



### Science Meeting – Scientific Report

The scientific report (WORD or PDF file - maximum of seven A4 pages) should be submitted online within two months of the event. It will be published on the ESF website.

*Proposal Title: Modeling TLE's and TGF's*

*Application Reference N°: 5668*

1) Summary (up to one page)

The main aim was

- 1) to understand the state of TGF/TLE-modelling within Europe and to create new collaboration,
- 2) to meet relevant companies interested in European collaboration,
- 3) to structure an ITN-network application.

2) Description of the scientific content of and discussions at the event (up to four pages)

Here is the workshop webpage

<http://www.lorentzcenter.nl/lc/web/2014/687/info.php3?wsid=687&venue=Snellius> with participants and scientific program.

Aim (in accordance with the webpage):

We provide a forum for European collaboration on modelling atmospheric discharges, specifically Transient Luminous Events and High Energy Emissions from Thunderstorms like TGFs, as well as the impact of particle showers created by high energy cosmic particles. We will discuss physical concepts and results as well as input data, numerical methods, approximations and model reduction and possibilities of sharing code. The workshop is supported by the ESF research networking program *Thunderstorm Effects on the Atmosphere-Ionosphere System (TEA-IS)*.

The workshop program can be found on:

<http://www.lorentzcenter.nl/lc/web/2014/687/program.php3?wsid=687&venue=Snellius>

**3) Assessment of the results and impact of the event on the future directions of the field (up to two pages)**

**All three goals described under 1 have been met. In particular, an ETN application within the European Marie Curie framework has been submitted by the participants on Jan. 13.**

**4) Annexes 4a) and 4b): Programme of the meeting and full list of speakers and participants**

**See attached files.**

**All 22 participants are from member countries of the ESF-network except Fuellekrug, Dujko and Diniz. We have covered the costs of Fuellekrug and Dujko by the ESF-network, but travel and lodging of Diniz was covered by other funding.**

## Modeling TLEs and TGFs

20 – 24 October 2014, Lorentz Center@Snellius – Leiden

**Scientific Topic:** We provide a forum for European collaboration on modeling atmospheric discharges, specifically Transient Luminous Events and High Energy Emissions from Thunderstorms like TGFs, as well as the impact of particle showers created by high energy cosmic particles. We will discuss physical concepts and results as well as input data, numerical methods, approximations and model reduction and possibilities of sharing code. The workshop is supported by the ESF research networking program *Thunderstorm Effects on the Atmosphere-Ionosphere System (TEA-IS)*. The location is the *Lorentz Center* with plenty of office space for collaborations of smaller subgroups within a workshop.

### Workshop plan:

All workshop participants will stay in the same hotel. There are offices for everybody.

Keep your presentations to 20 minutes, address methods used (approximations, software, databases), recent results and open problems. There is also plenty of space to present additional material on posters. We will limit the plenary sessions to 3 - 4 hours per day, including ample time for questions and discussion.

In the afternoons, we can break up into subgroups to discuss particular issues of physical concepts, input data or numerical and analytical methods. Each group appoints a discussion leader who will report results and conclusions to all workshop participants in the late afternoon. The goal is to learn about each other's work and to set up joined projects. In Amsterdam, we have set up a group webpage on our codes <http://cwimd.nl> where we like to link to pages of collaborating groups.

Here is a rough schedule of presentations, open to changes on the spot if useful.

### Monday:

9:00 – 9:30: arrival at Snellius, registration and coffee

9:30 welcome, introduction to the Lorentz Center by Arjen Doelman

Introduction to the workshop, introduction round of participants

Olivier Chanrion (with T. Neubert): Bremsstrahlung-MC/PIC (from PhD thesis Denis Cinar), influence of the scattering angular deviation on the runaway threshold (with Anne Bourdon and Z. Bonaventura)

Alexander B. Skeltved: *Modelling of RREAs and the feedback mechanism using GEANT4*

Christoph Koehn: *Generation and propagation of photons, leptons and hadrons in thunderstorms: cross-sections and results*

Alejandro Luque: *Relativistic Impact Ionization Fronts* [Phys. Rev. Lett. 2014]

Olaf Scholten: overview over extended air shower modeling and measurements

Gia Trinh: *Effects of atmospheric electric fields on radio emission from extended air showers*

17:30 Wine & Cheese Party at the Lorentz Center

### Tuesday, starting at 9:30:

Casper Rutjes: *Free electrons from extensive air showers including interactions with hydrometeors*

Anna Dubinova: *Positive streamer formation from ice particles (and other insulators)*

Olivier Chanrion: fluid-particle coupling for streamer simulation (with Anne Bourdon, Z. Bonaventura and Torsten Neubert)

Jannis Teunissen: *3D modeling of discharge inception and propagation in air, and more ...*

Enrico Camporeale: *A short introduction on whistler waves and their importance for the magnetosphere and lightning related phenomena*

Andrey Mezentsev: *UV-sprites in LF radio noise*

**Wednesday, starting at 9:30:**

Nikolai Lehtinen: *Dynamics of a fractal streamer structure*

Ute Ebert and Alejandro Luque: *Growing discharge trees with self-consistent charge transport: the collective dynamics of streamers*

Alejandro Luque: *elves and planetary electricity*

Francisco Gordillo-Vazquez: *Chemical and optical fingerprints of elves*

Sasa Dujko: *Elementary physical processes of electrons in planetary atmospheric discharges*

Ashutosh Agnihotri: *Poster: Simulating streamer-to-spark transition in short gaps*

17:00: A guided tour in Leiden old city center, followed by a dinner in restaurant "Verboden Toegang" (Kaiserstraat 7, Leiden)

**Thursday, starting at 9:30:**

Presentations by a few interested companies

**Rest of Thursday and Friday:**

Offices are available for further exchange and collaboration or collaboration planning, or for work on your own. Some groups are already formed.

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International Center for workshops in the Sciences

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## Modeling TLEs and TGFs from 20 Oct 2014 through 24 Oct 2014

Names listed in boldface are linked to the home pages of these participants

<b>Ashutosh Agnihotri</b>	(Amserdam, Netherlands)
Enrico Camporeale	(Amsterdam, Netherlands)
Olivier Chanrion	(Kgs Lyngby, Denmark)
Anna Dubinova	(Amsterdam, Netherlands)
<b>Sasa Dujko</b>	(Belgrade, Serbia)
<b>Ute Ebert</b>	(Amsterdam, Netherlands)
<b>Martin Fullekrug</b>	(Bath , United Kingdom)
Francisco J Gordillo-Vazquez	(Granada, Spain)
<b>Christoph Köhn</b>	(Amsterdam, Netherlands)
Nikolai Lehtinen	(Bergen, Norway)
Jiawei Liu	(Hedehusene, Denmark)
Alejandro Luque	(Granada, Spain)
Andrey Mezentsev	(Bergen, Norway)
Joan Montana	(Barcelona, Spain)
Torsten Neubert	(Kongens Lyngby, Denmark)
Casper Rutjes	(Amsterdam, Netherlands)
<b>Olaf Scholten</b>	(Groningen, Netherlands)
Alexander Skeltved Broberg	(Bergen, Norway)
Gabriel Sousa Diniz	(São José dos Campos, Brazil)
<b>Jannis Teunissen</b>	(Amsterdam, Netherlands)
Gia Trinh	(Groningen, Netherlands)
<b>Oscar van der Velde</b>	(Terrassa, Spain)

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# Modeling TLEs and TGFs

## Modeling TLEs and TGFs

Oct 2014	19	20	21	22	23	24	25
Ashutosh Agnihotri	■	■	■	■	■	■	■
Enrico Camporeale	■	■	■	■	■	■	■
Olivier Chanrion	■	■	■	■	■	■	■
Anna Dubinova	■	■	■	■	■	■	■
Sasa Dujko	■	■	■	■	■	■	■
Ute Ebert	■	■	■	■	■	■	■
Martin Fullekrug	■	■	■	■	■	■	■
Francisco J Gordillo-Vazquez	■	■	■	■	■	■	■
Christoph Köhn	■	■	■	■	■	■	■
Nikolai Lehtinen	■	■	■	■	■	■	■
Jiawei Liu	■	■	■	■	■	■	■
Alejandro Luque	■	■	■	■	■	■	■
Andrey Mezentsev	■	■	■	■	■	■	■
Joan Montana	■	■	■	■	■	■	■
Torsten Neubert	■	■	■	■	■	■	■
Casper Rutjes	■	■	■	■	■	■	■
Olaf Scholten	■	■	■	■	■	■	■
Alexander Skeltved Broberg	■	■	■	■	■	■	■
Gabriel Sousa Diniz	■	■	■	■	■	■	■
Jannis Teunissen	■	■	■	■	■	■	■
Gia Trinh	■	■	■	■	■	■	■
Oscar van der Velde	■	■	■	■	■	■	■
Oct 2014	19	20	21	22	23	24	25
Nr of Attendees	12	20	20	22	19	16	05