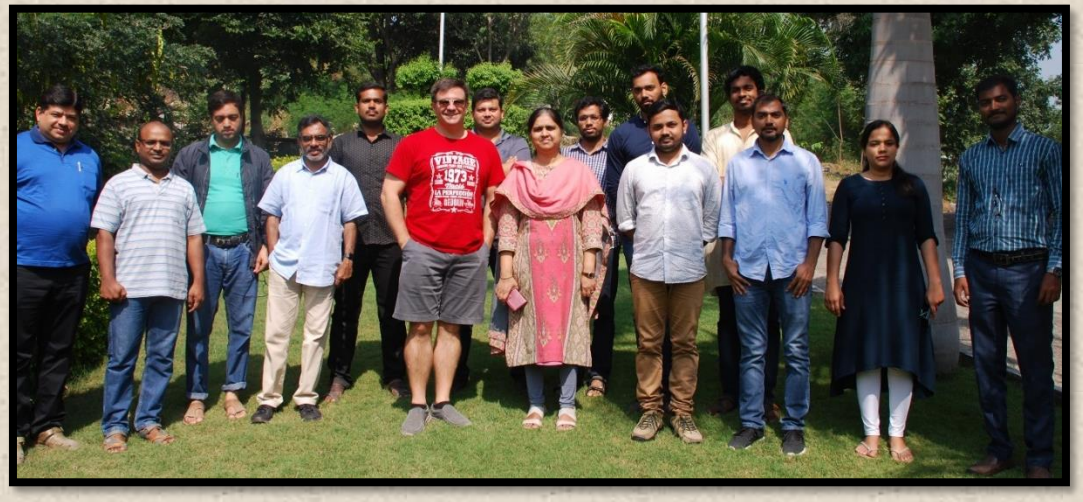
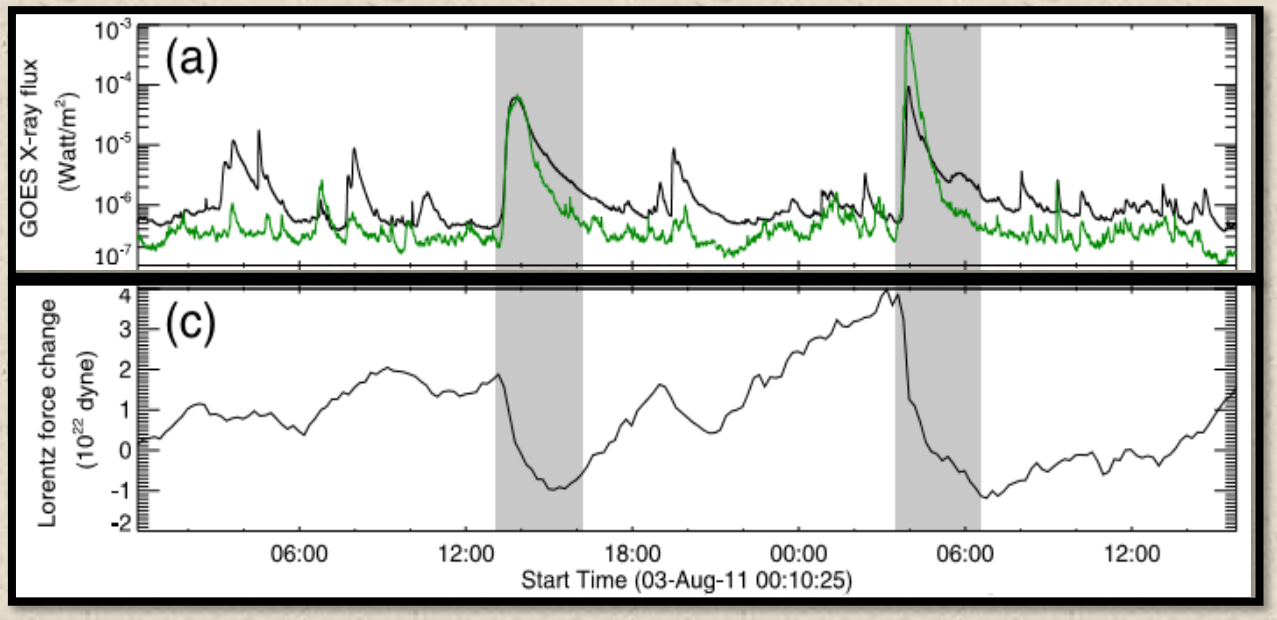
PRL News – The Spectrum

December 2019





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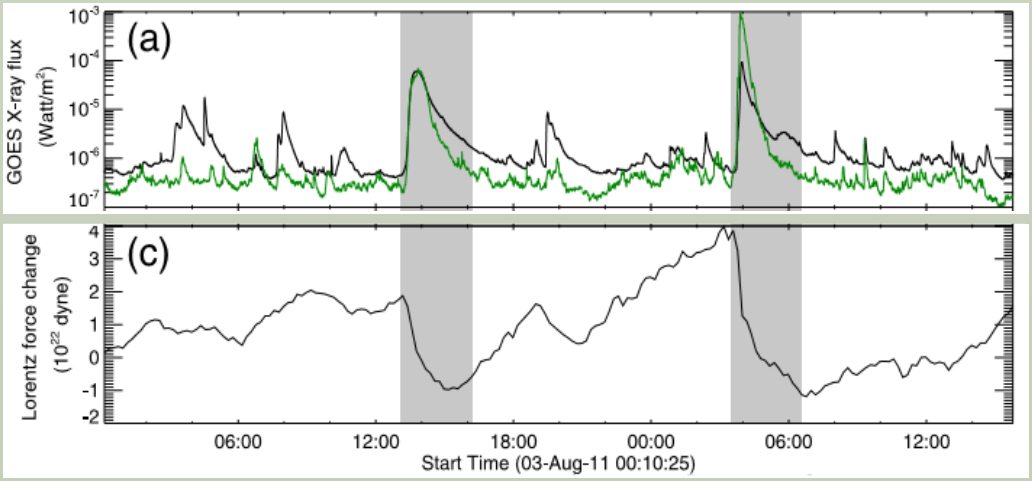
Lorentz Force Evolution Reveals the Energy Build-up Processes during Recurrent Eruptive Solar Flares

(Ranadeep Sarkar, Nandita Srivastava, and Astrid M. Veronig)

Ranadeep Sarkar

The energy release and build-up processes in the solar corona have significant implications in particular for the case of large recurrent flares in same active region (AR), which pose challenging questions about the conditions that lead to the episodic energy release processes. It is not yet clear whether these events occur due to the continuous supply of free magnetic energy to the solar corona or because not all of the available free magnetic energy is released during a single major flaring event. In order to address this question, we report on the evolution of photospheric magnetic field and the associated Lorentz force changes in ARs 11261 and 11283, each of which gave rise to recurrent eruptive M- and X-class flares.



Our study reveals that after the abrupt downward changes during each flare, the Lorentz force increases by 2–5×10^{22} dyne in between the successive flares (see figure). The distinct rebuild-up of net Lorentz force in between the successive flares and its abrupt downward changes during each flare obtained in our study, are the first observational evidence found in the evolution of any nonpotential parameter of solar ARs, that confirms the "build-up and release" scenario for magnetic energy storage in the solar corona. We conclude that the recurrent large flares studied in this work occurred due to the newly supplied energy to the AR, instead of consuming the available residual energy. We also have found a correlation between the CME momentum and the associated change in the net Lorentz force, which is consistent with the momentum balance condition for solar flares.

In context of space weather predictions, the evolutionary pattern of the net Lorentz force changes reported in this study has significant implications, in particular, for the forecasting of recurrent large eruptive flares from the same AR and hence the chances of interaction between the associated CMEs.

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Events & Activities

PENSION ADALAT HELD AT PRL

As per the directives of The Secretary, Department of Pensions and Pensioners' Welfare, New Delhi and Department of Space, Bangalore, a Pension Adalat was held on Friday, the 23rd August 2019, in K.R. Ramanathan Auditorium, PRL, Ahmedabad for addressing various Pension related grievances.

42 Pensioners of PRL had attended the Pension Adalat. The Adalat was conducted by Shri Rathin Sengupta, Head, P&GA, Shri Suresh Babu A, Head, Accounts & IFA and Shri Senthil Babu, AO (Establishment). The grievances/suggestions of Pensioners were heard and noted. On this occasion, Director, PRL inaugurated Retired Employees' Portal and addressed the pensioners regarding portal's utilization. Registrar, PRL also addressed all Pensioners regarding Pension Adalat in brief and advised to utilize the portal by logging in for its various uses. A demo of the portal was given by Portal Development team of Computational Services i.e. Shri Padia Girishkumar D., Smt. Srishti Sharma and Shri Prashant Jangid. The pension Adalat ended with vote of thanks by Head, P&GA, PRL.

Events at Udaipur Solar Observatory

VISIT OF DR. ALBERTO SAINZ DALDA

Dr. Alberto Sainz Dalda, Researcher at the Bay Area Environmental Research Institute CA USA, visited USO from 30th October to 1st November 2019. Dr. Sainz Dalda is one of the core team members at Lokheed Martin Solar and Astrophysics Laboratory, where his principal role is to provide scientific support to NASA's Interface Region Imaging Spectrograph (IRIS), that has been operational since 2013. IRIS has been delivering unprecedented observations of the solar atmosphere from the upper photosphere to the corona, with special attention to the chromosphere and the transition region. During his visit, he interacted with students and faculty and detailed the procedures for co-ordinated observing campaigns between IRIS and MAST. His Colloquium titled **IRIS2: using representative profiles to invert IRIS Mg II h & k lines** was arranged at USO on 31st October. Dr. Sainz Dalda also gave a half-day tutorial the following day on the IRIS data archive, its functionality, and advanced navigation tools.

VISIT OF CSSTEAP PARTICIPANTS TO USO

As a part of the annual academic endeavour between **PRL** and the **Centre for Space Science and Technology Education in Asia Pacific (CSSTEAP)**, a 2-week short course on Space Weather was organized at PRL Ahmedabad from 14 – 27 November 2019. The course comprised 27 participants from India, Bangladesh, Bhutan, Nepal, Sri Lanka, Laos, Thailand, Vietnam, Mongolia, Ethiopia, Uzbekistan, and Kazakhstan. Several Lectures were arranged for the same which included topics like **Telescopes and Post-focus Instrumentation**, **Tools for Astronomy, Coronal Mass Ejections, Space Weather from a Solar Perspective, Solar Structure and Dynamics**, and **Solar Oscillations**

The participants carried out lab exercises on calculating heliographic coordinates of sunspots and determining the solar differential rotation. Following the project, they visited the GONG and e-Callisto facilites in the office premises and were also taken to the island to see the 50 cm MAST and SPAR telescope.

INVITED TALK

Prof. Nandita Srivastava gave an Invited Talk: **"New challenges in Solar Physics Research"** at the Young Astronomer's meet at Kodaikanal Observatory, IIA on September 23, 2019.

Awards & Honors to the PRL Family

- **Dr. Kuljeet Kaur Marhas** (Associate Professor, PSDN) has received the D. Lal memorial Award- 2019, awarded by American Geophysical Union (AGU) which carries a medal, a citation and honor of being AGU conferred Fellow. She has also been awarded the Eminent Mass Spectrometerist- 2019 by the Indian Society of Mass Spectrometry (ISMAS). This award carries a medal and a citation.

- **Yash Srivastava**, (JRF, PSDN) has been awarded the prestigious Shyama Prasad Mukherjee (SPM) Fellowship in Earth Sciences for his excellent performance in the CSIR-UGC-NET exam of June-2017.

Colloquia at PRL

- **Dr. Megha Upendra Bhatt** (Scientist -SD, PRL) delivered a colloquium entitled *"An indirect approach of estimating lunar refractory elements"* on 27 November 2019.