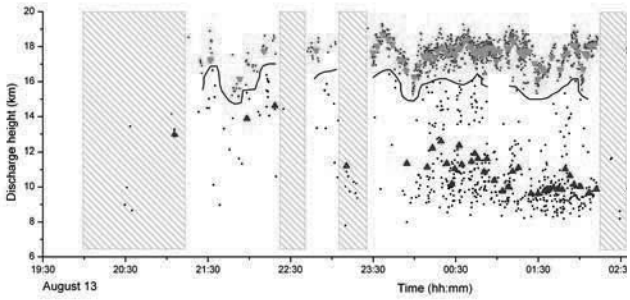


Fig.2 NBE discharging heights in a thunderstorm in Chongqing. Blue and green triangles represent average heights for each 15 successive +NBEs and –NBEs, respectively. Shaded rectangles indicate the periods when no –NBE is produced. Black curve represents the possible location of the upper positive charge layer, dividing almost all +NBEs and –NBEs into two sides.

Characteristics of lightning activity in tropical cyclones during landfall period

Lighting distribution and eyewall outbreaks in tropical cyclones during the period of landfall in China have been investigated. Cloud-to-ground lightning data from a regional lightning detetciton network and strom intensity data (winds and central pressure) were used to analyze the temporal and spatial distribution of lighnting activies during landfall peirod (pre-landfall, landfall and post-landfall) of 33 tropical cyclones making lanfall in China from 1999 to 2010. Lightning activities varied enormously from storm to storm with average flash rate over 500 km of radius from 3 fl/hr to 3201 fl/hr, and no obvious relationship between average intensity and average flash rate was occurred.

The maximum flash density extended from eyewall region (0-60 km) to outer rainbands (180-500 km) as the storm intensify level increased, and the average ratio of flash dentsity in eyewall to outer rainband was maximum in the level of tropical storm (17.2-24.4 m/s) and minimum in severe typhoon (41.5-50.9 m/s) .The ratio of positive to ground flash was much smaller in outer rainband than in the eyewall and inner rainband. When compaired lightning activites in the period of pre-landfall and post-landfall, the radial distribution of flash density varied with storm intensity level. When the storms making landfall, flash densities in the eyewall region increased in tropical storms and typhoons (32.7-41.4 m/s), while decreased in severe tropical storms (24.5-32.6 m/s).

Lightning outbreaks were identified in a consistent manner for all tropical cyclones to inspect the relationship of eyewall flashes to structure and intensity change. An outbreak was categorized as a 50% increase in flashes from one hour to the next, and the absolute increased count was larger than the average hourly flash frequency. In agreement with past studies, the authors found eyewall flash outbreaks during the period of rapid changes in storm intensity (15% of outbreaks in intensification, and 43% in weaken) and the period of maximum intensity (15% of outbreaks in maximum intensity). The maximum sustained winds were preceded by eyewall flash outbreak in approximately 7.1 hours. A new result of our analysis found 10% of the outbreaks occurred prior to and during periods of storm turning, which was potentially important for trajectory change forecasting of tropical cyclones (Fig. 3).

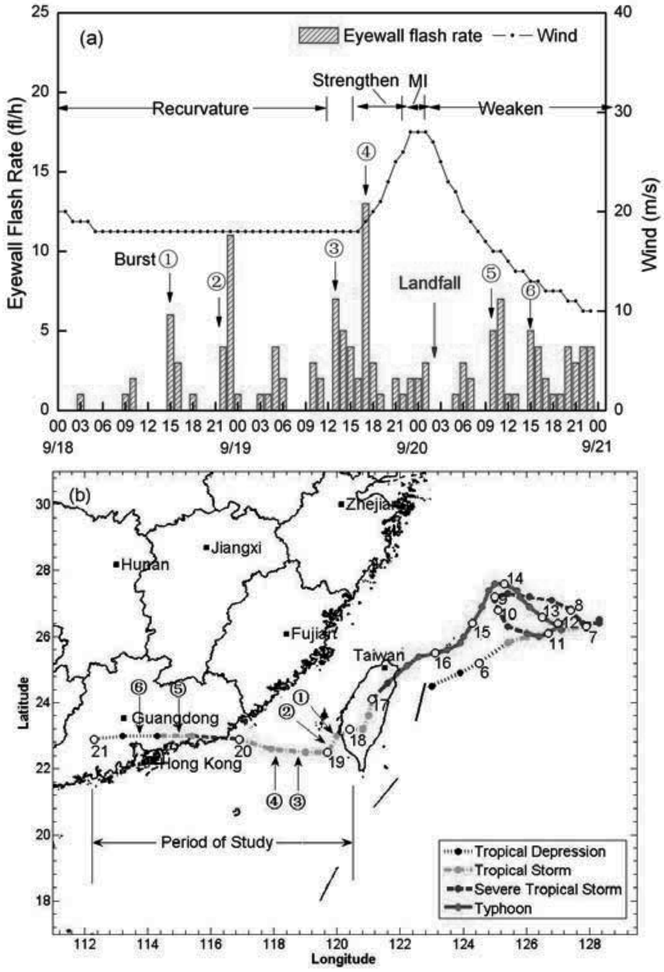


Fig.3 Eyewall lightning outbreaks of Typhoon Nari. (a) Temporal evolution of eyewall lightning, superimposed on hourly maximum sustained wind speed. (b) Best-track positions for the life cycle. The dotted line denotes tropical depression status, the dash-dot line tropical storm, the dashed line severe tropical storm, and the solid line typhoon. Open circles mark the 0000 UTC positions. The numbers next to the open circles indicate the dates in September 2001. Arrows with serial numbers in both figures indicate the six times of eyewall outbreaks. The period of study is between 0000 UTC 18 and 0000 UTC 21 September.

RESEARCH ACTIVITY BY INSTITUTIONS

Lightning Research Group of Gifu University (Gifu, Japan)

From the summer of 2011 and with the support from the lightning research group of University of Florida, we have started lightning observation experiments at The International Center for Lightning Research and Testing (ICLRT) at Camp Blanding, Florida by installing three high speed imaging systems, called LAPOS (Lightning Attachment Process Observation System). So far, we have recorded 5 rocket triggered lightning, 1 on-site natural lightning, and more than 5 off-site natural lightning that occurred at a distance less than 3 km from LAPOS. We have reported our observation system and some of the preliminary results at the APL2011 (Chengdu, China). We are going to report more detailed results at 2012ICLP (Vienna, Austria, Sept. 2-7, 2012).

On the other hand, we have continued analyzing the data obtained for the lightning that hit on a windmill and its lightning protection tower. During the last winter season, we recorded 3 positive upward lightning that occurred within a short time period of only 5 minutes, a very rare phenomenon according to our experience. We are preparing a paper to report these three events.

From this winter, we are going to set up an observation site which allows us to observe the possible windmill and the tower lightning continuously all year round for at least 5 years. Before, we could observe the lightning just during Japanese winter seasons.

Lightning research group of OSAKA University (Oasaka, Japan)

We (Zen Kawasaki, Tomoo Ushio, Takeshi Morimoto, Satoru Yoshida, Yoshitaka Nakamura) have been developing VHF/LF lightning locating system and the Ku-band broadband radar network. With these new developed systems, we have conducted field observation experiments on summer thunderstorms, and obtained plenty of data. Right now we are analyzing those data.

Akita et al. [2011] authored a paper titled "Effects of Charge Distribution in Thunderstorm on Lightning Propagation Paths in Darwin, Australia (J. Atmos. Sci., Vol. 68, No. 4, pp. 719-726, 2011). The authors found that the cloud–to-ground (CG) and intracloud (IC) flashes were initiated from the outer and the inner parts of the upper side of the graupel regions, respectively. In the cases of CG flashes, the negative leaders traveled first about ten kilometers horizontally through positive charge regions and then began to bend toward the ground when they reached the end edge of the positive charge regions where there were no graupel region underneath. In contrast, in the cases of the IC flashes the negatively charged graupel regions block the downward developments of negative leaders. Dr. Akita has been staying in NMT to perform a comparison between NMT's LMA and our broadband interferometer.

We have also developed a new high-resolution Doppler radar, called Ku-band broadband radar (BBR), with fast scanning capability (Yoshikawa et al., IEEE Geoscience and Remote Sensing, 48, 8, pp. 3225-3235, 2010). Due to the new system design, the BBR can accurately measure the radar reflectivity factor with a range resolution of several meters and a time resolution of 55 s per volume scan from the nearest range of 50 m to 15 km for 10W power using pulse compression. Dr. Yoshikawa has been collaborating with Prof. Chandrasekar in CSU on this new radar network research.

Additionally, a new state of the art Phased Array Radar (PAR) system will be installed in Osaka University in next April, and the Global Lightning and Sprite Measurements mission (GLIMS mission) from the International Space Station headed by Osaka University in collaboration with Hokkaido University, the University of Electro-Communication, Stanford University and JAXA will be launched in next spring. In this mission, VHF interferometer, six photometers, two CMOS cameras, and the VLF receiver are used for the observation of lightning and sprites from ISS.

MIT (Cambridge, MA, USA)

VadimMushtak and Earle Williams continue to make progress on the inversion of the Schumann resonance background observations to infer the global lightning activity. A forward model that treats the day-night asymmetry of the ionosphere is used for this work. With the use of only 4-5 ELF stations from the following set: (Moshiri, Japan (YasuHobara and Masashi Hayakawa), Belsk, Poland (MariuszNeska), Shillong, India (AshwiniSinha and B.M. Pathan), Nagycenk, Hungary (Gabriella Satori and Tamas Nagy), Syowa, Antarctica (Yuki Takahashi and Mitsu Sato) and Rhode Island, USA (Robert Boldi)) very realistic locations and diurnal variations of lightning in the three tropical ‘chimneys’ are obtained on individual days. An efficient means for eliminating the spectral- contaminating effects of large transients (‘Q-bursts’) has also been worked out, with considerable improvement in the robustness of the ‘background’ inversions.

NiltonRenno, Danny Rosenfeld, Hugh Christian, Rich Blakeslee and Earle Williams have been working for several months on a proposal submission to the NASA Earth Venture program, aimed at making global satellite measurements of cloud condensation number (CCN) concentrations at cloud base height. The same satellite is designed to carry an improved Lightning Imaging Sensor for quantifying the electrical activity of CCN-ingesting clouds. A major scientific goal will be the quantitative resolution of contributions of thermodynamics and aerosol to various phenomena: the land-ocean lightning activity, the distribution of large hail over continents, the distribution of ‘warm’ clouds in the tropics and the strongly electrified eyewall convection in hurricanes.

Joan Montanya invited Earle Williams to join the thesis committees for two of his PhD students: Daniel Aranguren and Victor March, in Barcelona, Spain in October. The visitors also traveled to the group’s Lightning/Sprites observatory at the Eagle’s Nest in the Pyrennees.

Luiz Machado (CPTEC, CachoeiraPaulista, Brazil) invited Earle Williams to participate in the CHUVA field experiment in the vicinity of Sao Jose dos Campos during the month of November under FAPESP support. Williams will work with scientists at CPTEC and INPE, and with the Lightning Mapping Array and high-speed video camera observations, to test predictions for lightning current cutoff instability developed in the MIT PhD thesis of Stan Heckman, and to work with new X-band polarimetric radar observations with Enrique Mattos.

Cheng-Ling Kuo and the ISUAL satellite group have invited Earle Williams to their laboratory in Taiwan. This invitation follows the shedding of light by ISUAL on the sprite polarity paradox. This visit is scheduled after the Fall AGU meeting.

Summaries of several meetings and conferences on topics in atmospheric electricity have appeared (or are in the works) in EOS. These include the International Workshop on Winter Lightning in Sapporo, Japan in June, the Southern Thunder Workshop in Norman, Oklahoma in July, the TGF (Terrestrial Gamma Flashes) Workshop in Huntsville, Alabama in July, and the International Conference on Atmospheric Electricity in Rio de Janeiro, Brazil in August. As current Editor for EOS in Atmospheric Electricity, Earle Williams encourages the submission of both meeting summaries and topics of general interest in our field.

MIT Lincoln Laboratory (Lexington, MA, USA)

Earle Williams and Marilyn Wolfson have requested and received lightning observations archived by ATDnet (Alec Bennett), Earth Networks (Stan Heckman), USPLN (Kim Rauenzahn), Vaisala, Inc (Nikki Hembury and Ron Holle), and the World Wide Lightning Location Network (Bob Holzworth) for regions over the Atlantic Ocean. The main goal is the assessment of hazard weather to aviation in a region out of the normal radar surveillance range. The investigation and inter-comparison of these data sets is currently in progress.

Personnel working under the program for NEXRAD Dual Pol upgrade have recently performed a calibration of differential reflectivity of the KOUN radar at NSSL with metal spheres of 6” and 12” diameter, tethered with balloons. The processing of these observations is currently in progress. A paper on the use of ZDR measurements in winter storms, showing frequent evidence of enhanced positive differential reflectivity where dendritic and hexagonal flat plate crystals are most likely to occur, was presented at the AMS Radar Conference in Pittsburgh in September. The assessment of supercooled water and attendant icing hazard (and the implications of that for ice particle charging) remain challenging problems in this context.

Special Laboratory of Physics, University of Shkodra, Albania

Florian Mandija (f_mandija@yahoo.com)

The objective of our working group during the period May-November 2011 is focused primarily on the measurements of aerosol number concentrations on the sub-micrometric and micrometric size modes. Such measurements were carried out over the region of North-West of Albania, mostly on the urban centre of Shkdora city and over the area of Shkodra Lake. This work is still running and it is supported financially be the Albanian Ministry of Technology and Innovation. During these monitoring campaigns we are attempting to estimate aerosol sources in this region, their diurnal and annual cycles, as well as deposition rate over the area of Shkodra Lake.

Simultaneously with aerosol measurements we have recorded also the concentrations of atmospheric ions in these areas. This will help to estimate also attachment and recombination among ions and aerosol particles in specific environmental conditions. Some of our measurement results there are presented in the International Conference on Atmospheric Electricity.

Other contributions of our working group consist on the theoretical work, the first of done to determine recombination and attachment coefficients in the case of charged ultrafine particles, published in the RSC Advances Journal. The second work deals with a model to determine the coefficients of power law aerosol size distributions. This work is presented in the proceedings of ICAE 2011.

In addition of this it is expected to continue the monitoring campaign over the above mentioned areas, as well as to develop two theoretical models into a more generalized aspect.

University of Florida (Gainesville, FL, USA)

A total of 16 full-fledged lightning flashes and 12 attempted upward leaders were triggered in 2011 at the ICLRT at Camp Blanding (CB), Florida, operated jointly by the University of Florida and the Florida Institute of Technology. Twelve flashes contained leader/return stroke sequences (a total of 41) and four were composed of the initial stage only. There were also five kiloampere-scale ICC pulses. Nine triggered flashes with return strokes, besides being recorded at CB, were recorded at the ICLRT's Lightning Observatory in Gainesville (LOG) and six also in Starke, at distances of 45 and 3 km, respectively. Additionally, eight natural negative lightning discharges that terminated on the site or in its immediate vicinity were recorded at CB and five of them also at LOG.

Chris Biagi defended his Ph.D. Dissertation titled "Observations and Modeling of Processes in Artificially Initiated (Triggered) Lightning". He continues his work at UF as a postdoctoral fellow.

C.J. Biagi, M.A. Uman, J. Gopalakrishnan, J.D. Hill, V.A. Rakov, T. Ngin, and D.M. Jordan authored a paper titled "Determination of the electric field intensity and space charge density versus height prior to triggered lightning". The authors inferred the vertical profiles of space charge density and electric field intensity above ground by comparing modeling and measurements of the ground-level electric field changes caused by elevating grounded lightning-triggering wires. The ground-level electric fields at distances of 60 m and 350 m were measured during six wire launches that resulted in triggered lightning. The wires were launched when ground-level electric fields ranged from 3.2 to 7.6 kV/m and the triggering heights ranged from 123 to 304 m. From wire launch time to lightning initiation time, the ground-level electric field reduction at 60 m ranged from 2.2 to 3.4 kV/m, with little ground-level electric field reduction being observed at 350 m. We observed that the triggering heights were inversely proportional to the ground-level electric field when the wires were launched. Their Poisson equation solver simulated the ground-level electric field changes as the grounded wires extended in assumed vertically varying profiles of space charge density and electric field intensity. Their model reproduced the measured ground-level electric field changes when the assumed space charge density decayed exponentially with altitude, with ground-level charge densities between 1.5 and 7 nC/m^3, space charge exponential decay height constants ranging from 67 to 200 m, and uniform electric field intensities far above the space charge layer ranging from 20 to 60 kV/m. The model predicted typical charge densities on the wires of some tens of uC/m with milliampere-range currents flowing into the wires from ground to supply the wire charge. The paper is published in the JGR - Atmospheres.

A. Nag (presently with Vaisala), S. Mallick, V.A. Rakov, J. S. Howard, C.J. Biagi, J. D. Hill, M.A. Uman, D.M. Jordan, K.J.Rambo, J. E. Jerauld, and B.A. DeCarlo, in collaboration with K.L. Cummins, and J.A. Cramer of Vaisala, authored a paper titled "Evaluation of NLDN Performance Characteristics Using Rocket-Triggered Lightning Data Acquired in 2004–2009". The authors evaluated performance characteristics of the U.S. National Lightning Detection Network (NLDN) using rocket-triggered lightning data acquired in 2004–2009 at Camp Blanding, Florida. A total of 37 negative flashes that contained leader/return stroke sequences (a total of 139) were triggered during these years. For all the return strokes, locations of channel terminations on the ground were known exactly and for 122 of them currents were measured directly using noninductive shunts. The NLDN recorded 105 Camp Blanding strokes in 34 flashes. The resultant flash and stroke detection efficiencies were 92% and 76%, respectively. The median absolute location error was 308 m. The median NLDN-estimated peak current error was −6.1%, while the median absolute value of current estimation error was 13%. Strokes in "classical" triggered flashes are similar to regular subsequent strokes (following previously formed channels) in natural lightning, and hence the results presented here are applicable only to regular negative subsequent strokes in natural lightning. The flash detection efficiency reported here is expected to be an underestimate of the true value for natural negative lightning flashes, since first strokes typically have larger peak currents than subsequent ones. The paper is published in the JGR - Atmospheres.

University of Reading (U. K.)

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Michael J. Rycroft, e-mail: michaelrycroft@btinternet.com

Based on a presentation made at the ISSI Workshop on Coupling between the Earth's Atmosphere and its Space Environment, held in Bern, Switzerland, in September 2010, Prof Michael Rycroft and Prof Giles Harrison, both of the U.K., have teamed up to write an overview paper. This is entitled "Electromagnetic Atmosphere-Plasma Coupling: The Global Atmospheric Electric Circuit"; it was published online on 28 October 2011 in Space Science Reviews. The reference is: DOI 10.1007/s11214-011-9830-8. The paper will be published in a printed copy of the journal early in 2012.

The paper describes the global circuit, its generators (thunderstorms and electrified rain/shower clouds) and its loads in the fair-weather part of the circuit, drawing particular attention to the enormous range of spatial and temporal scales involved. Some results derived from a PSpice model of the global circuit are mentioned. Experimental results comparing global circuit variations with the neutron count rate at Climax, Colorado, are discussed, as is new evidence for charge layers at the edges of extensive layer clouds.

University of Utah (Salt Lake City, Utah, USA)

Using 13 years of Tropical Rainfall Measuring Mission (TRMM) Microwave Imager (TMI), Precipitation Radar (PR) and Lightning Imaging Sensor (LIS) observations, relationships between lightning flash rates and proxies for convective intensity of thunderstorms over the tropics and subtropics are examined. Three manuscripts have been prepared based on this research so far. In the first paper, Peterson and Liu summarize the climatologies of the lightning flashes in the anvil regions of thunderstorms. In general, about 5% of lightning flashes occur over regions without surface rainfall, and about 5% occur over regions with stratiform precipitation. In the second paper, Liu, Cecil and Zipser investigate the relationships between lightning flash rate and TMI minimum brightness temperature, as well as the *area* with low brightness temperatures at 85 GHz and 37 GHz in the "snapshots" of the thunderstorms by TRMM. The minimum 37 GHz brightness temperature in thunderstorms is found to be a good indicator of the probability of lightning. However, the *area* of low brightness temperatures is better correlated with the lightning flash rates than the minimum brightness temperature. Over some land regions, high correlations between flash rate and the area of low brightness temperature at 85 and 37 GHz are established. However, there are large regional variations of these relationships. In the third paper, Liu, Cecil and Zipser use radar reflectivity profiles from the PR to further investigate relationships between flash rate and vertical structures of thunderstorms. There is a high correlation between the flash rates and the volumes with radar reflectivity greater than 30, 35, or 40 dBZ in the mixed phase region, but the correlation coefficient varies significantly between thunderstorms over different regions, especially between land and ocean. These results are confirmed by repeating the analysis for regions of the storms defined as convective, thus eliminating the contribution from large areas of stratiform radar echo that have much less lightning. The first two papers are in early online release in JGR, and the third is under review.

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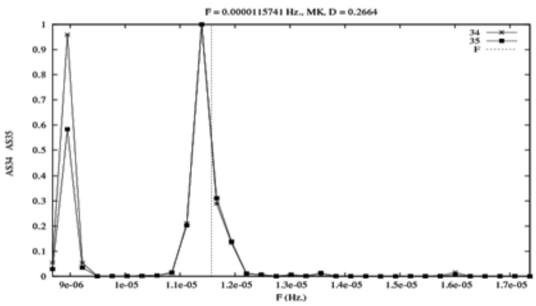
The average amplitude of the vertical electric field strength in the atmospheric surface layer at the frequencies of luni-solar tides has been estimated. The special feature of the problem of estimation of the amplitude E_z at the frequencies of tides is related to the necessity of using a long time series of experimental data which is related to the frequency range of tidal variations and to the necessary frequency resolution. A system of multichannel synchronic monitoring of the electrical field on the spaced apart stations has been created. A programme and analytical complex has been created for investigating the structure of the signals in spectral and time ranges, caused by geophysical processes. A system of multichannel synchronic monitoring of the electrical field on the spaced apart stations has been created: a physical experimental proving ground of Vladimir State University, 2 stations of the Institute of solar and terrestrial physics at the Baikal lake, a station of Institute of vulcanology and seismology in Paratunka (Komchatka), a station in Obninsk on the base of the scientific and manufacturing firm «Taifun». The fluxmeter allows to measure electric intensity within 10000 V/m with an averege square value of measuring error 1 V/m. The service band is 5 Hz, supply voltage is 12V .An author certificate has been got for the sensor. Comparison of the estimates of the electric field amplitude at the frequencies of solar tides (S1, S2, S3, S4, K1, P1) derived from the data obtained at the stations of the VSU proving ground and also at the stations of Hydrometeorological Service shows that they have the same order of magnitude and are comparable to the theoretical estimates. Spectral analysis E_Z, of the atmosphere boundary layer field at the frequencies of moon tides (2N2, M2, M1, O1, L2) according to the spaced apart stations gave an estimation of the electrical field amplitude at the frequencies of moon tides in the limits. Using the method of the latent vectors doesn't exclude using spectral analysis or some other vectors, but they are used not in the respect to the initial time series but in the respect to latent vectors which are independent from each other, each of them carries its own information. Using the method of spectral analysis of latent vectors in time series for many years of the electrical field vertical component showed its efficiency for revealing periodical components with energetic contribution up to 10^{-4}. In fig. 1 there are shown examples of spectral analysis of latent vectors of the moon (M2) and solar (S1) tides of the time series of the electrical field. The proportion of the amplitude spectral maximum value at the chosen of latent vectors to its mean value for component E_Z while extracting periods corresponding to the solar and moon tides for the stations with a long time monitoring (Voyeikovo, Verchnaya Dubrova, Dushety) is mean 267, and for the station of the ground VSU, Baikal and Obninsk is mean 179.

Station Baikal, 2007-2008



Station VSU, 2004-2009

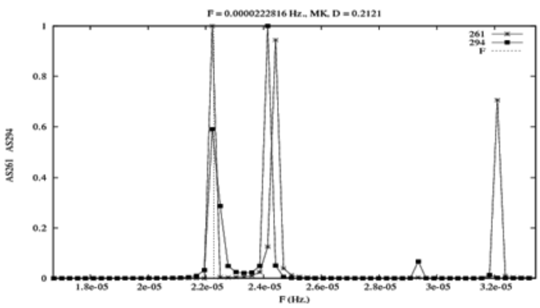


Figure 1. Spectral analysis of latent vectors of moon (M2) and solar (S1) tides of the time series of the electrical field (logarithmic scale).

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.

Ajello Joseph M., Mangina Rao S., Strickland Douglas J., Dziczek Dariusz. 2011. Laboratory studies of UV emissions from proton impact on N2: The Lyman-Birge-Hopfield band system for aurora analysis. J. Geophys. Res., Vol. 116, No. null, A00K03 10.1029/2010JA016103.

Akita M., Y. Nakamura, S. Yoshida, T. Morimoto, T. Ushio, Z. Kawasaki, D. Wang. 2011. Effects of charge distribution in thunderstorm on lightning propagation paths in Darwin, Australia. J. Atmos. Sci., Vol. 68, No. 4, 719-726.

Albrecht Rachel I., Morales Carlos A., Silva Dias Maria A. F. 2011. Electrification of precipitating systems over the Amazon: Physical processes of thunderstorm development. J. Geophys. Res., Vol. 116, No. D8, D08209 10.1029/2010JD014756.

Alexander Kern, Christof Schelthoff, Moritz Mathieu. 2011. Probability of lightning strikes to air-terminations of structures using the electro-geometrical model theory and the statistics of lightning current parameters. Atmospheric Research, In Press.

Alexandre M. Ramos, Ricardo Ramos, Pedro Sousa, Ricardo M. Trigo, Marta Janeira, Victor Prior. 2011. Cloud to ground lightning activity over Portugal and its association with circulation weather types. Atmospheric Research, 101, 84-101.

Andrew B. Collier, Arthur R.W. Hughes. 2011. Lightning and the African ITCZ. Journal of Atmospheric and Solar-Terrestrial Physics, 73, 2392-2398.

Arechiga Rene O., Johnson Jeffrey B., Edens Harald E., Thomas Ronald J., Rison William. 2011. Acoustic localization of triggered lightning. J. Geophys. Res., Vol. 116, No. D9, D09103 10.1029/2010JD015248.

Arthur C. Almeida, Brígida R. P. Rocha, José Ricardo S. Souza, José Alberto S. Sá, José A. Pissolato Filho. 2011. Cloud-to-ground lightning observations over the eastern Amazon Region. Atmospheric Research, In Press, Corrected Proof, Available online 14 September 2011.

Ávila Eldo E., Bürgesser Rodrigo E., Castellano Nesvit E., Pereyra Rodolfo G., Saunders Clive P. R. 2011. Charge separation in low-temperature ice cloud regions. J. Geophys. Res., Vol. 116, No. D14, D14202 10.1029/2010JD015475.

Baba Y., V. A. Rakov. 2011. Simulation of corona at lightning-triggering wire: Current, charge transfer, and the field-reduction effect. J. Geophys. Res., 116, doi:10.1029/2011JD016341.

Babich Leonid, Haldoupis Christos, Kudryavtsev Andrei, Kutsyk Igor. 2011. The effect of charge density in tropospheric thunderclouds on production of sprites and terrestrial gamma ray flashes. J. Geophys. Res., Vol. 116, No. A9, A09313 10.1029/2011JA016726

Baranski, P., Marek Loboda, Jan Wiszniowski, Marek Morawski. 2011. Evaluation of multiple ground flash charge structure from electric field measurements using the local lightning detection network in the region of Warsaw. Atmospheric Research, In Press, Corrected Proof, Available online 29 October 2011.

RECENT PUBLICATIONS

Biagi C. J., M. A. Uman, J. Gopalakrishnan, J. D. Hill, V. A. Rakov, T. Ngin, D. M. Jordan. 2011. Determination of the electric field intensity and space charge density versus height prior to triggered lightning. J. Geophys. Res., 116, D15201, doi:10.1029/2011JD015710.

Biagi C. J., Uman M. A., Gopalakrishnan J., Hill J. D., Rakov V. A., Ngin T., Jordan D. M. 2011. Determination of the electric field intensity and space charge density versus height prior to triggered lightning. J. Geophys. Res., Vol. 116, No. D15, D15201 10.1029/2011JD015710.

Breneman A., Cattell C., Wygant J., Kersten K., Wilson L. B. III, Schreiner S., Kellogg P. J., Goetz K. 2011. Large-amplitude transmitter-associated and lightning-associated whistler waves in the Earth's inner plasmasphere at L < 2. J. Geophys. Res., Vol. 116, No. A6, A06310 10.1029/2010JA016288.

Cerrato Y., E. Saiz, C. Cid, W. D. Gonzalez, J. 2011. Palacios Solar and interplanetary triggers of the largest Dst variations of the solar cycle 23. Journal of Atmospheric and Solar-Terrestrial Physics, In Press, Corrected Proof, Available online 19 September 2011.

Chandima Gomes, M. Z. A. Ab Kadir. 2011. A theoretical approach to estimate the annual lightning hazards on human beings. Atmospheric Research, 101, 719-725.

Chen Baojun, Yin Yan. 2011. Modeling the impact of aerosols on tropical overshooting thunderstorms and stratospheric water vapor. J. Geophys. Res., Vol. 116, No. D19, D19203 10.1029/2011JD015591.

Chou J. K., Tsai L. Y., Kuo C. L., Lee Y. J., Chen C. M., Chen A. B., Su H. T., Hsu R. R., Chang P. L., Lee L. C. 2011. Optical emissions and behaviors of the blue starters, blue jets, and gigantic jets observed in the Taiwan transient luminous event ground campaign. J. Geophys. Res., Vol. 116, No. A7, A07301 10.1029/2010JA016162.

Cláudia R. de Mesquita, Rosilene N. Dias, Silvério Visacro. 2011. Comparison of peak currents estimated by lightning location system and ground truth references obtained in Morro do Cachimbo station. Atmospheric Research, In Press, Corrected Proof, Available online 21 July 2011.

Cohuet J. B., R. Romero, V. Homar, V. Ducrocq, C. Ramis. 2011. Initiation of a severe thunderstorm over the Mediterranean Sea. Atmospheric Research, 100, 603-620.

Collier Andrew B., Gjesteland Thomas. Ostgaard Nikolai. 2011. Assessing the power law distribution of TGFs. J. Geophys. Res., Vol. 116, No. A10, A10320 10.1029/2011JA016612.

Cooray V., V. Rakov. 2011. Engineering lightning return stroke models incorporating current reflection from ground and finitely conducting ground effects. IEEE Trans. on EMC, 53, 773-781.

Cotts Benjamin R. T., Inan U. S., Lehtinen N. G. 2011. Longitudinal dependence of lightning-induced electron precipitation. J. Geophys. Res., Vol. 116, No. A10, A10206 10.1029/2011JA016581.

Cummer Steven A., Lu Gaopeng, Briggs Michael S., Connaughton Valerie, Xiong Shaolin, Fishman Gerald J., Dwyer Joseph R. 2011. The lightning-TGF relationship on microsecond timescales. Geophys. Res. Lett., Vol. 38, No. 14, L14810 10.1029/2011GL048099.

RECENT PUBLICATIONS

Devendraa Siingh, D. M. Chate, K. Ali. 2011. Time-elapsed evolution of aerosol size distributions by snow particles after passage of blizzard over the Maitri, Antarctica. International Journal of Remote Sensing, UK, DOI: 10.1080/01431161.2010.542206.

Devendraa Siingh, R. P. Singh, A. K. Singh, M. N. Kulkarni, A. S. Gautam, A. K. Singh. 2011. Solar activity, lightning and climate. Survey in Geophysics, 32, DOI 10.1007/s10712-011-9127-1.

Devendraa Siingh, V. Gopalakrishnan, A. S. Gautam, R.P. Singh. 2011. Estimation of aerosol size distribution using KL model from the ion-mobility spectra. International Journal of Remote Sensing, DOI: 10.1080/01431161.2010.512945.

Devendraa Siingh, V. Pant, A. K. Kamra. 2011. The ion-aerosol interaction from the ion mobility and aerosol particle size distribution measurements on 17 January and 18 February 2005 at Maitri, Antarctica-A case study. Journal of Earth System Science, 120, 735-754.

Dwyer J. R., Schaal M., Rassoul H. K., Uman M. A., Jordan D. M., Hill, D. 2011. High-speed X-ray images of triggered lightning dart leaders. J. Geophys. Res., Vol. 116, No. D20, D20208 10.1029/2011JD015973.

Dwyer Joseph R., Babich Leonid P. 2011. Low-energy electron production by relativistic runaway electron avalanches in air. J. Geophys. Res., Vol. 116, No. A9, A09301 10.1029/2011JA016494.

Dwyer Joseph R., Rassoul Hamid K. 2011. Comment on "Runaway breakdown and electrical discharges in thunderstorms" by Gennady Milikh and Robert Roussel-Dupré. J. Geophys. Res., Vol. 116, No. A8, A08312 10.1029/2011JA016670.

Edens H. E. 2011. Photographic and lightning mapping observations of a blue starter over a New Mexico thunderstorm. Geophys. Res. Lett., Vol. 38, No. 17, L17804 10.1029/2011GL048543.

Enghoff Martin B., Pedersen Jens Olaf Pepke, Uggerhøj Ulrik I., Paling Sean M., Svensmark Henrik. 2011. Aerosol nucleation induced by a high energy particle beam. Geophys. Res. Lett., Vol. 38, No. 9, L09805 10.1029/2011GL047036.

Enrique V. Mattos, Luiz A.T. Machado. 2011. Cloud-to-ground lightning and Mesoscale Convective Systems. Atmospheric Research, 99, 377-390.

Fischer G., Gurnett D. A. 2011. The search for Titan lightning radio emissions. Geophys. Res. Lett., Vol. 38, No. 8, L08206 10.1029/2011GL047316.

Fishman G. J., Briggs M. S., Connaughton V., et al. 2011. Temporal properties of the terrestrial gamma-ray flashes from the Gamma-Ray Burst Monitor on the Fermi Observatory. J. Geophys. Res., Vol. 116, No. A7, A07304 10.1029/2010JA016084.

Füllekrug M., R. Roussel-Dupré, E. M. D. Symbalisty, J. J. Colman, et al. 2011. Relativistic electron beams above thunderclouds. Atmospheric Chemistry and Physics, 11, 7747-7754.

Fuschino F., Marisaldi M., Labanti C., Barbiellini G., Del Monte E., et al. 2011. High spatial resolution correlation of AGILE TGFs and global lightning activity above the equatorial belt. Geophys. Res. Lett., Vol. 38, No. 14, L14806 10.1029/2011GL047817.

Gao W. H., Sui C. H., Chen W. T. C., Chang W. Y. 2011. An evaluation and improvement of microphysical parameterization from a two-moment cloud microphysics scheme and the Southwest Monsoon Experiment (SoWMEX)/Terrain-influenced Monsoon Rainfall Experiment (TiMREX) observations. J. Geophys. Res., Vol. 116, No. D19, D19101 10.1029/2011JD015718.

Gopalakrishnan V., S. D. Pawar, P. Murugavel, Kirankumar P. Johare. 2011. Electrical characteristics of thunderstorms in the Eastern part of India. Journal of Atmospheric and Solar-Terrestrial Physics, 73, 1876-1882.

Gordillo-Vázquez F. J., Luque A., Simek M. 2011. Spectrum of sprite halos. J. Geophys. Res., Vol. 116, No. A9, A09319 10.1029/2011JA016652.

Grard Réjean, Berthelin Stéphanie, Béghin Christian, Hamelin Michel, Berthelier Jean-Jacques, López-Moreno Jose J., Simões Fernando. 2011. Comment on "An analysis of VLF electric field spectra measured in Titan's atmosphere by the Huygens probe" by J. A. Morente et al. J. Geophys. Res., Vol. 116, No. E5, E05005 10.1029/2009JE003555.

Han F., C. Steven A., Li J. B., Lu G. P. 2011. Daytime ionospheric D region sharpness derived from VLF radio atmospherics. J. Geophys. Res., Vol. 116, No. A5, A05314 10.1029/2010JA016299.

Hill J. D., Uman M. A., Jordan D. M. 2011. High-speed video observations of a lightning stepped leader. J. Geophys. Res., Vol. 116, No. D16, D16117 10.1029/2011JD015818.

Holzworth R. H., McCarthy M. P., Pfaff R. F., Jacobson A. R., Willcockson W. L., Rowland D. E. 2011. Lightning-generated whistler waves observed by probes on the Communication/Navigation Outage Forecast System satellite at low latitudes. J. Geophys. Res., Vol. 116, No. A6, A06306 10.1029/2010JA016198.

Howard J., Uman M. A., Biagi C., Hill D., Rakov V. A., Jordan D. M. 2011. Measured close lightning leader-step electric field–derivative waveforms. J. Geophys. Res., Vol. 116, No. D8, D08201 10.1029/2010JD015249.

Huang S. M., Hsu C. L., Chen A. B., Li J., Lee L. J., Yang G. L., Wang Y. C., Hsu R. R., Su H. T. 2011. Effects of notch-filtering on the ELF sferics and the physical parameters. Radio Sci., Vol. 46, No. 5, RS5014 10.1029/2010RS004519.

Jiang R. B. , X. S. Qie, C. X. Wang, J. Yang, et al. 2011. Lightning M-components with peak currents of kilo amperes and their mechanism. Acta Phys. Sin., Vol. 60, NO.7, 079201-1.

Jin G., Spasojevic M., Cohen M. B., Inan U. S., Lehtinen N. G. 2011. The relationship between geophysical conditions and ELF amplitude in modulated heating experiments at HAARP: Modeling and experimental results. J. Geophys. Res., Vol. 116, No. A7, A07310 10.1029/2011JA016664.

Yang J., X. S. Qie, G. L. Feng. 2011. Characteristics of one sprite-producing summer thunderstorm. Atmospheric Research, In Press, Corrected Proof, Available online 26 August 2011.

Joan Bech, Nicolau Pineda, Tomeu Rigo, Montserrat Aran, Jéssica Amaro, Miquel Gayà, Joan Arús, Joan Montanyà, Oscar van der Velde. 2011. A Mediterranean nocturnal heavy rainfall and tornadic event. Part I: Overview, damage survey and radar analysis. Atmospheric Research, 100, 621-637.

Johnson J. B., Arechiga R. O., Thomas R. J., Edens H. E., Anderson J., Johnson R. 2011. Imaging thunder. Geophys. Res. Lett., Vol. 38,

RECENT PUBLICATIONS

No. 19, L19807 10.1029/2011GL049162.

Kułak Andrzej, Młynarczyk Janusz. 2011. A new technique for reconstruction of the current moment waveform related to a gigantic jet from the magnetic field component recorded by an ELF station. Radio Sci., Vol. 46, No. 2, RS2016 10.1029/2010RS004475.

Kuo C. L., Huba J. D., Joyce G., Lee L. C. 2011. Ionosphere plasma bubbles and density variations induced by pre-earthquake rock currents and associated surface charges. J. Geophys. Res., Vol. 116, No. A10, A10317 10.1029/2011JA016628.

Lan Y., Zhang Y. Y., Dong W. S., Lu W. T., Liu H. Y., Zheng D. 2011. Broadband analysis of chaotic pulse trains generated by negative cloud-to-ground lightning discharge. J. Geophys. Res., Vol. 116, No. D17, D17109 10.1029/2010JD015159.

Lang T. J., Li J., Lyons W. A., Cummer S. A., Rutledge S. A., MacGorman D. R. 2011. Transient luminous events above two mesoscale convective systems: Charge moment change analysis. J. Geophys. Res., Vol. 116, No. A10, A10306 10.1029/2011JA016758.

Lathem T. L., Kumar P., Nenes A., Dufek J., Sokolik I. N., Trail M., Russell A. 2011. Hygroscopic properties of volcanic ash. Geophys. Res. Lett., Vol. 38, No. 11, L11802 10.1029/2011GL047298.

Liu C., D. Cecil, E. J. Zipser. 2011. Relationships between lightning flash rates and passive microwave brightness temperatures at 85 and 37 GHz over the tropics and subtropics. J. Geophys. Res., in press.

Liu D. X., X. S. Qie, Y. J. Xiong, G. L. Feng. 2011. Evolution of the total lightning activity in a leading-line and trailing stratiform mesoscale convective system over Beijing. Adv. Atmos. Sci., 28(4), 866-878.

López J., J. Montanyà, M. Maruri, D. De la Vega, J.A. Aranda, S. Gaztelumendi. 2011. Lightning initiation from a tall structure in the Basque Country. Atmospheric Research, In Press, Corrected Proof, Available online 23 July 2011.

Lu Gaopeng, Cummer Steven A., Lyons Walter A., et al. 2011. Lightning development associated with two negative gigantic jets. Geophys. Res. Lett., Vol. 38, No. 12, L12801 10.1029/2011GL047662.

Mackay C., Fraser-Smith A. C. 2011. World coverage for single station lightning detection. Radio Sci., Vol. 46, No. null, RS0M01 10.1029/2010RS004600.

Mandija F. 2011. A method to determine the recombination and attachment coefficients of atmospheric ions and ultrafine particles in different charge levels. RSC Advances Journal, RSC Adv., 1, 142-146.

Mandija F., F. Vila, E. Lukaj. 2011. Air pollution in Shkoder region. International Journal of Ecosystems and Ecology Sciences (IJEES), 1, 37-41.

Mandija F., J. Bushati, P. Zogaj, F. Vila. 2011. Source apportionment of PM10, PM2.5 and PM1 in the largest city in the north of Albania. Regional Science Iniquity Journal, 3(1), 85-94.

Marshall R. A., Bortnik J., Lehtinen N., Chakrabarti S. 2011. Optical signatures of lightning-induced electron precipitation. J. Geophys. Res., Vol. 116, No. A8, A08214 10.1029/2011JA016728.

MontanyJ.à, O.A. van der Velde, V. March, D. Romero, G. Solà, N. Pineda. 2011. High-speed video of lightning and x-ray pulses during the 2009–2010 observation campaigns in northeastern Spain. Atmospheric Research, In Press, Corrected Proof, Available online 6 October 2011.

Moosavi S. H. S., Moini R., Sadeghi S. H. H., Kordi B. 2011. Application of the nonlinear antenna theory model to a tall tower struck by lightning for the evaluation of return stroke channel current and radiated electromagnetic fields. J. Geophys. Res., Vol. 116, No. D11, D11118 10.1029/2010JD014684.

Mora N., F. Rachidi, M. Rubinstein. 2011. Application of the time reversal of electromagnetic fields to locate lightning discharges. Atmospheric Research, In Press, Corrected Proof, Available online 5 September 2011.

Morales R., Nenes A., Jonsson H., Flagan R. C., Seinfeld J. H. 2011. Evaluation of an entraining droplet activation parameterization using in situ cloud data. J. Geophys. Res., Vol. 116, No. D15, D15205 10.1029/2010JD015324.

Morente Juan A., Portí Jorge A., Navarro Enrique A., Salinas Alfonso. 2011. Reply to comment by R. Grard et al. on "An analysis of VLF electric field spectra measured in Titan's atmosphere by the Huygens probe". J. Geophys. Res., Vol. 116, No. E5, E05006 10.1029/2010JE003581.

Murthy B.S., R. Latha, P. Sreeja, M.C.R. Kalapureddy, T. Dharmaraj, R.T. Waghmare. 2011. Pre-monsoon/monsoon thunderstorm characteristics over Pune—An investigation using Doppler Sodar observations. Journal of Atmospheric and Solar-Terrestrial Physics, 73, 2356-2366.

Nag A., V.A. Rakov, D. Tsalikis, J.S. Howard, C.J. Biagi, J.D. Hill, M.A. Uman, D.M. Jordan. 2011. Characteristics of the initial rising portion of near and far lightning return stroke electric field waveforms. Atmospheric Research, In Press, Corrected Proof, Available online 7 September 2011.

Nathan Magee, Michael Kavic. 2011. Probing the climatological impact of a cosmic ray–cloud connection through low-frequency radio observations. Journal of Atmospheric and Solar-Terrestrial Physics, In Press, Corrected Proof, Available online 12 October 2011.

Neubert T., O. Chanrion, E. Arnone, F. Zanotti, S. A. Cummer, J. Li, M. Füllekrug, S. Soula, O. A. van der Velde. 2011. The properties of a gigantic jet reflected in a simultaneous sprite: Observations interpreted by a model. J. Geophys. Res., doi:10.1029/2011JA016928, in press.

Nickolaenko A. P., Yatsevich E. I., Shvets A. V., Hayakawa M., Hobara Y. 2011. Universal and local time variations deduced from simultaneous Schumann resonance records at three widely separated observatories. Radio Sci., Vol. 46, No. 5, RS5003 10.1029/2011RS004663.

Nicolau Pineda, Joan Bech, Tomeu Rigo, Joan Montanyà. 2011. A Mediterranean nocturnal heavy rainfall and tornadic event. Part II: Total lightning analysis. Atmospheric Research, 100, 638-648.

Nieckarz Zenon, Kulak Andrzej, Zieba Stanislaw, Odzimek Anna. 2011. Cloud-to-ground lightning dipole moment from simultaneous observations by ELF receiver and combined direction finding and time-of-arrival lightning detection system. J. Geophys. Res., Vol. 116, No. D8, D08107 10.1029/2010JD014736.

Ondrášková A., S. Ševčík, P. Kostecký. 2011. Decrease of Schumann resonance frequencies and changes in the effective lightning areas toward the solar cycle minimum of 2008–2009. Journal of Atmospheric and Solar-Terrestrial Physics, 73, 534-543.

Pan L. L., Munchak L. A. 2011. Relationship of cloud top to the tropopause and jet structure from CALIPSO data. J. Geophys. Res., Vol. 116, No. D12, D12201 10.1029/2010JD015462.

Pant V., Devendraa Siingh, A. K. Kamra. 2011. Size distribution of atmospheric aerosols at Maitri, Antarctica. Atmospheric Environment, 45, 5138-5149.

Peterson M., C. Liu. 2011. Global statistics of lightning in anvil and stratiform regions over tropics and subtropics observed by TRMM. J. Geophys. Res., in press.

Petra Mikuš, Maja Telišman Prtenjak, Nataša Strelec Mahović. 2011. Analysis of the convective activity and its synoptic background over Croatia. Atmospheric Research, In Press, Corrected Proof, Available online 6 October 2011.

Qie X. S., Jiang R. B., Wang C. X., Yang J. Wang J. F., Liu D. X. 2011. Simultaneously measured current, luminosity, and electric field pulses in a rocket-triggered lightning flash. J. Geophys. Res., Vol. 116, No. D10, D10102 10.1029/2010JD015331.

Qilin Zhang, Jing Yang, Mingyuan Liu, Zhenhui Wang. 2011. Measurements and simulation of the M-component current and simultaneous electromagnetic fields at 60 m and 550 m. Atmospheric Research, 99, 537-545.

Qilin Zhang, Jing Yang, Xiaoqin Jing, Dongshuai Li, Zhenhui Wang. 2011. Propagation effect of a fractal rough ground boundary on the lightning-radiated vertical electric field. Atmospheric Research, In Press, Corrected Proof, Available online 29 October 2011.

Qin Jianqi, Celestin Sebastien, Pasko Victor P. 2011. On the inception of streamers from sprite halo events produced by lightning discharges with positive and negative polarity. J. Geophys. Res., Vol. 116, No. A6, A06305 10.1029/2010JA016366.

Robledo Martinez A., Sobral H., Ruiz-Meza A. 2011. Space charge effects and arc properties of simulated lightning on Venus. J. Geophys. Res., Vol. 116, No. A6, A06313 10.1029/2010JA015856.

Roussel Dupré Robert, Milikh Gennady. 2011. Reply to comment by Joseph R. Dwyer and Hamid K. Rassoul on “Runaway breakdown and electrical discharges in thunderstorms”. J. Geophys. Res., Vol. 116, No. A8, A08313 10.1029/2011JA016742.

Sharma S. R., V. Cooray, M. Fernando, F. J. Miranda. 2011. Temporal features of different lightning events revealed from wavelet transform. Journal of Atmospheric and Solar-Terrestrial Physics, 73, 507-515.

Sharma S. R., V. Cooray, M. Fernando. 2011. Unique lightning activities pertinent to tropical and temperate thunderstorms. Journal of Atmospheric and Solar-Terrestrial Physics, 73, 483-487.

Shivalika Sarkar, Sunita Tiwari, A.K. Gwal. 2011. Electron density anomalies associated with M≥5.9 earthquakes in Indonesia during 2005 observed by DEMETER. Journal of Atmospheric and Solar-Terrestrial Physics, 73, 2289-2299.

Shoory Abdolhamid, Rachidi Farhad, Delfino Federico, Procopio Renato, Rossi Mansueto. 2011. Lightning electromagnetic radiation over a stratified conducting ground: 2. Validity of simplified approaches. J. Geophys.

RECENT PUBLICATIONS

Res., Vol. 116, No. D11, D11115 10.1029/2010JD015078.

Shoory Abdolhamid, Rachidi Farhad, Rubinstein Marcos. 2011. Relativistic Doppler effect in an extending transmission line: Application to lightning. J. Geophys. Res., Vol. 116, No. D13, D13205 10.1029/2010JD015279.

Silvério Visacro, Claudia R. Mesquita, Alberto De Conti, Fernando H. Silveira. 2011. Updated statistics of lightning currents measured at Morro do Cachimbo Station. Atmospheric Research, In Press, Corrected Proof, Available online 2 August 2011.

Singh A. K., Devendraa Siingh, R. P. Singh. 2011. Impact of galactic cosmic rays on Earth's atmosphere and human health atmospheric environment. Atmospheric Environment, 45, 3806- 3818.

Singh A. K., Devendraa Siingh, R.P. Singh. 2011. State Studies of Earth’s Plasmasphere: a Review. Planetary of Space Science, 59, 810-834.

Smith D. M., Dwyer J. R., Hazelton B. J., et al. 2011. A terrestrial gamma ray flash observed from an aircraft. J. Geophys. Res., Vol. 116, No. D20, D20124 10.1029/2011JD016252.

Smith D. M., Dwyer J. R., Hazelton B. J., Grefenstette B. W., et al. 2011. The rarity of terrestrial gamma-ray flashes. Geophys. Res. Lett., Vol. 38, No. 8, L08807 10.1029/2011GL046875.

Sorokin V. M., Yu.Ya. Ruzhin, A.K. Yaschenko, M. Hayakawa. 2011. Generation of VHF radio emissions by electric discharges in the lower atmosphere over a seismic region. Journal of Atmospheric and Solar-Terrestrial Physics, 73, 664-670.

Soula Serge, van der Velde Oscar, Montanya Joan, Huet Patrice, Barthe Christelle, Bór József. 2011. Gigantic jets produced by an isolated tropical thunderstorm near Réunion Island. J. Geophys. Res., Vol. 116, No. D19, D19103, 10.1029/2010JD015581.

Streltsov A. V., Chang C. L., Labenski J., Milikh G., Vartanyan A., Snyder A. L. 2011. Excitation of the ionospheric Alfvén resonator from the ground: Theory and experiments. J. Geophys. Res., Vol. 116, No. A10, A10221, 10.1029/2011JA016680.

Sugiyama K., Nakajima K., Odaka M., Ishiwatari M., Kuramoto K., Morikawa Y., Nishizawa S., Takahashi Y. O., Hayashi Y. Y. 2011. Intermittent cumulonimbus activity breaking the three-layer cloud structure of Jupiter. Geophys. Res. Lett., Vol. 38, No. 13, L13201, 10.1029/2011GL047878.

Takeda M., Yamauchi M., Makino M., Owada T. 2011. Initial effect of the Fukushima accident on atmospheric electricity. Geophys. Res. Lett., Vol. 38, No. 15, L15811 10.1029/2011GL048511.

Tan Lun C., Shao X., Sharma A. S., Fung Shing F. 2011. Relativistic electron acceleration by compressional-mode ULF waves: Evidence from correlated Cluster, Los Alamos National Laboratory spacecraft, and ground-based magnetometer measurements. J. Geophys. Res., Vol. 116, No. A7, A07226 10.1029/2010JA016226.

Tanaka Y. T., Hayakawa M., Hobara Y., Nickolaenko A. P., Yamashita K., Sato M., Takahashi Y., Terasawa T., Takahashi T. 2011. Detection of transient ELF emission caused by the extremely intense cosmic gamma-ray flare of 27 December 2004. Geophys. Res. Lett., Vol. 38, No. 8, L08805 10.1029/2011GL047008.

Tom A. Warner. 2011. Observations of

simultaneous upward lightning leaders from multiple tall structures. Atmospheric Research, In Press, Corrected Proof, Available online 21 July 2011.

Tsuchiya H., Enoto T., Yamada S., Yuasa T., Nakazawa K., Kitaguchi T., Kawaharada M., Kokubun M., Kato H., Okano M., Makishima K. 2011. Long-duration γ ray emissions from 2007 and 2008 winter thunderstorms. J. Geophys. Res., Vol. 116, No. D9, D09113 10.1029/2010JD015161.

Vernon Cooray, Gerald Cooray. 2011. Electromagnetic radiation field of an electron avalanche. Atmospheric Research, In Press, Corrected Proof, Available online 24 June 2011.

Vernon Cooray, Marley Becerra. 2011. Attractive radii of vertical and horizontal conductors evaluated using a self consistent leader inception and propagation model—SLIM. Atmospheric Research, In Press, Corrected Proof, Available online 31 August 2011.

Vernon Cooray, Vladimir Rakov. 2011. On the upper and lower limits of peak current of first return strokes in negative lightning flashes. Atmospheric Research, In Press, Corrected Proof, Available online 16 June 2011.

Virts Katrina S., Thornton Joel A., Wallace John M., Hutchins Michael L., Holzworth Robert H., Jacobson Abram R. 2011. Daily and intraseasonal relationships between lightning and NO2 over the Maritime Continent. Geophys. Res. Lett., Vol. 38, No. 19, L19803 10.1029/2011GL048578.

Wang D., Takagi N. 2011. A downward positive leader that radiated optical pulses like a negative stepped leader. J. Geophys. Res., Vol. 116, No. D10, D10205 10.1029/2010JD015391.

Wang Kaiti, Wang Yun-Ching, Su Han-Tzong, Hsu Rue-Ron, Lin Tzu-Yuan. 2011. Wave mode of the low-latitudinal ELF-whistlers. J. Geophys. Res., Vol. 116, No. A9, A09323 10.1029/2011JA016832.

Warner Tom A., Orville Richard E., Marshall J. L., Huggins Kyle. 2011. Spectral (600–1050 nm) time exposures (99.6 µs) of a lightning stepped leader. J. Geophys. Res., Vol. 116, No. D12, D12210 10.1029/2011JD015663.

Westbrook C. D., Illingworth A. J. 2011. Evidence that ice forms primarily in supercooled liquid clouds at temperatures > −27°C. Geophys. Res. Lett., Vol. 38, No. 14, L14808 10.1029/2011GL048021.

Whitley Toby, Füllekrug Martin, Rycroft Michael, et al. 2011. Worldwide extremely low frequency magnetic field sensor network for sprite studies. Radio Sci., Vol. 46, No. 4, RS4007 10.1029/2010RS004523.

Zhou Helin, Diendorfer Gerhard, Thottappillil Rajeev, Pichler Hannes, Mair Martin. 2011. Characteristics of upward bipolar lightning flashes observed at the Gaisberg Tower. J. Geophys. Res., Vol. 116, No. D13, D13106 10.1029/2011JD015634.

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 **2012 spring** issue of the newsletter is **May 15, 2012**.

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