



Ground Effects Topical Group

Magnus Wik - NeuroSpace

Introduction to GETG

- New spokesperson: Magnus Wik (NeuroSpace)
- Deputy spokesperson: Not yet decided
- The Ground Effects Topical Group (GETG) cover a wide range of activities:
 - Modelling the occurrence of geomagnetic variations and geoelectric fields during space weather events.
 - Modelling GIC in electric power systems (discrete grounding).
 - Modelling GIC in buried pipeline networks (continuous grounding).
 - Measurements of geomagnetic variations, geoelectric fields and GIC.
 - Development of forecast techniques of geomagnetic storms and GIC based on neural networks and physical models.
 - Risks and hazards from an insurance and social perspective.
 - Analysis and classification of extreme events.
 - Public outreach.

EURISGIC

- **EU**ropean **RISk** from **G**eomagnetically Induced **C**urrents
- Work programme: SPA.2010.2.3-01 Security of space assets from space weather events
- 2011-03-01 until 2014-02-30
- Coordinator: Ari Viljanen / FMI
- Participant Organisations:
 - ▶ *Finnish Meteorological Institute (FMI), Finland*
 - ▶ *British Geological Survey (BGS), UK*
 - ▶ *NeuroSpace, Sweden*
 - ▶ *Swedish Institute of Space Physics (IRF), Sweden*
 - ▶ *Geodetic and Geophysical Research Institute (GGRI), Hungary*
 - ▶ *Polar Geophysical Institute (PGI), Russia*
 - ▶ *The Catholic University of America (CUA), USA*

EURISGIC

- First European-wide real-time prototype GIC forecast service in power systems, based on in-situ solar wind observations and MHD simulations of the Earth's magnetosphere (NN, Solar Shield and GUMICS).
- GIC risk map giving the probability of large geoelectric field and GIC values in the European high-voltage power system.
- Analysis of worst-case scenarios, in today's or future power grids, based on historical geomagnetic data.
- One major goal of the EURISGIC project is to demonstrate that GIC modelling (and forecasting) for a large area is feasible.

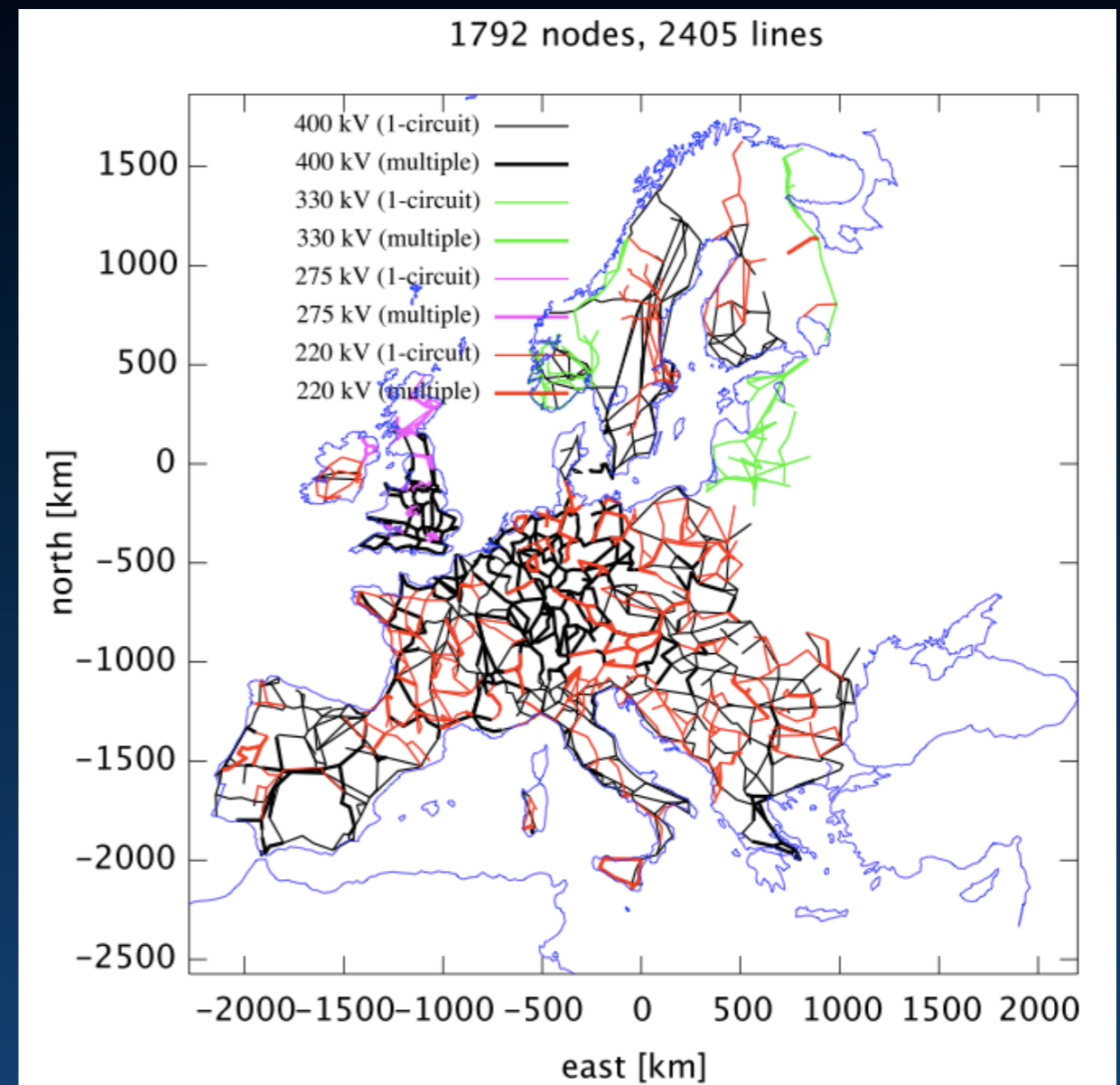


Figure: Prototype model of high-voltage power grids in Europe.

EURISGIC website



EURISGIC
EUROPEAN RISK FROM GEOMAGNETICALLY INDUCED CURRENTS
an EU/FP7 Space Research Project

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Latest News

The EURISGIC consortium had a meeting in Sopron, Hungary, on 26-27 Jan 2012 to discuss about the results obtained in 2011. [READ MORE...](#)

Funded by EU/FP7



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Welcome to the EURISGIC project website

Geomagnetically induced currents (GIC), occurring during magnetic storms, pose a natural disaster risk to the reliable operation of electric power transmission grids.

The EURISGIC EU/FP7 project will produce the first European-wide real-time prototype forecast service of GIC in power systems, based on in-situ solar wind observations and comprehensive simulations of the Earth's magnetosphere.

By utilising geomagnetic recordings, we will also derive the first map of the statistical risk of large GIC throughout Europe. Because the most intense geomagnetic storms constitute the most remarkable threat, with a risk of power grid blackouts and destruction of transformers, we will also investigate worst-case GIC scenarios based on historical data.

EURISGIC will exploit the knowledge and advanced modelling methods developed in Europe and North America. Close communication throughout the project with a stakeholder advisory group will help in directing the research and outreach appropriately.

The results of this study will help in the future design of more robust and secure protection against GIC in power transmission grids in Europe, which are anticipated to become increasingly interconnected and geographically wider.

GIC are observed in power transmission grids, oil and gas pipelines, telecommunication cables and railways. This project focuses on high-voltage power transmission networks, which are probably currently the most susceptible to GIC effects.

Geomagnetic storms cover large geographical regions, at times the whole globe. Consequently, power networks are rightly described as being European critical infrastructures whose disruption or destruction would have a significant impact on at least two member states.

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 260330.

Events Calendar

June 2012

Mon	Tue	Wed	Thu	Fri	Sat	Sun
28	29	30	31	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	1
2	3	4	5	6	7	8

EURISGIC Consortium

- Finnish Meteorological Institute (Coordinator)
- British Geological Survey
- NeuroSpace
- Swedish Institute of Space Physics
- Geodetic and Geophysical Institute, RCAES, HAS
- Polar Geophysical Institute of the Russian Academy of Sciences
- The Catholic University of America

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Reports/activities from GETG members

- Finland (Finnish Meteorological Institute):
 - Paper “Continental scale modelling of geomagnetically induced currents” sent to SWSC (EURISGIC)
 - Updating the GUMICS-4 MHD models (faster).
 - Interpolation of the magnetic field (1996-2008) covering Europe using the SECS method.
 - Calculation of GIC in spherical (and planar) geometry (test runs).
 - Collect GIC recordings in power networks (since 1996).
 - Derive “GIC risk map” over Europe (part of EURISGIC).
- Sweden (IRF, NeuroSpace):
 - Forecasting and classification of ground dB/dt using Neural Networks
 - Interpolate ground magnetic field using Neural Networks
 - Prototype Power Grid Model of Europe (> 200 kV) together with FMI.
 - Establish a prototype GIC forecast server at RWC-Sweden.
 - Online GIC demonstration tool in preparation.
- UK (British Geological Survey):
 - The regional grid model of the UK was applied to identify sites with high GIC values.
 - Worst case scenarios of GIC in the European high-voltage power grid.
 - Compilation of data archives and digitising of historic analogue data.
 - Combine archived digital geomagnetic data of 1996-2008 from Europe.

Reports/activities from GETG members

- Russia (Polar Geophysical Institute):
 - Five GIC recording sites were installed in the 330 kV power grid in North-West Russia.
 - A DC description of the grid has been prepared with more precise parameters than in the European prototype model.
 - A complete analysis of modelled GIC and GIC data is ongoing (EURISGIC).
- Hungary (Geodetic and Geophysical Research Institute of HAS):
 - Conversion of 58 1-D models into a general conductivity map of Europe. Based on extensive literature study and inversion of published magnetotelluric sounding curves into 1-dimensional layered structures.
 - Comparison of measured and calculated electric field at Nagycenk observatory (EURISGIC).
 - All analogue form electric field recordings (1957-1996) at the Nagycenk observatory, Hungary, have been scanned, and more than 25% of them have been digitised.

Reports/activities from GETG members

- Canada (NRCan):
 - Paper: “Techniques for Modelling Geomagnetically Induced Currents in Power Systems”, Boteler, D.H., R.J. Pirjola and A. Foss.
 - Paper: “Influence of System Characteristics on the Amplitudes of Geomagnetically Induced Currents”, K. Zheng et al (with North China Electric Power University).
 - Paper: “Goelectric Fields due to Small-scale and Large-scale Source Currents”, K. Zheng et al.
 - Paper: “Influence of Geophysical Environment Characteristics on the Amplitudes of Geomagnetically Induced Currents” (Under work)
 - See also presentation by Larisa.
- USA (Catholic University of America):
 - Update of the US Solar Shield MHD model (to cover subauroral latitudes) for EURISGIC.
 - Manuscript: “Generation of 100-year geomagnetically induced current scenarios.” by A. Pulkkinen et. al.

Past and upcoming activities

- GIC User's lunch at ESWW8. Paper about this event to be published (hopefully) in JSWSC.
- “Nordic symposium on the impact of solar storms on power systems” at Copenhagen airport January 17, 2012. It was arranged by NVE (Norwegian Water Resources and Energy Directorate).
- Workshop at Lund University “Solar storms and their impact on society”, May 21, 2012.
- Electric infrastructure security summit - British parliament, London, 14-15 May 2012.
- Next GETG meeting will take place at ESWW9 in Brussels.
- The TIEMS (The International Emergency Management Society) conference focusing on "Solar Activity and Potential Damaging Consequences for Industrial Operations and Critical Infrastructure" will be held in Oslo, Norway 22-24 October 2012.

Discussion and Conclusions

- The geomagnetic hazard on ground technology is a cross-disciplinary activity. Collaboration between solar-, space- and geophysicists and the power engineering community is therefore crucial to turn scientific results into new practical tools for mitigation.
- During the EURISGIC project, we intend to raise the public awareness and inform policy makers in Europe about the potential hazards of GIC, especially to countries in southern Europe.
- Because of this we would like to invite more non-scientists, e.g. from the emergency management agencies, power engineers and insurance companies, to the GETG.
- But we also need to invite scientists, e.g. solar scientists, doing basic research not normally involved in space weather activities.
- It might be useful to split the GETG into smaller subgroups/working groups. However, a subgroup such as “Forecasting” could be useful for several TGs. Possibility to better correlate the work between all TGs (or change the TGs) ? Separate SWWT-TG workshop ?
- There is a lot of “double work” in Europe with SWWT, COST ES0803 and e.g. SSA. Advice about space weather is now requested, not only by ESA, but also by EU, national authorities and agencies. This flow of information should be better coordinated and distributed more broadly.

Thank You!



Comments, feedback or suggestions?
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See you at ESWW9!