Integrating High Resolution Solar Physics

WP2 and WP9

General Assembly
Zoom, 5 february 2021

Dan Kiselman, Stockholm University

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824135.

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WP2 & WP9

- WP2: Coordination for improved exploitation of solar physics infrastructures
- WP9: Trans-National Access Programme

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824135.

This presentation

1. Other WP2-activities
2. Trans-National Access Programme

Virtual Access Programme to be presented by Mats Carlsson … next Friday.

WP2

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824135.

22 deliverables!

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D2.1	1st Report on the activities of the EAST TAC and promotion of the Access programmes	4 - SU	Report	Public	18
D2.2	2nd Report on the activities of the EAST TAC and promotion of the Access programmes	4 - SU	Report	Public	36
D2.3	3rd Report on the activities of the EAST TAC and advertisement of the Access programmes	4 - SU	Report	Public	48
D2.4	Minutes from Forum meeting 1	4 - SU	Report	Public	12
D2.5	Minutes from Forum meeting 2	4 - SU	Report	Public	24
D2.6	Minutes from Forum meeting 3	4 - SU	Report	Public	36
D2.7	Minutes from Forum meeting 4	4 - SU	Report	Public	48
D2.8	General guidelines for co-ordinated solar observations	11 - AIP	Report	Public	36
D2.9	Guidelines for co-observations between ALMA and ground-based solar telescopes	16 - ASU	Report	Public	24
D2.10	Guidelines for service observations	4 - SU	Report	Public	36
D2.11	Report on networking activities for instrumentation 1	2 - IAC	Report	Public	18
D2.12	Report on networking activities for instrumentation 2	2 - IAC	Report	Public	36
D2.13	Report on networking activities for instrumentation 3	2 - IAC	Report	Public	48
D2.14	Report on networking activities for turbulence control 1	1 - KIS	Report	Public	18
D2.15	Report on networking activities for turbulence control 2	1 - KIS	Report	Public	36
D2.16	Report on networking activities for turbulence control 3	1 - KIS	Report	Public	48
D2.17	Report on the inventory of existing software and expressed needs for solar physics data tools	13 - USFD	Report	Public	18
D2.18	Update on metadata recommendations for observational data	3 - UiO	Report	Public	18
D2.19	Final metadata recommendations for observational data	3 - UiO	Report	Public	48
D2.20	First report on metadata recommendations for simulation data	3 - UiO	Report	Public	18
D2.21	Final report on metadata recommendations for simulation data	3 - UiO	Report	Public	48
D2.22	Report on Big-Data storage possibilities	1 - KIS	Report	Public	36

Description of deliverables

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824135.

WP2.1.2 Forum for Solar Telescopes and Databases.
Lead SU. Participants: all interested partners.

1st Forum was held in Stockholm 26 Nov 2019.
2nd Forum was held in Zoom-space 26 Nov 2020.
3rd Forum – Will it take place in Oslo this autumn?

D2.4 Minutes from Forum meeting 1 M12

D2.5 Minutes from Forum meeting 2 M24

D2.6 Minutes from Forum meeting 3 M36

2nd SOLARNET Forum for telescopes and databases

Date: Thursday 26 November 2020, 10:00-12:00 and 13:30-15:30 CET
Venue: Online Event via Zoom
Registration Deadline: 24 November 2020

Topics will cover:

* The Trans-national Access Programme: The solar telescopes GREGOR, SST, THEMIS, and VTT plus the Piz Daint supercomputer

* The Virtual Access Programme: Databases for solar data and their use.

* Presentations and discussions on issues related to telescope and database operations and use.

Anyone with an interest in high-resolution solar physics is welcome to register. This specifically includes current or potential users of the sol

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WP2.1.3 Coordinated observations.

Lead: AIP. Participants: SU, KIS, CNRS, IAC, AISAS, MPG.

D2.8 Guidelines M36

WP2.1.4 Coordination between ALMA and ground-based solar telescopes.

Lead: ASU. Participants: SU, KIS, CNRS, MPG, HVAR, UiO.

D2.9 Guidelines M24

Work together!

WP2.1.5 Service mode observations.

Lead: SU. Participants: KIS, IAC, UiO, CNRS, QUB, INAF, UNICT, AIP.

D2.10 Guidelines M36

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WP2.2 JRA Coordination and dissemination of results

WP2.2.1 Networking for instrumentation activities. An **email-list** will be created and **on-line seminars** arranged to facilitate communication. A **workshop** on solar instrumentation representing mainly the activities of WP6 and WP8 will be arranged. **Lead: IAC.** Participants: WP6 and WP8 partners.

D2.11 First report on networking M18

D2.12 2nd report on networking M36

WP2.2.2 Networking for activities related to atmospheric turbulence and seeing. Networking will be facilitated between the involved partners with an **email-list** and **on-line seminars**. One **dedicated workshop** called "MCAO for EST" will be organised
Lead: KIS. Participants: WP7 partners, AIP, Aperio, ORB, UNIGRAZ.

D2.14 First report on networking M18

D2.15 2nd report on networking M36

MS4 "Workshops took place."

Postponed due to covid-19. When will they take place?

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WP2.2.3 Coordination of development of software tools for solar physics. **Lead: USFD.** Participants: SU, UiO, QUB, ASU, Aperio.

D2.17 Report on the inventory M18

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SOLARNET=1.0

WP2.2.4 Metadata definitions for observational data.
One physical **meeting** planned.
Lead: UiO. Participants: KIS, IAC, SU, CNRS, INAF, MPG, AIP, USFD, UCL, ASU, ORB, HVAR, AISAS, USI/IRSOL.

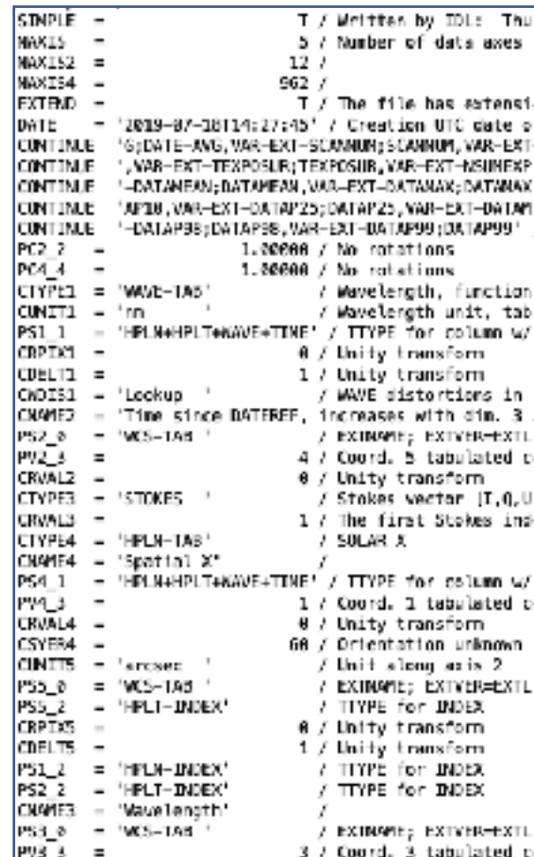
D2.18 Updated document M18

D2.19 Final document M48

WP2.2.5 Metadata definitions and database structure for numerical simulations. One joint **meeting** with WP2.2.4.
Lead: UiO. Participants: KIS, IAC, SU, MPG, USFD, UCL, USI/IRSOL.

D2.20 First report M18

D2.21 Final report M48



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WP2.2.6 Big-data storage. **Lead: KIS.** Participants: WP5 partners.

D2.22 Report M36

Data in the cloud or in-house?

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What is a TRANS-NATIONAL ACCESS PROGRAMME?

- Open research infrastructures to researchers from other countries.
- Infrastructures get paid.
- Travel for researchers to the facility.
- In our case: 2 researchers, administrated by the SOLARNET Project Office.

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This project aims at integrating the major European infrastructures in the field of high-resolution solar physics.

Total cost: 13.5 M€

EU grant: 10 M€

30% of that is for the Access programmes

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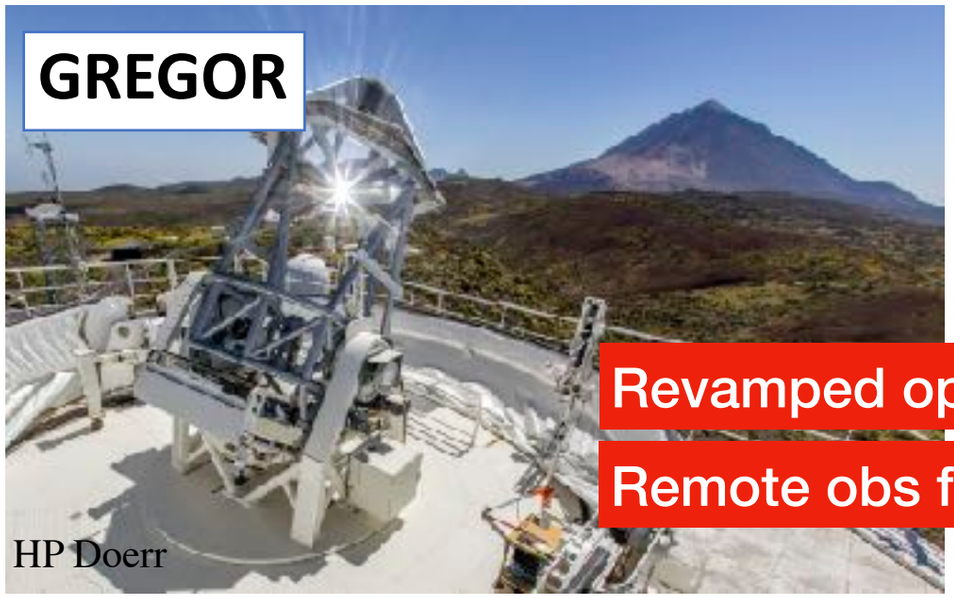
Ground-based telescopes

SOLARNET
Trans-national Access Programme



Revamped optical train

Remote obs from Freiburg possible

Adaptive optics

New vacuum window
Operations from summer 2021

Some time in service mode

Offering HeSP in 2022?

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Balloon-borne telescope

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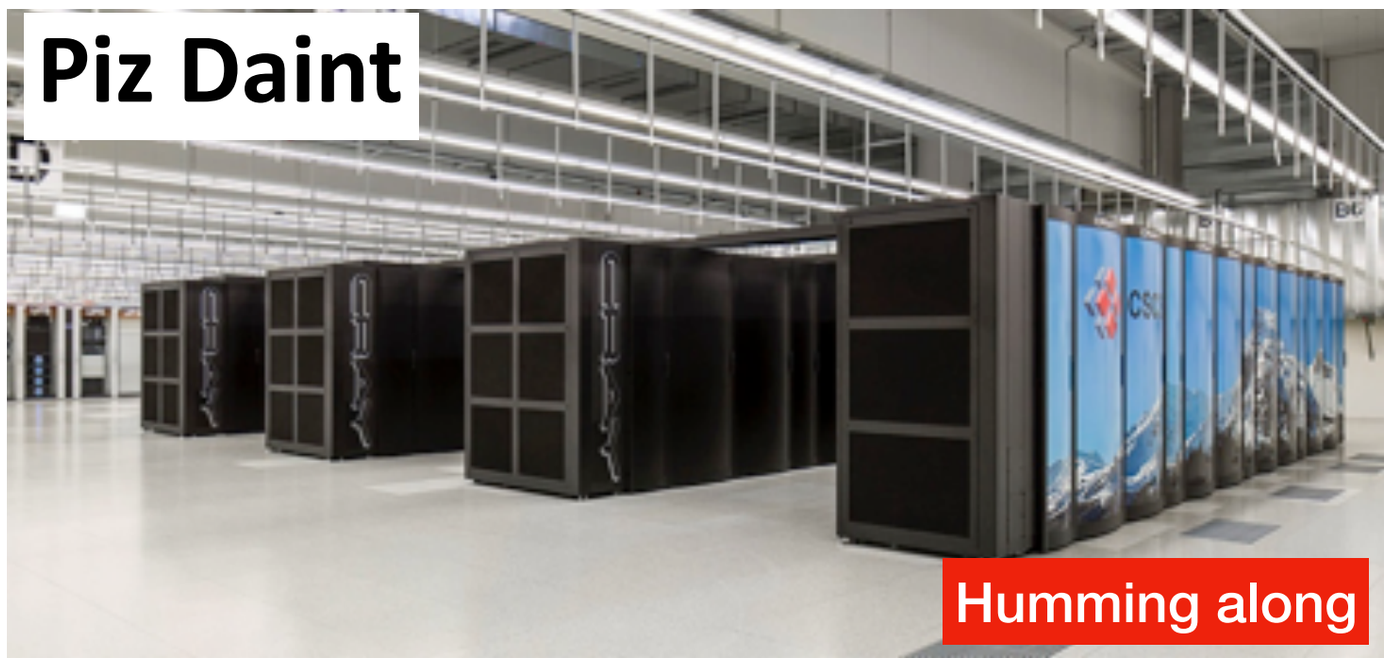
Supercomputer



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Awarding of time and coordination of the TNA.

EAST = European Association for Solar Telescopes

EAST TAC

Dan Kiselman (SU): SST, chair

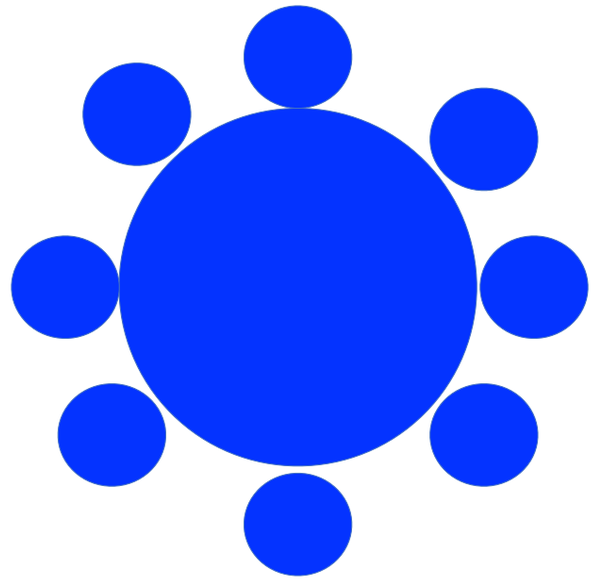
Bernard Gelly (CNRS): THEMIS

Saida Diaz (KIS): GREGOR, VTT

Marian Martinez (IAC): Spanish TAC

Andreas Lagg (MPG): SUNRISE

Oskar Steiner (USI/IRSOL & KIS): Piz Daint supercomputer



Distributes Access time in SOLARNET and also ITP for GREGOR, THEMIS, VTT.

Two external scientific referees for every call.

Time awarded on scientific merit, but priority to users who:
- have not previously used the installation.
- are working in countries where no equivalent research infrastructure exist.

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Nationality rules

- The PI and at least half of the Co-I's must be from an EU or associated country (including UK) *except* for the country of the facility.

	"Excluded" countries
GREGOR & VTT	DE, ES
THEMIS	FR, ES
SST	SE, ES
SUNRISE 3	DE
Piz Daint	CH

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Non-associated third countries

- Allowed up to a limit of 20%.
- Our plan, after it has become clear that UK is still ”associated”, is to allow 20% for the ground-based telescopes, jointly.
- 2021 calls for GREGOR, SST, THEMIS, VTT are thus open to the world.

Requested by the Mid-Term Review

Common application form for the Access Programme

To be bundled with individual forms for each facility.

It worked for 2021A!

Application to the

SOLARNET

Transnational Access Programme

for the 2021A observing season: GREGOR, SST, THEMIS

To be sent by email, together with the appropriate detailed proposal forms for the wanted telescope(s) as pdf files, to `east-tac@astro.su.se` no later than 25 January 2021 23:59 UT.

Project name

Observations of minute details in major structures

Applicant information

Role	Name	Email	Affiliation (Country)
PI	A. Person	`a.person@solar.ac.uk`	Solar Institute (UK)
CoI	A. Nother Person	`a.n.person@solar.fr`	Institute Solaire (FR)
CoI	Also A. Person	`a.a.person@solar.no`	Solinstituttet (NO)

Observations programme information

We apply for observations with the following instruments.

Days	Telescope	Instruments	Countries	PI new to the facility	Expected observing period
	GREGOR		DE, ES		Apr–Aug
10	SST	CRISP, CHROMIS	SE, ES	✓	Apr–Oct
10	THEMIS	Something	FR, ES		Apr–Oct

If two or more telescopes are requested then this will be taken as an application for coordinated observations to be accepted or rejected in its entirety. For the possibility of using only one telescope, please submit a separate proposal for that telescope.

Appendices: 1. SST proposal form. 2. THEMIS proposal form.

Legal

Applications must follow these rules:

- PI's affiliation country cannot be the same as the telescope country (owner and location). The same applies to the majority of the CoIs.
- This call will allow applications also from countries that are not EU members or associated states.
- You must acknowledge support from SOLARNET when publishing results. You must also report to SOLARNET about publications. See `https://solarnet-project.eu/Acknowledgement-SOLARNET-EU-funding`.

By submitting this application, the PI certifies that they follow the rules above and that they are aware of the paragraph below.

Data will become public one year after delivery to the PI.

The SOLARNET Transnational Access Programme has received financial support from the European Union's Horizon 2020 research and innovation program under grant agreement No. 824135.

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Calls for SOLARNET TNA		Deadline	Oversub-scription	
2019 (A)	GREGOR, VTT, SST, THEMIS	20 Jan 2019	3.2	18 proposals, 8 accepted
2019 B	GREGOR, VTT	2 Jun 2019	1.7	5 proposals, 3 accepted
2019 PD	Piz Daint	24 Oct 2019	0.75	5 preproposals => 2 full proposals, all accepted
2020	SST, THEMIS	20 Jan 2020	1.4	5 proposals, 5 accepted – 4 executed in service mode, 1 rolled over to 2021
2020 A	GREGOR (science verification), VTT	19 Apr 2020	0.33	1 VTT proposal accepted – rolled over to 2021
2020 B	GREGOR, VTT	19 Sep 2020	0.5	1 GREGOR proposal accepted.
2020 PD	Piz Daint	31 May/30 Sep 2020		7 proposals => 4 full proposals, 3 accepted, 1 in limbo
2021 (A)	GREGOR, SST, THEMIS	25 Jan 2021		Several proposals…

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COVID-19 impact on the TNA

Spanish lockdown closed observatories. Travel restrictions for most of the rest of the year: staff and/or observers couldn't travel.

- SST managed to operate with a single staff member during 4 months. In the end delivered 23 d in service mode.
- GREGOR "revamp" in the spring, observing season was planned to start late. Managed to deliver 10 d in remote service mode.
- VTT could never operate.
- THEMIS could not execute the proposal that was accepted.
- Piz Daint has kept operating.
- Two proposals that could not be executed were rolled over to 2021.

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WP9 Access statistics – end of 2020

	Units delivered (planned) in 2020	Units delivered 2019-2020	Minimum quantity of Access	Percentage provided	PI countries
GREGOR [d]	10 (30)	56	143	39 %	**3UK, SK, CZ, IT**
SST [d]	23 (25)	37	85	44 %	2DE, **GR, 2UK, AT**
THEMIS [d]	0 (16)	14	80	18 %	**IT**
VTT [d]	0 (20)	10	75	13 %	**CZ**
SUNRISE 3 [h]	0 (0)	0	11	0 %	none
Piz Daint [knodeh]	*270* (375)	*270*	1500	*18 %*	SE, DE

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Gleanings from statistics and questionnaires

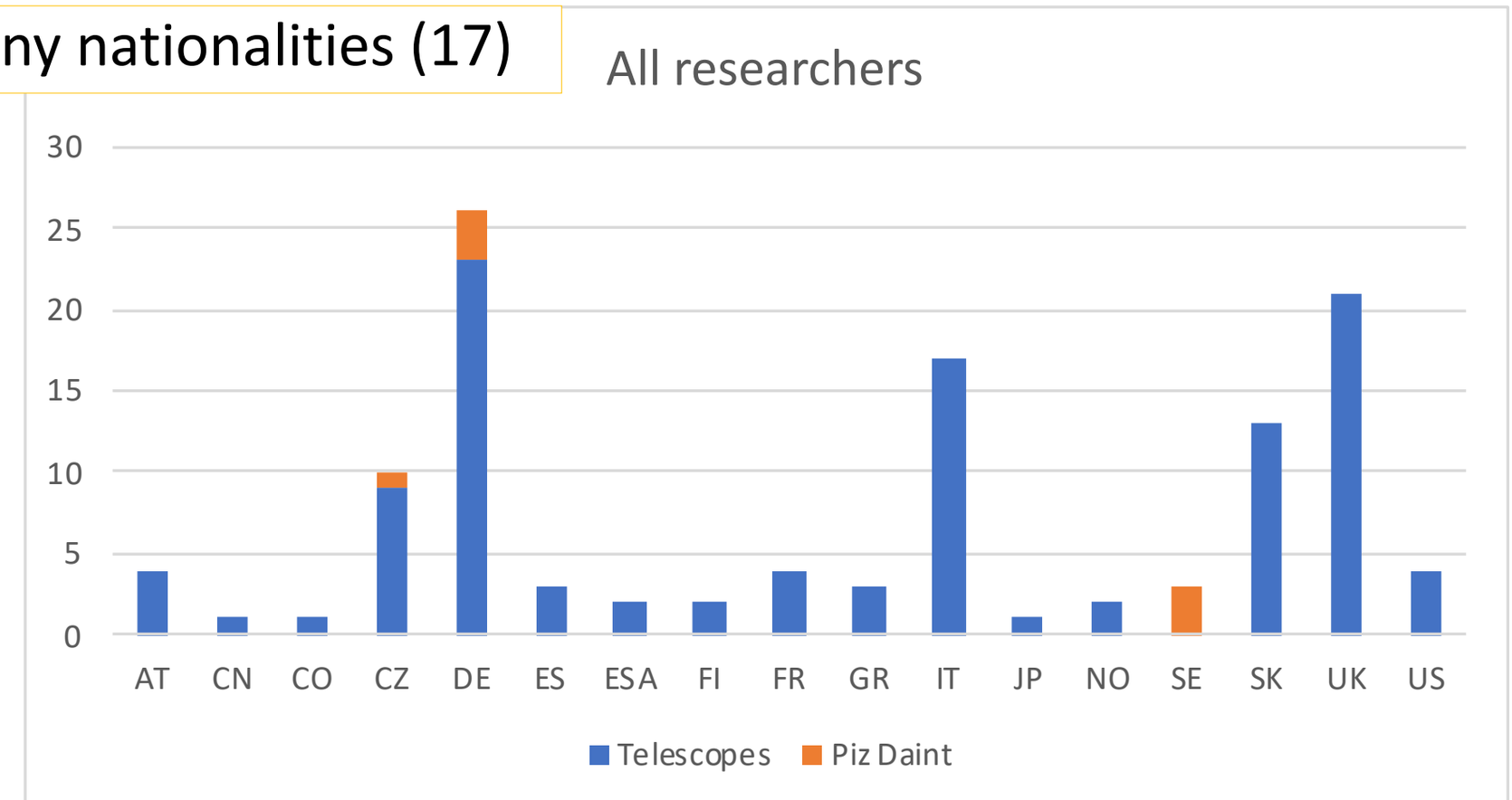
Questionnaire: Users generally content, but don't understand that they wouldn't have got access otherwise and how expensive the time is.

Piz Daint demanding to use.

Female/Male fraction for PI's of accepted proposals = 40%/60%.
For all proposals = 35%/65%

All accepted projects were within the field of solar physics, except the one for THEMIS which was on the planet Mercury.

Many nationalities (17)



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SOLARNET TNA impact

Three publications in our records: Fischer, Abbasvand, Campbell

The Astrophysical Journal Letters, 903:L10 (7pp), 2020 November 1 https://doi.org/10.3847/2041-8213/a

Interaction of Magnetic Fields with a Vortex Tube at Solar Subgranular Scale

C. E. Fischer[1], G. Vigeesh[1], P. Lindner[1], J. M. Borrero[1], F. Calvo[2], and O. Steiner[1,3]
[1] Leibniz Institute for Solar Physics (KIS) Schöneckstrasse 6, D-79104 Freiburg, Germany; cfischer@leibniz-kis.de
[2] Institute for Solar Physics, Dept. of Astronomy, Stockholm University AlbaNova University Centre, SE-106 91 Stockholm, Sweden
[3] Istituto Ricerche Solari Locarno (IRSOL) Via Patocchi 57, 6605 Locarno-Monti, Switzerland
Received 2020 August 19; revised 2020 September 17; accepted 2020 September 17; published 2020 October 27

Abstract

Using high-resolution spectropolarimetric data recorded with the Swedish 1 m Solar Telescope, we have identified several instances of granular lanes traveling into granules. These are believed to be the observational signature of underlying tubes of vortical flow with their axis oriented parallel to the solar surface. Associated with these horizontal vortex tubes, we detect in some cases a significant signal in linear polarization, located at the trailing dark edge of the granular lane. The linear polarization appears at a later stage of the granular lane development, and is flanked by patches of circular polarization. Stokes inversions show that the elongated patch of linear polarization signal arises from the horizontal magnetic field aligned with the granular lane. We analyze snapshots of a magnetohydrodynamic numerical simulation and find cases in which the horizontal vortex tube of the granular lane redistributes and transports the magnetic field to the solar surface causing a polarimetric signature similar to what is observed. We thus witness a mechanism capable of transporting magnetic flux to the solar surface within granules. This mechanism is probably an important component of the small-scale dynamo supposedly acting at the solar surface and generating the quiet-Sun magnetic field.

Unified Astronomy Thesaurus concepts: Solar photosphere (1518); Solar granulation (1498); Solar magnetic fields (1503); Magnetohydrodynamical simulations (1966); Magnetohydrodynamics (1964)

Supporting material: animations

A&A 642, A52 (2020)
https://doi.org/10.1051/0004-6361/202038559

Astronomy & Astrophysics

Observational study of chromospheric heating by acoustic waves

V. Abbasvand[1,2], M. Sobotka[1], M. Švanda[1,2], P. Heinzel[1], M. García-Rivas[1,2], C. Denker[3], H. Balthasar[3], M. Verma[3], I. Kontogiannis[3], J. Koza[4], D. Korda[2], and C. Kuckein[3]

[1] Astronomical Institute of the Czech Academy of Sciences (v.v.i.), Fričova 298, 25165 Ondřejov, Czech Republic
e-mail: vahid.abbasvand.azar@asu.cas.cz
[2] Astronomical Institute of Charles University, Faculty of Mathematics and Physics, V Holešovičkách 2, 180 00 Praha 8, Czech Republic
[3] Leibniz-Institut für Astrophysik Potsdam, An der Sternwarte 16, 14482 Potsdam, Germany
[4] Astronomical Institute, Slovak Academy of Sciences, 059 60, Tatranská, Lomnica, Slovakia

Received 2 June 2020 / Accepted 5 August 2020

ABSTRACT

Aims. Our aim is to investigate the role of acoustic and magneto-acoustic waves in heating the solar chromosphere. Observations in strong chromospheric lines are analyzed by comparing the deposited acoustic-energy flux with the total integrated radiative losses.
Methods. Quiet-Sun and weak-plage regions were observed in the Ca II 854.2 nm and Hα lines with the Fast Imaging Solar Spectrograph (FISS) at the 1.6-m Goode Solar Telescope on 2019 October 3 and in the Hα and Hβ lines with the echelle spectrograph attached to the Vacuum Tower Telescope on 2018 December 11 and 2019 June 6. The deposited acoustic energy flux at frequencies up to 20 mHz was derived from Doppler velocities observed in line centers and wings. Radiative losses were computed by means of a set of scaled non-local thermodynamic equilibrium 1D hydrostatic semi-empirical models obtained by fitting synthetic to observed line profiles.
Results. In the middle chromosphere ($h = 1000$–1400 km), the radiative losses can be fully balanced by the deposited acoustic energy

Astronomy & Astrophysics manuscript no. aanda
February 2, 2021

Temporal evolution of small-scale internetwork magnetic fields i the solar photosphere

R. J. Campbell[1], M. Mathioudakis[1], M. Collados[2, 3], P. H. Keys[1], A. Asensio Ramos[2, 3], C. J. Nelson[1], D. Kuridze[4] and A. Reid[1]

[1] Astrophysics Research Centre, Queen's University of Belfast, Northern Ireland, BT7 1NN, UK
email: rcampbell55@qub.ac.uk
[2] Instituto de Astrofísica de Canarias, Vía Láctea s/n, E-38205 La Laguna, Tenerife, Spain
[3] Dept. Astrofísica, Universidad de La Laguna, E-38205, La Laguna, Tenerife, Spain
[4] Department of Physics, Aberystwyth University, Ceredigion, Cymru, SY23 3BZ, UK
[5] Abastumani Astrophysical Observatory, Mount Kanobili, 0301 Abastumani, Georgia

Received 30 November 2020 / accepted 31 January 2021

ABSTRACT

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Important!

- Access recipients must **acknowledge** SOLARNET in their publications (also talks!).
- Do report *all* publications (and talks!) to SOLARNET-office@leibniz-kis.de

https://solarnet-project.eu/Acknowledgement-SOLARNET-EU-funding

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Calls in 2021

SOLARNET 2020(A) call Dec 1

- Deadline Jan 25
- GREGOR, SST, THEMIS
- Being processed!

GREGOR & VTT 2020B, deadline in June?

SOLARNET Piz Daint call in April, deadline September.

SUNRISE 3 call towards the end of the year.
Exact rules yet to be defined.

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Trans-national Access Programme: Challenges

- Scheduling and observing modes in 2021?
- Delivering all Access that we promised.
- Training and assistance for Piz Daint applicants.
- Advertising for coming calls. Stress that non-associated countries are allowed (if quota allows it).
- Remind users to acknowledge support and report publications.

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Cross-WP challenges

Data from Access programmes must be made public after one year

- Archive of computed data.
- Responsibility for computed data while waiting for the archive is on the user.
- What is the data license for ”public” data?