



Hosting Agreement for Visiting Researchers in Sweden

Appendix to application

This Hosting Agreement should be used for researchers from outside the EU, EEA or Switzerland invited by a research funding body (institution, organisation, company, etc.) to conduct research in Sweden for a period of over three months.

The Hosting Agreement is a prerequisite for the research funding body to be able to receive the researcher and for the researcher to be able to obtain a residence permit. The Agreement constitutes part of the researcher's application for a residence permit to conduct research or when applying for an extension to their stay.

Through the Agreement, the research funding body undertakes to receive the researcher and the research undertakes to conduct the research project. The agreement must therefore be signed by both the research funding body and the researcher. If a signature is missing, it will take longer to process the application. Provisions regarding hosting agreements are included in the Swedish Act on Approval of Research Organisations to Host Visiting Researchers (SFS 2008:290).

You can also find this form, together with further information, on our website at www.migrationsverket.se. Please complete the form on your computer as this makes it easier for us to process the case.

1. Parties to this Agreement

This Agreement applies between the following research funding body and researcher.

1a. Research funding body

Institution, company, etc. Luleå University of Technology	Organisation/Company Reg. No. 202100-2841
Address 971 87 Luleå	

1b. Researcher

Surname Tatrari	First name Gaurav
Date of birth (DD.MM.YYYY) 19.06.1994	Gender ☒ Male ☐ Female
Nationality India	Current place of residence (town/city and country) Haldwani, Indien

2. Contact person at the research funding body

Title Associate Professor	Name Faiz Ullah Shah
Telephone 0920-491291	Email address faiz.ullah@ltu.se

3. Details of research project

Provide a brief description of the research project, how it is being funded and the researcher's role in the project:

The Division of Chemical Engineering has announced a post-doc scholarship within the research subject "Chemistry of interfaces" with a research focus on novel ionic liquid-based electrolytes for batteries and supercapacitors.

The project is planned to start as soon as possible and run for two years, funded through a stipend by the Kempe Foundation.

Date: 1st Aug. 2022

Dear Dr. Sandeep Pandey

I am delighted to announce that I have finally decided to hire you as a postdoc fellow in our group. This is the best way to quickly join our lab. All financial support will be paid entirely from my research budget for the time being. It will start from 40 million Korean Won per year including essential insurance. We will find new/additional supporting methods after entering Korea. This includes the application for a research assistant professorship at Konkuk University. You can also apply for the Korean government's research projects as PI under my guidance. Therefore, labor costs are expected to be paid more than the suggested minimum and will increase according to research achievements.

I hope you can join our lab ASAP. I really hope that you can be an excellent addition to our lab. From now on, let's start the related paperwork for entry, such as obtaining a visa, etc. It seems very complicated, but please see the Immigration office (<https://www.immigration.go.kr/immigration/index.do>), school authorities in KU, and/or your acquaintance. From the 1st contact with KU office, I informed several things. Let's explore each other for further action.
Thank you.

Sincerely,

Man-Jong Lee

Man-Jong Lee, Ph.D
Professor
Nano-Device and Energy Chemistry Lab.
Dept. of Chemistry
Dept. of Advanced Technology Fusion
Konkuk University
1 Hwayang-dong, Gwangjin-ku,
Seoul 143-701, KOREA

Department of Electrical Engineering
Shandong University of Technology
Zibo, PR China

Phone. : +82-2-2049-6021, +82-2-2201-0627
Fax. : +82-2-452-3410
Cell : 010-9540-0629
Home : <http://home.konkuk.ac.kr/~leemtx>

RAMAN-CHARPAK FELLOWSHIP 2019



SCIENTIFIC / TOUR REPORT

1. Personal Information:

Name of the Fellow:	Reetika Joshi
Nationality:	Indian
Passport Number:	N4293712
Address and contact details:	Reetika Joshi, Department of Physics, DSB Campus, Kumaun University, Nainital, 263002 Mobile: +91 7060360313

2. Academic Information:

PhD registered University:	Kumaun University, Nainital, India
Name of institute/lab of PhD work	Department of Physics, DSB Campus, Kumaun University, Nainital
Present Position:	Senior Research Fellow (SRF)
Name of your PhD supervisor:	Prof. Ramesh Chandra
Title of PhD work:	Study of Solar Jets and Related Flares

3.Host Institution/University details (*Institute/University you have visited under the Raman-Charpak Fellowship*):

Name of the host supervisor:	Dr. Guillaume Aulanier
Address of the host Institution/University:	Observatoire de Paris, LESIA 5 place Jules Janssen 92195 Meudon Cedex, France Email : guillaume.aulanier@obspm.fr Phone: +33 1 4507 7146
Exact duration of Fellowship availed (mention the dates):	From 13 January 2020 to 26 May 2020

4.Details of research work done during the fellowship:

a) Title of Research Work: Formation and Dynamics of Solar Jets

b) Background: Solar active phenomena can be divided into two categories namely: Large scale activities (solar filament eruption, solar flares, CMEs) and small scale activities (ellerman bombs, solar jets). The large scale activities can affect our space weather directly however, there are cases where the small scale events can also be associated with CMEs and affect the space weather. One of the important small scale solar activity is solar jet. These are defined as the small scale plasma ejection from the solar surface to coronal heights and these are observed in the wide range of electromagnetic spectra such as: H-alpha (Roy 1973; Schmieder et al. 1988; Uddin et al. 2012), Ca II H (Shibata et al. 2007; Chifor et al. 2008), Extreme Ultraviolet (EUV) (Alexander & Fletcher 1999; Joshi et al. 2017) and soft X-ray (Shibata et al. 1992; Sterling et al. 2015). Very often, solar jets are associated with solar flares, which are the explosive beam of energy upto several tens of MeV. Based on the morphological description of coronal jets using the Hinode/XRT data, Moore et al. 2010 divided the solar jets into two categories, named as ‘standard’ and ‘blowout’ jets. Standard jets have a narrow spire with a relative dim base, whereas the blowout jets reveal an initial phase quite similar to standard jets, but with a bright base and a narrow spire. This is afterwards

followed by a violent flux rope eruption and then consequent broadening of the spire (Moore et al. 2013). Later on this violent flux rope eruption can be observed as CMEs (Liu et al. 2015). Magnetic reconnection is generally accepted for the trigger mechanism of solar jets (Aulanier et al. 2005). However, how and where the magnetic reconnection initiated is still debatable. To explain the trigger mechanism of solar jets, first dynamical model in two dimensions (2D) was proposed (Yokoyama & Shibata 1995, 1996; Nishizuka et al. 2008). In this 2D model the magnetic reconnection was driven by flux emergence. Currently X-ray or EUV jets are being modeled in three dimensions (3D). According to the 3D model, jets are caused by the interaction of an emerging magnetic bipole with the preexisting coronal magnetic field (Archontis & Hood 2012; Moreno-Insertis & Galsgaard 2013). Pariat et al. (2009) did 3D numerical simulations for the jets imposing the horizontal photospheric motion of polarities.

c) Objective(s): Solar jets are oftenly associated with solar flares and sometimes accompanied by CMEs which can produce accelerated particles in the shock front and participated actively to the space weather activity. Despite of the major advances on both observational and theoretical investigations, the underlying physical mechanisms which trigger solar jets, associated flares and CMEs are not completely understood. The major questions related to the understanding of the potential relation of solar jets with solar flares and CMEs includes : What is the relationship between solar jets and flares?; How does an interaction take place between a small scale eruption (solar jet) and a large scale eruption (CME)?; Are the hot and cold jets have same or different mechanisms? The observations show that jets can be topologically complex and may contribute to the heating of the solar corona and the acceleration of the solar wind. Therefore in order to understand the solar jets and associated flares, our plans are as follows :

- Large scale solar eruptions are sometimes in the form of geomagnetic storms, directly affect our space weather. Solar jets are small scale eruption associated with these large scale eruptions, hence our main objective is to understand the triggered mechanism of solar jets and its relation with these large scale eruptions such as: solar flares and CMEs.
- For probing the nature of explosive solar flares and CMEs, it is helpful to have a detailed analysis of the small scale key factor behind them. So the another objective is to explain the dynamics and kinematics of the solar jets with the help of various space borne satellites such as: SDO, IRIS and ground based observatory such as: MSDP spectrograph at Meudon Paris.

- Do all jets triggered at high altitude magnetic reconnection or it can occur at any height of the solar atmosphere. This can be understood by the magnetic topology. Therefore we aim to study the magnetic topology at the location of solar jets and flares.

d) Methodology/Work done: Solar jets are small scale mass eruptions from the solar surface and are suggested to be the key for large scale eruptions and are related to emerging and cancelling magnetic flux. Jets could be one element for triggering filament eruptions and finally CMEs. We have a few case studies to analyse. We would like to define the characteristics which are the same for all these events. Numerical simulations could be applied using their main characteristics as boundary conditions. Numerical simulations would be used as a tool to see if the physical proposed mechanism can work in a certain magnetic field configuration.

We have studied different solar activities like solar filament eruption, flare, and jet eruption. To achieve the proposed objectives, we plan to use the observational data from the various space borne satellites and ground based observatories. The description of the data is as follows:

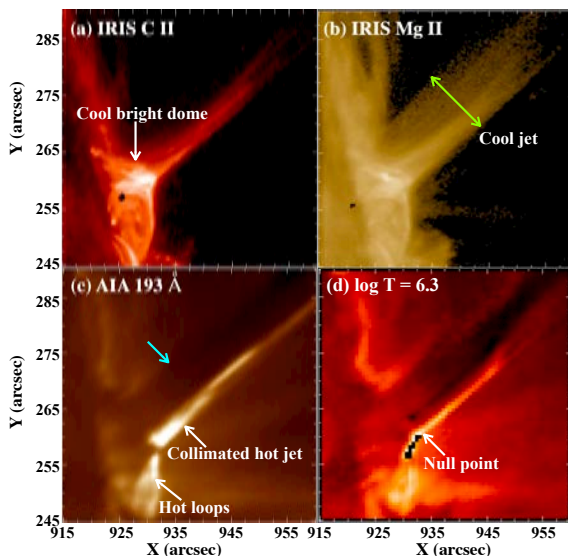
- **SDO Data :** For the multi-wavelength study of solar jets and flares, we use the high spatial and temporal resolution SDO data. The SDO satellite contains three instruments : Atmospheric Imaging Assembly (AIA, Lemen et al. 2012), Extreme Ultraviolet Variability (EUV, Woods et al. 2011) and Helioseismic Magnetic Imager (HMI, Schou et al. 2011). In our study we will use the data from AIA and HMI instruments. AIA observed the sun at seven different wavelengths (94 Å, 131 Å, 171 Å, 211 Å, 304 Å, 335 Å, and 1600 Å) in EUV and UV spectral lines. The spatial and temporal resolution of SDO/AIA are 0.6 arcsec and 12 sec respectively. This high spatial and temporal resolution data allow us to observe the solar jets and flares with a deeper understanding. The SDO/HMI observes the different component of photospheric magnetic field data. Therefore to understand the magnetic causes of solar jets, we use HMI data with spatial resolution of 0.5 arcsec and temporal resolution upto 45 seconds.
- **IRIS Data :** For the spectroscopic observations of jets, we will use the data from Interface Region Imaging Spectrograph (IRIS, Pontieu et al. 2014). This spectrograph contains a 19 cm Cassegrain telescope with a feeding of a dual range UV spectrograph and a slit jaw imager with 0.16 pixel and four 2061×1056 CCDs. The spatial and temporal resolution of IRIS is 0.4 and 2 sec, respectively. IRIS provides diagnostics from the photosphere to the corona, with a focus on the chromosphere and transition region.

- **Chromospheric Data :** For chromospheric evolution of cool jets/surges and solar flares, we will use H-alpha ($6563 \text{ \AA}$) data. In order to explain the photospheric observations we also use the H α data from some other ground based observatories, such as: Big Bear Solar Observatory (BBSO), and Global Oscillation Network Group (GONG).

e) Results obtained: Here are the results according to the work done from first to fourth month.

First Month: For the first month we worked on “**Case study of multi temperature coronal jets for emerging flux MHD models**” by **Reetika Joshi**, R. Chandra, B. Schmieder, F. Moreno-Insertis, G. Aulanier, D. Nóbrega-Siverio, and P. Devi. The work is now published in “**Astronomy and Astrophysics journal** (Impact factor: 6.2)”. The summary of the work is as follows:

Jets in the solar atmosphere have been studied with increasing intensity along the past decades. We aim to study six recurrent jets occurring in the active region NOAA 12644 on April 04, 2017. These jets are observed in all the hot filters of AIA and in cool temperatures in IRIS slit-jaw images with a high spatial resolution. The AIA filters allow us to study the temperature and the emission measure of the jets using the filter ratio method. We study the pre-jet phases by analysing the intensity oscillations at the base of the jets with the wavelet technique. A fine co-alignment of the AIA and IRIS data shows that the jets are initiated at the top of a canopy-like, double chambered structure with cool emission in one side and hot emission in the other side. The hot jets are collimated jets in the hot temperature filters with high velocities (around 200 km/s) and preceded by cool large laminar ejections in the same area with lower speed and identified ejected kernels (45 km/s). Before each jet, we find quasi-periodic intensity oscillations with a period between 2 and 6 minutes in phase with small ejections. This series of hot and cool jets defines a pure case-study of 3D jet MHD models as a result of emerging flux. The double-chambered structure corresponds to the existence of a null point, cool loops and hot reconnected loops. In MHD models between the emergence and the ambient magnetic field a current sheet (CS) with plasmoids is created. The plasmoids may launch torsional Alfvén waves and the kernels would be the result of the untwisting of the plasmoids in open magnetic field.



An example of observed solar jet with Atmospheric Imaging Assembly (AIA) onboard Solar Dynamics Observatory (SDO) and Interface Region Imaging Spectrograph (IRIS).

(available at: <https://arxiv.org/pdf/2005.06064.pdf>).

Second Month: For the second month we worked on “**Analysis of the evolution of a multi-ribbon flare and failed filament eruption**” with the solar group at Meudon France and scientists from Argentina and India. In this project we work on the formation of a solar filament by a whirl fibril around the sunspot and squeezed fibrils on May 09, 2019 in NOAA AR 12740. We also observed the filament with the GONG ground based instrument and found that it is well visible in H-alpha wavelength. We are analyzing the magnetic topology of the event and working for the magnetic field extrapolation at the filament location. This work is in progress and we are planning to submit it soon.

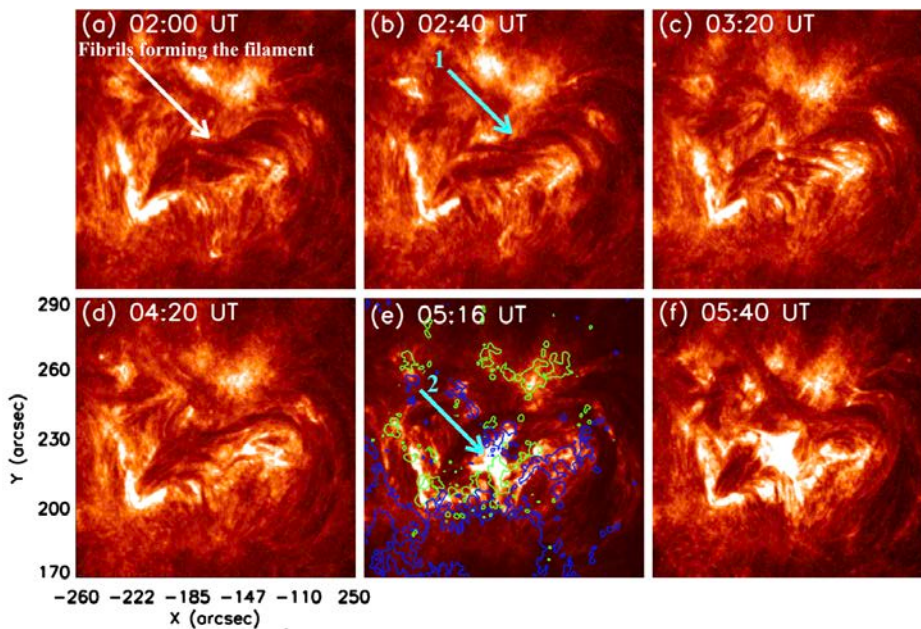


Figure shows AIA 304 Å observations which represent the formation of the solar filament by a whirl fibril around the sunspot and squeezed fibrils on May 09, 2019 from NOAA AR 12740. The polarity inversion line is nearly horizontal between negative (blue contours) and positive (green contours) magnetic field polarities. The two points (1 and 2) are showing the location of magnetic flux cancellation.

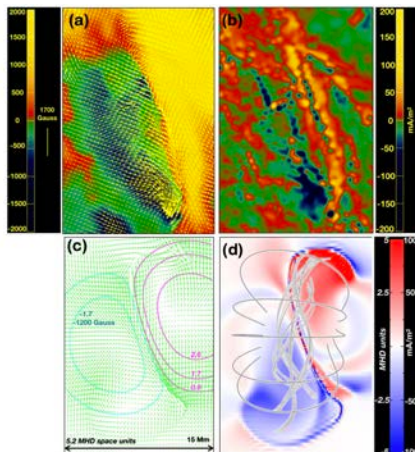
For the second month we worked on an another project entitled “**Observational evidences of current sheet formation and loop contraction during a prominence eruption**” by P. Devi, P. Démoulin, R. Chandra, **Reetika Joshi**, B. Schmieder, B. Joshi, C. Nous. The paper is submitted to **Solar Physics journal**. The summary is as follows:

We analysed the observations of a prominence eruption on 02 March 2015 associated with a GOES M3.7 class flare with AIA and the Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI). The AIA observations outline the erupting flux rope and the formation of a long and thin current sheet behind. RHESSI observations reveal the formation of a pair of foot-point sources and one loop-top source. Both AIA and RHESSI observations support the standard model of eruptive flares. The source region is a decaying bipolar AR where magnetic flux cancellation is present during several days before the eruption. This built the

observed sheared loops and plausibly the flux rope core. This configuration is close to the ones used in recent MHD simulations. Coronal observations show loops in contraction/expansion located on the side of the erupting flux rope. The earliest contraction occurs 19 minutes after the start of the prominence eruption indicating that this contraction is not associated with the eruption driver. Rather, this prominence eruption has the main characteristics of a torus unstable flux rope where the contraction/expansion of the lateral loop is due to a side vortex developing after the flux rope is launched.

Third Month: In the third month of my RC visit to France, I worked on “**Transfer of twist to a solar jet during reconnection**” by **Reetika Joshi**, Brigitte Schmieder, Guillaume Aulanier, Véronique Bommier, and Ramesh Chandra. The paper is submitted in **Astronomy and Astrophysics journal**. The summary is as follows:

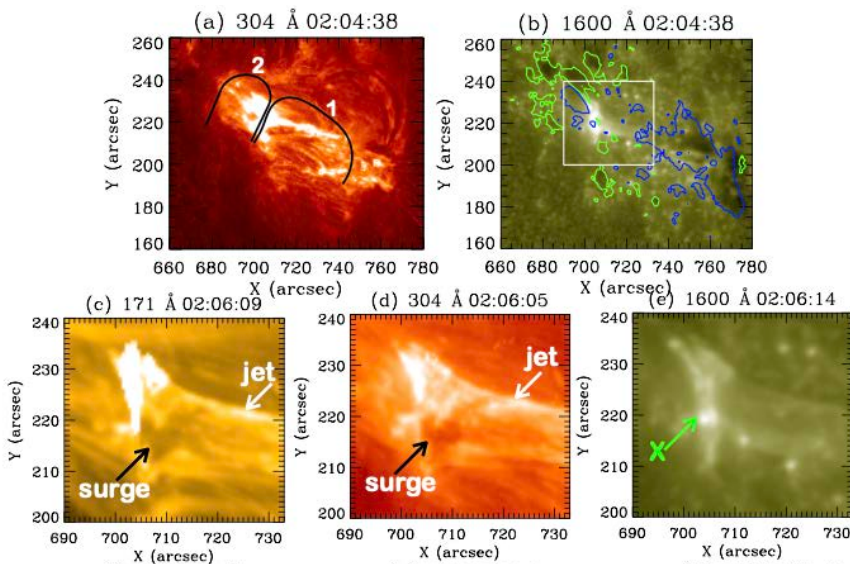
Solar jets often have a helical structure containing both hot and cooler, denser than the corona, ejected plasma. Different mechanisms are proposed to trigger jets by magnetic reconnection between emergence of magnetic flux and environment, or induced by twisted photospheric motions bringing the system to instability. Multi-wavelength observations of a twisted jet observed with the AIA aboard SDO and the IRIS was selected to understand how the twist was injected in the jet because fortunately IRIS spectrographic slit was just crossing the reconnection site. We follow the magnetic history of the AR based on the analysis of the Helioseismic and Magnetic Imager (HMI) vector magnetic field computed with the UNNOFIT code. The nature and dynamics of the jet reconnection site is characterized by IRIS spectra. In the magnetic field maps we evidenced the pattern of a long sigmoidal flux rope (FR) along the polarity inversion line of the reconnection site. Before the jet, there was an extension of the FR and a part of it was detached and formed a small bipole with a bald patch (BP) region where the reconnection took place. At the time of the reconnection the Mg II spectra exhibited a clear gradient/tilt of blue/red shifts with maxima of +150 to -300 km/s along the jet base which is interpreted as a rotating or helical structure. Comparison with numerical MHD simulations confirmed the existence of the long FR. While the FR stays stable, we conjecture that there is a transfer of twist during the extension of the FR to the reconnection site. The reconnection would start in the low atmosphere in the BP reconnection region and extend along the current sheet formed above.



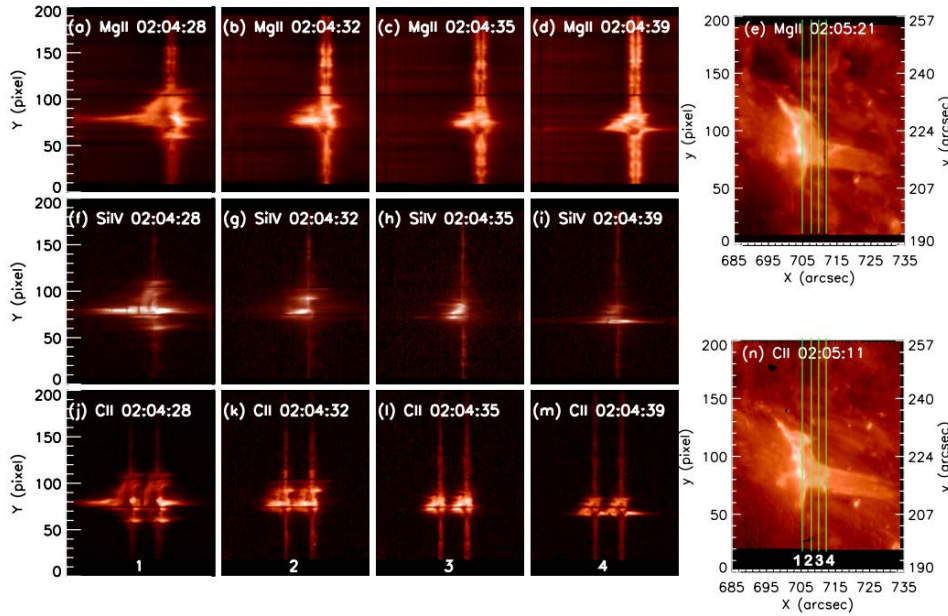
Flux rope evidenced in the HMI observations and comparison with the images from MHD simulations. Panel (a): Vector magnetic field map computed with the UNNOFIT code and the yellow/dark blue areas show the positive/negative magnetic field polarity. Panel (b): From MHD simulations the iso-contours of vertical magnetic field with vectors. Panel (c): The magnetic field lines are plotted with the grey color and red/blue contours are electric currents. So the FR has a very strong electric currents, with current flowing from red to blue.

Fourth Month: For the fourth month and during the extended period, we worked on a project “**Multi-thermal solar jet initiated in a bald patch region observed by AIA and IRIS**” by **Reetika Joshi**, B. Schmieder, G. Aulanier, R. Chandra, A. Tei, and P. Heinzel. We are finishing this work and plan to submit it in **Astronomy and Astrophysics journal**. The summary is as follows:

IRIS with its high spatial and temporal resolution brings an exceptional diagnostics for the dynamics of solar activity in the chromosphere and the corona, such as jets and surges. The aim of this work is to study the plasma structure and dynamics of a EUV jet and surge observed with IRIS and the SDO instruments. Fortunately the IRIS slit was just scanning the jet base when the reconnection occurred in a bald patch magnetic region, region with tangent to the solar surface magnetic field lines. We proceed to a spatial-temporal analysis of the IRIS spectra of the lines observed in the spectral ranges of Mg II, CII and Si IV ions. Dopplershifts in Mg II lines are computed by using a cloud model technique. Strong asymmetry with large blue wing extension of the Mg II and C II lines is interpreted by the ejection of two plasma clouds, one explosive cloud with blueshifts of the order of -300 km/s and one cloud with lower Dopplershift (-50 km/s) which lowers the Mg II blue peak of the EUV burst by absorption. In the miniflare at the jet base we identified emission of several transition region lines (O IV), cool temperature absorption lines in Si IV line broad profiles, Mg II triplet lines, Balmer and Si IV continua. The IRIS spectra demonstrate that the magnetic reconnection is accompanied by explosive clouds with super Alfvénic flows or/and large scale microturbulence. At the reconnection site, Mg II, C II and Si IV line profiles indicate the presence of cool plasma overlying hot plasma. We conjecture that cool material trapped in the bald patch region during the reconnection is expelled towards the corona above the flaring atmosphere in overlying loops producing a surge together with a hot jet. We propose a sandwich model with multi layers of different temperatures similar to UV burst MHD simulations.



Multi-wavelength observations of the solar jet and surge in different AIA and IRIS wavebands on March 22 2019. Panels a-b show the active region 12736 in AIA 304 Å and 1600 Å respectively. In panel (a) the brackets indicate the two systems of arch filaments (1 and 2) on both sides of the mini flare. The jet and surge are pointed with white and black arrows in panels c and d. The reconnection point is denoted with a green arrow in panel e.



IRIS spectra of Mg II k 2796.35 Å (a-d), Si IV 1402.77 Å (f-i), and C II lines 1330 Å (j-m) at four slit positions (1, 2, 3, 4). The four different slit positions are presented with four green solid lines in the last column in Mg II and C II images.

f) Specific knowledge/information acquired:

I accomplished my Raman Charpak (RC) fellowship from January 13, 2020 to May 26, 2020 at Observatoire de Paris Meudon, France with Dr. Guillaume Aulanier and the solar physics group. I along with the group analysed several solar activity events and their space weather impacts. I got the important knowledge in spectroscopy and in magnetohydrodynamics (MHD).

g) Impact of acquired knowledge on your future research work:

As mentioned in objectives of the proposal, the main aim of my thesis is to understand the physical phenomena responsible before and during the solar jets observed from various group and space borne instruments. The work done during the Raman-Charpak fellowship is a combined study of the observations of solar jet data and their theoretical explanation with Prof. Guillaume Aulanier and his group, so Raman-Charpak fellowship provides me an opportunity closely work with French collaborators and make it easy to write my thesis and to achieve my doctoral research objectives in my focussed way.

h) References, if any:

- Alexander, D., Fletcher, L., 1999, *Solar Phys.*, 190, 167.
- Aulanier G., Demoulin P., Schrijver C.J., Janvier M., et al., 2013, *A&A*, 549, A66
- Aulanier G. & Dudík J., 2019, *A&A*, 621, A72
- Bain, H. M., Fletcher, L., 2009, *A&A*, 508, 1443.
- Benz, O. Arnold., 2008, *Living Rev. Solar Phys.*, 5.
- Chandra, R., Jain, R., Uddin, W., et al. 2006, *Solar Phys.*, 239, 239.
- Chandra, R., Mandrini, C. H., Schmieder, B., et al. 2016 *A&A*, 598, A41.
- Chandra, R., Filippov, B., Joshi, R., et al. 2017 *Solar Phys.*, 292, 81.
- Cheung, Mark C. M., De Pontieu, B., Tarbell, T. D., et al. 2015, *ApJ*, 801, 83.
- Chifor, C., Young, P. R., Isobe, H., et al. 2008, *A&A*, 481, L57.
- Cirtain, J. W., Golub, L., Lundquist, L., et al. 2007, *Science*, 318, 1580.
- Freeland, S. L., Handy, B. N., 1998, *Solar Phys.*, 182, 497.
- Guo, Y., Demoulin, P., Schmieder, B., et al. 2013., *A&A*, 555, 19.
- Heyvaerts, J., Priest, E. R., & Rust, D. M. 1977, *ApJ*, 216, 123.
- Howard, R. A., Moses, J. D., Vourlidas, A., et al. 2008, *Space Science Reviews*, 136, 67.
- Hundhausen, A. J., Sawyer, C. B., House, L., 1984, *Geophys. Res.*, 89, 2639.
- Joshi, R., Schmieder, B., Chandra, R., et al., 2017, *Solar Phys.*, 292, 152.
- Joshi, R., Chandra, R., Schmieder, B., Moreno-Insertis, F., Aulanier, G., et al. 2020 in press
- Lemen, J. R., Title, A. M., Akin, D. J., et al. 2012, *Solar Phys.*, 275, 17.
- Liu, C., Deng, N., Liu, R., et al. 2011, *ApJ*, 735, L18.
- Mandrini, C. H., Demoulin, P., van Driel-Gesztelyi, L., et al. 1996, *Solar. Phys.*, 168, 115.
- Moore, R. L., Sterling, A. C., Falconer, D. A., 2013 *ApJ*, 769, 134.
- Moore, R. L., Cirtain, J. W., Sterling, A. C., et al. 2010, *ApJ*, 720, 757.
- Moreno-Insertis, F. & Galsgaard, K. 2013, *ApJ*, 771, 20.
- Nishizuka, N., Shimizu, M., Nakamura, T., et al. 2008, *ApJ*, 683, 83.
- Nistico, G., Bothmer, V., Patsourakos, S., et al. 2009, *Solar Phys.*, 259, 87.
- Pariat, E., Antiochos, S.K., DeVore, C.R., 2009, *ApJ*, 691, 61.
- Pontieu, B. de., Title, A. M., Lemen, J. R., et al. 2014 *Solar Phys.* 289, 2733.
- Raouafi, N. E., Patsourakos, S., Pariat, E., et al. 2016, *Space Scien. Rev.*, 201.
- Roy, J.R., 1973, *Solar Phys.*, 28, 95.
- Schou, J., Scherrer, P. H., Bush, R. I., 2012, *Solar Phys.*, 275, 229.
- Schmieder, B., Guo, Y., Moreno-Insertis, F., et al. 2013, *A&A*, 559, A1.
- Schmieder B., Shibata K., van Driel-Gesztelyi L., et al. 1995, *Solar. Phys.*, 156, 245.
- Schmieder, B., Mein, P., Simmet, G.M., Tandberg-hanssen, E., 1988, *A&A*, 201, 327.
- Shibata, K., Nakamura, T., Matsumoto, T., et al., 2007, *Science*, 318, 1591.
- Shibata, K., Ishido, Y., Acton, L. W., et al. 1992, *PASJ*, 44, L173.
- Shimojo, M., Hashimoto, S., Shibata, K., et al. 1996, *PASJ*, 48, 123.
- Sterling, A. C., Moore, R. L., Falconer, D. A., 2015, *Nature*, 523, 437.
- Sterling, A. C., Moore, R. L., DeForest, C. E., 2010, *ApJ*, 714, L1.
- Titov, V. S., Priest, E. R., Demoulin, P., 1993, *A&A*, 276, 564.
- Török, T., Aulanier, G., Schmieder, B., et al. 2009, *ApJ*, 704, 485.

Tsuneta, S., Acton, L., Bruner, M., et al. 1993, Solar Phys., 136, 37.
Uddin, W., Schmieder, B., Chandra, R., et al. 2012, ApJ, 752, 70.
Uddin, W., Jain, R., Yoshimura, K., et al. 2004 Solar Phys., 225, 325.
Woods, T. N., Hock, R., Eparvier, F., et al. 2011, ApJ, 739, 59.

i) Details of your participation /poster presentation in a seminar /workshop during the stay in host country (if any):

- Presented an oral talk on “Transfer of twist from a flux rope to a solar jet initiated in a bald patch region” through zoom session with solar physics group at Observatoire de Paris, Meudon during lockdown due to COVID19
- Presented an oral talk on “Case study of multi temperature coronal jets for emerging flux MHD models” through zoom session with solar physics group at Observatoire de Paris, Meudon during lockdown due to COVID19
- Presented a poster in European Geophysical Union (EGU) meeting (online) held at Vienna Austria from May 3 - 8 2020.

5. How do you think that research work done under Raman-Charpak Fellowship will be beneficial for you in terms of your future doctoral research work?

I learned the spectroscopic techniques to study the small scale solar eruptive events, like solar jet. This is an important tool to analyze the spectra and the composition of the solar surface at different temperatures. The papers published with these analysis are directly associated with my thesis chapters. Along with that, the collaboration with the eminent scientists in theory and in observations open a path for me to pursue my career in research and to get a postdoc position. The Raman Charpak fellowship gave me an outstanding opportunity to provide he advance technological arrangements, global exposure and guidance to enrich my research work with the eminent scientist of solar physics and to collaborate with scientists from Spain, Norway,

Argentina, Japan, and Czech Republic. I regularly visited the Observatoire de Paris, Meudon France for the starting two months (January 13 - March 15) of my RC fellowship visit. But after that the COVID-19 started at France and we stuck in lockdown. The starting days of lockdown were really harsh and tough to adjust, but soon in a week our solar physics group at started a complete office environment through zoom meetings. I worked in the lockdown period closely with Dr. Brigitte Schmieder and discussions with Dr. Guillaume Aulanier, Dr. Véronique Bommier, Dr. Pascal Démoulin and Prof. Ramesh Chandra. I deeply thank CEFIPRA for selecting me for this fellowship and providing me a new and lifelong experience.



Date: 09 June 2020

Signature of the Fellow

Stamp (if any)



Signature of the Host Supervisor

Stamp (if any)

Please enclose a copy of certificate with this report (if any) received from your host supervisor.

ARBEITSVERTRAG

Zwischen dem Land Rheinland-Pfalz, vertreten durch die beiden Vizepräsidenten der Universität Koblenz-Landau, Frau Prof. Dr. Schaumann und Herrn Prof. Dr. Wehner, und Herrn Praveen Dhyani, Ph.D./Kumaun University, geboren am 21.06.1986, wird - vorbehaltlich noch vorzulegender Unterlagen und dass sich hieraus keine Hinderungsgründe ergeben - folgender Arbeitsvertrag geschlossen:

§ 1

Herr Dhyani, Ph.D./Kumaun University wird ab 05.09.2022 bis 28.02.2023 als vollbeschäftigter wissenschaftlicher Mitarbeiter nach § 57 Absatz 1 HochSchG eingestellt.

§ 2

Für das Arbeitsverhältnis gelten der Tarifvertrag für den öffentlichen Dienst der Länder (TV-L), der Tarifvertrag zur Überleitung der Beschäftigten der Länder in den TV-L und zur Regelung des Übergangsrechts (TVÜ-Länder) sowie die Tarifverträge, die den TV-L und den TVÜ-Länder ergänzen, ändern oder ersetzen, in der Fassung, die für den Bereich der Tarifgemeinschaft deutscher Länder und für das Land Rheinland-Pfalz jeweils gilt, solange der Arbeitgeber hieran gebunden ist und soweit das Gesetz über befristete Arbeitsverträge in der Wissenschaft (WissZeitVG) in der jeweils geltenden Fassung keine Regelung enthält.

Die Befristung des Vertrages beruht auf § 30 Absatz 1 Satz 1 TV-L i.V.m. § 2 Absatz 1 WissZeitVG.

§ 3

(1) Die Probezeit entspricht der Vertragslaufzeit.

(2) Für die Kündigung des gemäß § 30 Absatz 1 Satz 1 TV-L i.V.m. § 2 Absatz 1 WissZeitVG befristeten Arbeitsverhältnisses gilt § 34 TV-L.

§ 4

Der wissenschaftliche Mitarbeiter ist in der Entgeltgruppe 13 TV-L eingruppiert.

Der Arbeitgeber ist berechtigt, dem wissenschaftlichen Mitarbeiter aus dienstlichen Gründen eine andere Tätigkeit im Rahmen der Entgeltgruppe zuzuweisen.

§ 5

Es werden keine Nebenabreden vereinbart.

§ 6

Kann der wissenschaftliche Mitarbeiter auf Grund gesetzlicher Vorschriften von einem Dritten Schadensersatz wegen des Verdienstauffalls beanspruchen, der ihm durch Arbeitsunfähigkeit entstanden ist, tritt er seine Ansprüche auf Schadensersatz insoweit an den Arbeitgeber ab, als dieser dem wissenschaftlichen Mitarbeiter Entgelt einschließlich sonstiger Leistungen fortgezahlt hat.

§ 7

Änderungen und Ergänzungen dieses Arbeitsvertrages einschließlich der Nebenabreden sowie Vereinbarungen weiterer Nebenabreden sind nur wirksam, wenn sie schriftlich vereinbart werden.

Koblenz, 30.08.2022

Im Auftrag



Sabine Esper
Stellv. Referatsleitung



Praveen Dhyani, Ph.D./Kumaun
University



INSTITUTE OF
MACROMOLECULAR
CHEMISTRY
CZECH ACADEMY OF SCIENCES

Mrs. Monika MATIYANI
Pandey Bhawan Old Abkari
Ranikhet-263645, District- Almora
Uttarakhand
INDIA

Prague May 2, 2022
UMCH-101-304/2022

Letter of Invitation

Dear Monika Matiyani,

I'm writing to inform you that you were accepted to participate in the Postgraduate Course in Polymer Science organized by the Institute of Macromolecular Chemistry, Czech Academy of Sciences („the Institute“) under the auspices of UNESCO and IUPAC.

The course will start on 1st October, 2022 and will last 10 months – until 31st July 2023.

The Institute will provide you with a monthly scholarship of CZK 10.400,- and with accommodation in the Hotel Mazanka, address: Za Vodárnou 1-1013, 182 00 Praha 8. The Institute also commits to take out the Foreigners' Basic Medical Insurance with Pojišťovna VZP, a. s. The insurance meets all the conditions of the Act on the Residence of Foreigners in the Territory of the Czech Republic (326/1999 Coll. Subsequently amended). Please note, that the Institute will not contribute to your travel expenses.

Since **you will be applying for a long-term residence permit for the purpose of scientific research in the Czech Republic**, we are enclosing several documents, which will be needed for the application process. Upon receipt of these documents, please, contact EURAXESS (services free of charge) as soon as possible. We recommend also visiting the following website:

http://www.euraxess.cz/dokums_raw/zadost_application.pdf. Here, you can download a green application form and complete it. This form must be printed in color (GREEN) when submitted to an Embassy or a Consulate of the Czech Republic. The fee paid for the permit will be reimbursed by the Institute after your arrival to the Czech Republic. Please, retain a document about the payment (original receipt).

Please notify us when you submit the application.

I look forward to welcoming you in Prague.

Yours sincerely,

Jiří Kotek, PhD
director

Institute of Macromolecular Chemistry
Czech Academy of Sciences
Heyrovského nám. 2
162 06 Prague 6
Czech Republic
(1)

Enclosures:

Invitation letter (in Czech)

Hosting Agreement (in Czech/English)

Commitment to cover all cost (in Czech)

Confirmation of an entity (in Czech/English)