

WG 5 – Sensors and Instrumentation

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COST is supported by
the EU Framework Programme
Horizon 2020

Action Title: “Atmospheric Electricity Network: coupling with the Earth System, climate and biological systems (ELECTRONET)”
Cost Action 15211

WG 5 - Instrumentation Development

Objectives:

- To foster the development of new generation instrumentation for the needs of the AEF research community
- To pursue the development of a new satellite product for the remote sensing of PG

WG 5 – Instrumentation Development

Milestones and deliverables:



Done



To do

Month	0	6	12	18	24	30	36	42	48
WG/Deliverables/Milestones									
WG5	x	x	x	x	x	x	x	x	x
D5.1 Report on sensor needs	x	M							
D5.2 Recommendation report		x	x	M					
D5.3 Sensor development			x	x	x	x	x	M	
D5.4 Prototype development				x	x	x	x	x	x
D5.5 Satellite product development			x	x	x	x	M		

M: Milestone and delivery date

D5.3 and D5.5 have been submitted since the last meeting in Sopron

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Previous Deliverables

D5.1: Report on instrumentation requirements of AE community

- Report submitted by deadline of 30th April 2017 (coordinated by Keri Nicoll)
 1. Developments required for existing sensors
 2. Instrument development of interest to general public
 3. Potential funding routes for instrument development



Report on instrumentation needs of atmospheric electricity community

D5.2: Recommendation report for future sensors

- Report submitted by deadline of 30th Oct 2018 (coordinated by Keri Nicoll and Kostas Kourtidis)
- Hundreds of copies printed and distributed to atmospheric electricity community at scientific meetings



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<https://creativecommons.org/licenses/by/3.0/>



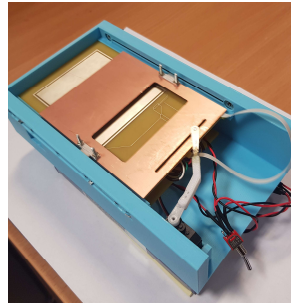
Funded by the Horizon 2020 Framework Programme of the European Union

D5.3 Sensor development

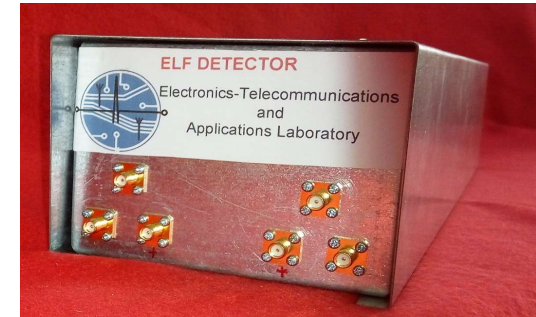
- Deliverable report submitted in April 2020, coordinated by Susana Barbosa
- Technical description, field tests and technology readiness level discussed



Miniature electric field meter
R.G. Harrison (UK)



Electric field sensor for
small UAVs
S. Chindea (UK)



Portable sensor for Schumann
resonances measurements
C. Votis (Greece)



Electrostatic detector
K. Kourtidis (Greece)



Microscintillator radioactivity detector
K. Aplin (UK)

D5.3 Sensor development

Technology readiness level and commercialisation of sensors

- Micro Scintillation radioactivity counter (Karen Aplin, Bristol) and Geiger ionisation sensor (Giles Harrison, Reading) are now available commercially
- Both are collaborations with electronics company – Asquared Technologies

Lessons learned from commercialisation

- Researchers must develop relationships with companies
- Companies generally look for a high level of technology readiness
- Researchers/company must work together to develop design specifications, higher level of sensor robustness, testing methods
- Developing a new sensor within a company is likely to be much simpler than from a university....(contractual agreements, IP issues)
- Companies may be interested in funding PhD students/consultancy work

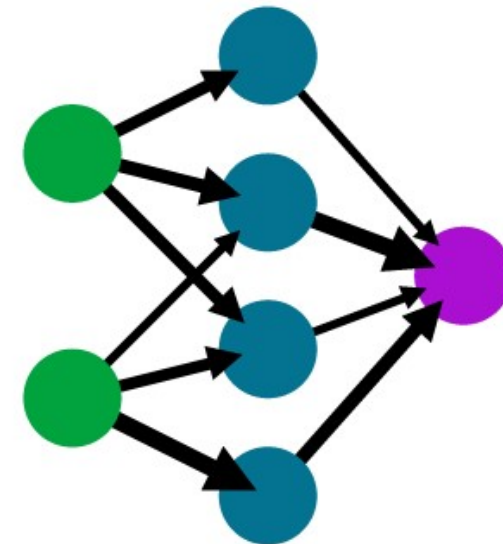
D5.4 Satellite product development

- Deliverable report submitted in Nov 2019
- Coordinated by Kostas Kourtidis and Yaroslav Vykyuk

- Aim: to derive surface fair weather PG by combining model results with low level satellite data
- Could attempt a numerical model but this would be highly complex (needs radon and ion balance calculations)
- Deep learning technique used with neural networks (i.e computer learns to perform some task by analysing training examples)

A simple neural network

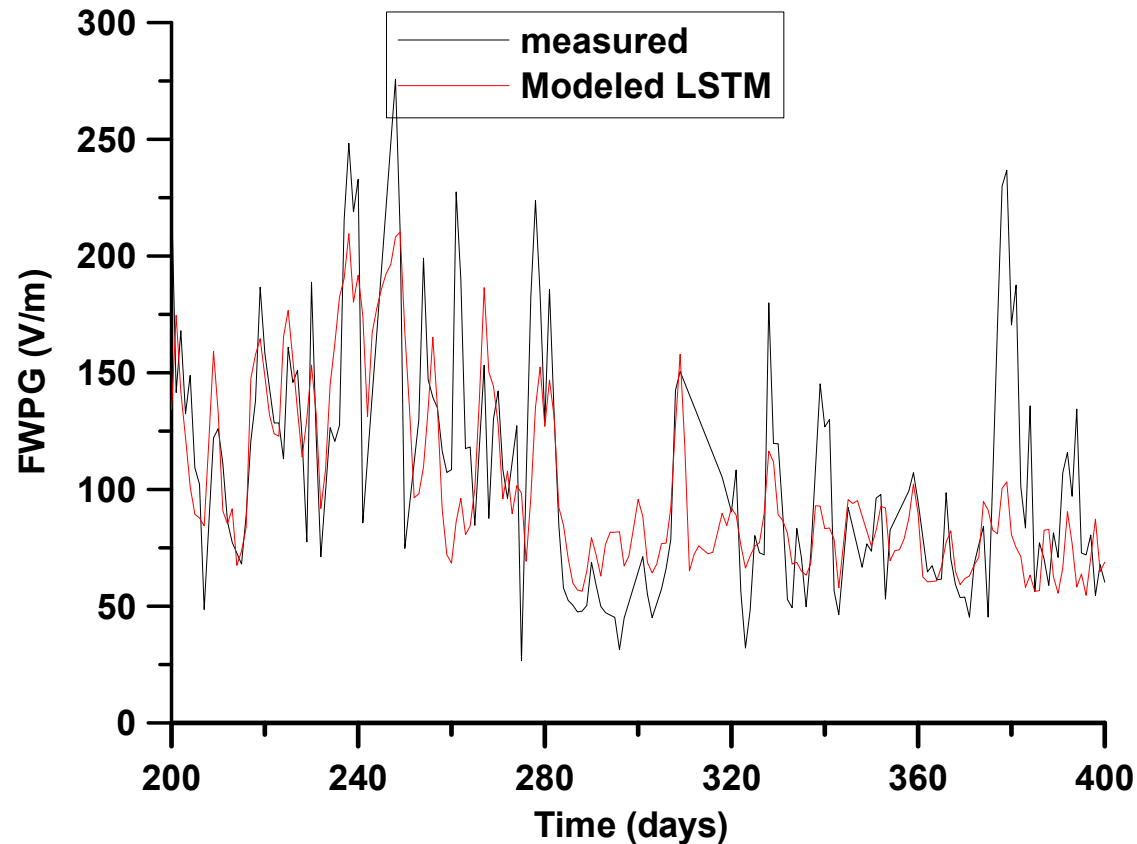
input layer hidden layer output layer



D5.4 Satellite product development

Input data

- Mean daily FW PG data from Xanthi, Greece
- Surface wind speed, wind direction, temperature, RH, pressure, precipitation, and specific humidity



- Future - Modis satellite data on aerosol, water vapour and clouds

WG5 - Additional Activities

WG5 related STSMs

- Veronika Barta: Parallel measurement with two Field Mill instruments at the Swider Geophysical Observatory
- Roy Yaniv: Familiarisation with use of conductivity sensors
- Hripsme Mkrtchyan: Use of reanalysis data in atmospheric electricity studies
- Vasiliki Daskalopoulou : Visit to University of Hertfordshire

Special issue of History of Geo and Space Sciences: Atmospheric electrical observatories

Dr Karen Aplin, University of Bristol (Karen.aplin@bristol.ac.uk)

- Open access journal, ongoing special issue, no closing date
- So far we have 2 papers published! Thanks to Jozsef Bor and his team, and Giles Harrison for their efforts.
- **Submissions welcomed:** reminder that
 - Aim of the Special Issue is to provide refereed, traceable links to information about historical atmospheric electricity observatories and data
 - mainly as a reference source for use in contemporary research
 - also historical interest
- https://hgss.copernicus.org/articles/special_issue1042.html
- Our colleague Michael Rycroft has also been subject of an HGSS bio article, please have a look <https://hgss.copernicus.org/articles/11/105/2020/>

Special issue of History of Geo and Space Sciences: Atmospheric electrical observatories

Editor(s): Karen Aplin

► [More information](#)

This special issue covers the history and development of observatories where long-term data sets of atmospheric electrical measurements were obtained. It is related to the international COST action CA15211 – Atmospheric Electricity Network: coupling with the Earth system, climate and biological systems and the GloCAEM (Global Coordination of Atmospheric Electricity Measurements) project, funded by the UK Natural Environmental Research Council (NERC) under grant number NE/N013689/1.

Download citations of all papers

- Bibtex
- EndNote
- Reference Manager

03 Jul 2020

Introduction to the special issue “Atmospheric electrical observatories”

Karen L. Aplin

Hist. Geo Space. Sci., 11, 137–138, <https://doi.org/10.5194/hgss-11-137-2020>, 2020

08 Apr 2020

Measurements of atmospheric electricity in the Széchenyi István Geophysical Observatory, Hungary

József Bór, Gabriella Sători, Veronika Barta, Karolina Szabóné-André, Judit Szendrői, Viktor Wesztergom, Tamás Bozóki, Attila Buzás, and Dávid Koroncay

Hist. Geo Space. Sci., 11, 53–70, <https://doi.org/10.5194/hgss-11-53-2020>, 2020

► [Short summary](#)

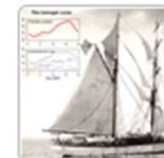
11 Sep 2020

Behind the curve: a comparison of historical sources for the Carnegie curve of the global atmospheric electric circuit

R. Giles Harrison

Hist. Geo Space. Sci., 11, 207–213, <https://doi.org/10.5194/hgss-11-207-2020>, 2020

► [Short summary](#)



Historical datasets

GLOCAEM

- GLObal Coordination of Atmospheric Electricity Measurements -

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[PUBLICATIONS AND CONTACT](#) • [HISTORICAL DATASETS](#) • [FAQS](#)

Historical datasets

Historic atmospheric electricity measurements can be valuable for contemporary science and technology, e.g. they can contribute to climatological studies of convective storms as well as

- List of historical datasets has been compiled by Karen Aplin (University of Bristol)

- Now available on GloCAEM website:

<https://glocaem.wordpress.com/historical-datasets/>

start	finish	quantity	location	reference
c1800	c1820	"AE"	Tubingen, Germany	McAdie, A, The electrification of the atmosphere, Terr. Magn., 2,2, 61-67 http://dx.doi.org/10.1029/TM002i002p00061 (1897)
c1816	1818	"AE"	Arctic Ocean	Volume III of <i>The Arctic Whaling Journals of William Scoresby the Younger</i> (Hakluyt Society Series 3, nos 12, 20 and 21)
1830s		"electricity"	Fyne Court, Broomfield, Somerset, UK	Scully, D, The Electric Eccentric, Somerset Life, Jan 2011, pp42-43
1839	1839	?	Dublin, Ireland	McAdie, A, The electrification of the atmosphere, Terr. Magn., 2,2, 61-67 http://dx.doi.org/10.1029/TM002i002p00061 (1897)

Further contributions should be sent to:

Karen.aplin@bristol.ac.uk

Summary

Objectives:

- To foster the development of new generation instrumentation for the needs of the AEF research community

Achieved

- To pursue the development of a new satellite product for the remote sensing of PG

Achieved

Thanks to all WG5 members for your input and efforts!