

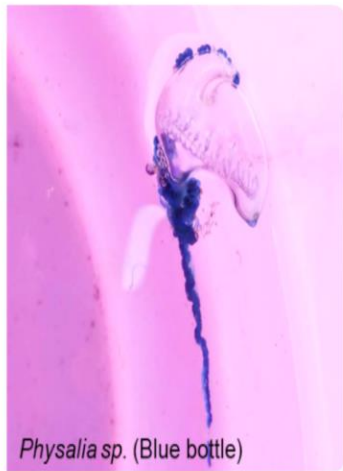


PRL NEWS – THE SPECTRUM

February 2020



Porpita porpita (Blue button)



Physalia sp. (Blue bottle)



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Ranadeep Sarkar

An Observationally Constrained Analytical Model for Predicting the Magnetic Field Vectors of Interplanetary Coronal Mass Ejections at 1 AU

(Ranadeep Sarkar, Nat Gopalswamy and Nandita Srivastava)

Coronal mass ejections (CMEs) are powerful expulsions of gigantic clouds containing magnetized plasma that routinely erupt from the Sun and propagate out through the solar system. When such an eruption is directed toward the Earth with high speed and has a southward component of the magnetic field (B_z), an intense magnetic storm occurs upon the impact of the CME on Earth's magnetosphere. The storm can occur when the CME's interplanetary flux rope (FR) and/or the sheath between the FR and the associated shock has southward B_z . Therefore, a prior knowledge of the strength and orientation of the magnetic field embedded in the FR is required in order to forecast the severity of geomagnetic storms caused by CMEs.

We have developed an observationally constrained analytical model, the INterplanetary Flux Rope Simulator (INFROS), for predicting the magnetic-field vectors of interplanetary CMEs (ICMEs). The main architecture of INFROS involves using the near-Sun flux rope properties obtained from the observational parameters that are evolved through the model in order to estimate the magnetic field vectors of ICMEs at any heliocentric distance. As a proof of concept, we validate INFROS for an Earth-impacting CME which occurred on 2013 April 11. The predicted magnetic field profiles of the associated ICME show good agreement with those observed by the in-situ spacecraft, namely, WIND (see Figure). Importantly, the maximum strength (10.5 ± 2.5 nT) of the southward component of the magnetic field (B_z) obtained from the model prediction is in agreement with the observed value (11 nT). INFROS shows promising results in near real time which could prove to be a useful space-weather forecasting tool compared to the time-consuming and computationally expensive MHD models. Source: <https://doi.org/10.3847/1538-4357/ab5fd7>

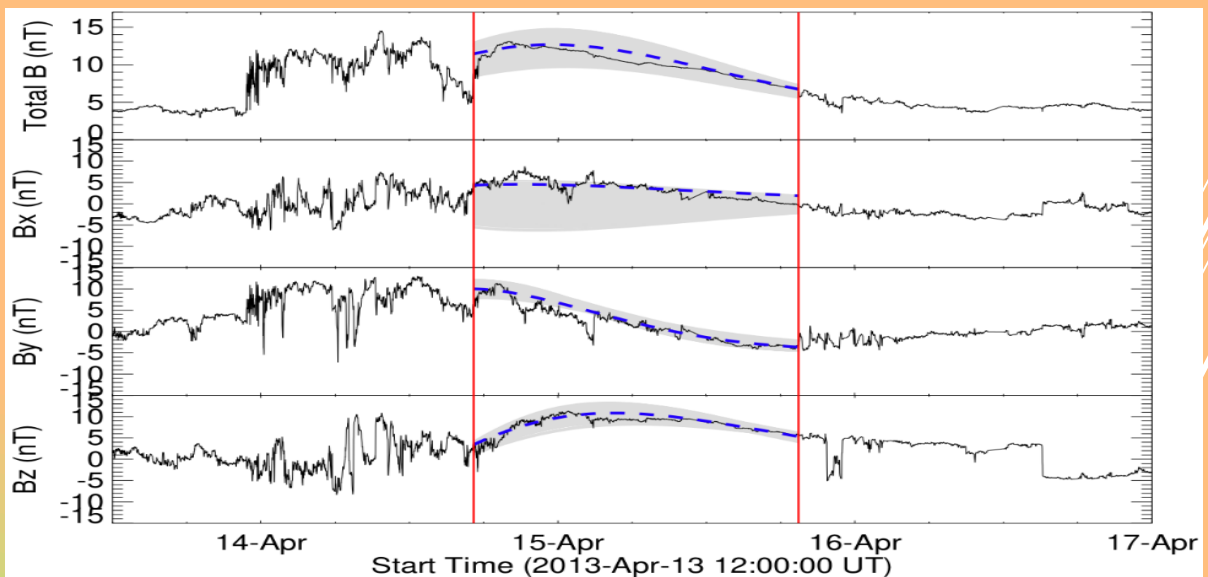
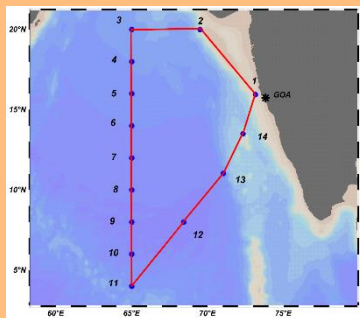


Figure : Magnetic vectors of the ICME as detected by the Wind spacecraft for the 2013 April 14 ICME event. The two red vertical lines denote the magnetic cloud (MC) boundary. The blue dashed lines denote the predicted magnetic vectors obtained from the model which best match the observed magnetic profiles of the MC. The gray shaded regions denote the uncertainty in predicting the respective magnetic vectors.

Science Highlights

Scientific Expedition in the Arabian Sea (Himanshu Saxena)

A group of eight research scholars from the Geosciences Division, PRL participated in a scientific expedition in the Arabian Sea during December 16, 2019 to January 7, 2020. This expedition, led by PRL, was conducted on-board ORV-Sagar Kanya-364 and included participants from PRL, SAC-Ahmedabad, Annamalai University, CSIR-CSMCRI Bhavnagar, and Gujarat University. The Arabian Sea acts as a hotspot for biological and physical processes regulating the oceanic productivity. The control of ocean systems on global climate is largely through microscopic photosynthetic organisms called as phytoplankton which consumes the atmospheric carbon dioxide, thereby helps to maintain the global climate. However, distribution and composition of phytoplankton is influenced by the circulation and mixing of ocean water and in turn the redistribution of nutrients. Therefore, the objective of PRL participants in this expedition was to study the biogeochemical properties of the Arabian Sea during winter monsoon. In order to resolve the intricacies involved in bio-geo-chemical nature of the Arabian Sea, water samples from twelve depths were collected using Seabird CTD Niskin sampler at fourteen stations situated in the coastal and open ocean. These samples were collected to understand various processes and their responsible factors, such as role of nutrients and elemental ratios on productivity, greenhouse gas fluxes from the ocean, N_2 fixation capacity of microorganisms in the ocean, and depth wise carbon dynamics in the Arabian Sea. Additionally, sediment cores from two locations were collected to understand the paleo-nitrogen cycling in the Arabian Sea, and sampling of the ambient air for aerosol concentration was also conducted to understand the atmospheric chemistry of the Arabian Sea during winter-monsoon. This expedition, not only allowed the research scholars to attain their scientific objectives but also allowed them to explore floating life on water.



ORV – Sagar Kanya and cruise track

Sample collection and on-board experiments



Porpita porpita (Blue button)



Physalia sp. (Blue bottle)

Free dwelling organisms observed during our expedition.



Participants of ORV Sagar Kanya (SK-364) cruise expedition

Events & Activities

Induction Training 2020 (Pradeep K Sharma)

“Training is the process of teaching new employees the basic skills they need to perform their jobs.”

Gary Dessler



Training refers to the learning & development activities carried out for the primary purpose of helping members of an organization acquire and apply the knowledge, skills, abilities, and develop the right attitude, all of which are needed to execute various jobs. PRL Administration is committed to plan such programme from time to time. In this regard, a Half-Day Orientation Training Programme was organized on 09/01/2020 in Nano SIMS Hall, PRL, Ahmedabad.

The Orientation Training Programme was initiated by Shri Rathin Sengupta, Head P&GA and Shri Pradeep K Sharma, AO with an intent of making the participants aware about the functioning rules and regulations of PRL/DOS and making them accustomed to the working environment of the Institute.

The participants were newly recruited Assistant, Trainee Assistants and Office trainees, deployed in various Divisions/Areas of PRL. The Session began with Introduction of all the members. It covered subjects like Introduction to DOS & PRL, Machinery of the Government by Shri. Pradeep K Sharma, Session on Computer and introduction to COWAA/COINS by Shri. Girish D Padia and Team, Session on Communication Skills and Motivation by Shri Rathin Sengupta, Session on Purchase & Stores by Ms. Nandini R Rao and Mr. Sunil D Hansrajani, Session on Accounts by Shri Suresh Babu and a concluding session on Stress Management by Shri. Anand D Mehta.

The Training was well applauded by all and went into interaction mode. It will help the new inductees to not only improve their efficiency and effectiveness at work but also will help in boosting their self-Confidence and assists everyone in self-management.

Glimpse of a few feedback received from the participants: -

भौतिक अनुसंधान प्रयोगशाला Physical Research Laboratory Induction training of Trainees/ Assistants/ Trainee Assistants	
Date: 9 th January 2020 Venue: Nano SIMS Hall	
FEEDBACK FORM	
Your feedback on half day Induction Training: It's a best step for PRL I have seen in during my short term work in PRL. I would like to appreciate the steps taken by all.	Your feedback on half day Induction Training: A nice way to make trainees to know about different divisions.
Suggestions, if any: It's my suggestion to have such more session to make people here more comfortable.	Suggestions, if any: To attend 5/6 lectures in a single day because difficult to understand continuous lectures.
Your feedback on half day Induction Training: It's been a good experience and a great opportunity to get know about the work-flow of different divisions within PRL.	Your feedback on half day Induction Training: It's been a good experience and a great opportunity to get know about the work-flow of different divisions within PRL.
Suggestions, if any: I would propose to divide the session in multiple days, with	Suggestions, if any: I would propose to divide the session in multiple days, with
Your feedback on half day Induction Training: Learning is a continuous process and I learned a lot of new things from this session. I would definitely implementing it. I would like to thank team recruitment and administration for conducting such session.	
Suggestions, if any:	

Events & Activities

Visit Of STP Participants to MIRO (Vivek Mishra)

A group of 28 participants related to various centers of ISRO as well as of PRL visited the Mt. Abu Infrared Observatory as a part of STP program jointly organized by SAC and PRL on 25th January , 2020.



Farewell to Dr. Syed Ibrahim



USO bid farewell to Dr. Syed Ibrahim, a Post Doctoral Fellow at USO, as he moved to the Aryabhata Research Institute of Observational Sciences (ARIES) Nainital to continue his post-doctoral career. Dr. Syed Ibrahim spent two years at USO collaborating with Dr. Bhuwan Joshi. Students and staff gathered on 3rd January 2020 to wish him all the very best for his research endeavours.

Short Course on Space Weather (J.Banerjee)

Space weather plays a very important role in life on Earth and affects almost all aspects of modern society. A clear understanding of space weather has become a necessity for modern civilization. With this view in mind, the Centre for Space Science and Technology Education in Asia and Pacific region (CSSTEAP) organized a short course on “Space Weather” conducted at Physical Research Laboratory (PRL), Ahmedabad during 14-27 November, 2019 for the participants from Asia-Pacific region. The inaugural ceremony was held at PRL on 14th November. There were 27 participants from 12 countries attending the course. Classes were held from 9-30 to 4-30 every working day at Nano-SIMS hall. A total of 25 lectures were delivered by PRL’s expert faculty on Solar sources of space weather, Propagation of the electromagnetic and charged particles through the heliosphere, The response of Earth’s magnetosphere, ionosphere and thermosphere to Space Weather, Solar influence on middle atmospheric processes, and Effect of Space Weather on electronic and communications systems. For a better understanding of the theory, there were practical sessions on Measurement of the speed of coronal mass ejection, Measurements of sunspots; number, area and rotation, Measurement of the geomagnetic field, Radio sounding of the ionosphere, Measurements of TEC and scintillation using GPS, and Study of optical signatures of space weather events .

As a part of the programme, the participants were taken to Udaipur and Mount Abu for a very short scientific tour. They visited the site of Global Oscillation Network Group (GONG) at Udaipur Solar Observatory or USO. The GONG site is part of a global network to make continuous observations of the Sun and provides rich information about solar activity. The participants got exposure regarding the working of the GONG instrument and the data products from GONG. They also visited the e-CALLISTO site at USO. Callisto stands for Compound Astronomical Low-Frequency Low-Cost Instrument for Spectroscopy and Transportable Observatory. The e-CALLISTO system is a valuable new tool for monitoring solar activity and for space weather research. e-CALLISTO is used for the observations of solar radio bursts and radio frequency interference monitoring for astronomical science. The trip to USO ended with a visit to MAST, the Multi-Application Solar Telescope installed on the island in Lake Fatehsagar to observe the photospheric and chromospheric layers of the sun. The working principle and design of the main telescope and the imaging instruments were explained to the students. The adaptive optics system, developed in-house, for compensating atmospheric seeing was also shown and explained. At Mt Abu Observatory, the students learned in detail about the functioning of 1.2 m telescope and the back-end instrumentation. They observed the rings of Saturn through the telescope. The short course ended on 27th November with a colourful valediction ceremony. Feedback from the participants was very positive.



Events & Activities

Celebration of Republic Day at PRL and USO

The 71st Republic Day of our Nation was celebrated at PRL and USO with the hoisting of the National Flag amid the reverberating chorus of the National Anthem by the staff, students and their families. At PRL, the event saw an inspiring speech by the Director, PRL. Exceptionally good CISF personnel were awarded for their services and prizes were also distributed to the winners of essay competition held during Vigilance Awareness Week-2019. The celebrations concluded with unleashing the Tricolor balloons by children and others in the sky.

At USO, the occasion saw a befitting honour to an act of bravery and selflessness on the part of Mr. Sunil Nagda, a 28-year old Home Guard, who rescued a drowning girl from Fatehsagar Lake Udaipur on Sunday the 24th of November 2019. The girl, who was riding a scooter with her friend, fell into the water after losing control of the vehicle which rammed into the railing along the lake. Mr. Nagda, who was on his motorcycle saw the crowd gathered around the lakeshore and upon learning the situation jumped into the water without any hesitation. He rescued the girl despite lacking formal training for such scenarios. Mr. Nagda managed to bring the girl to safety following a great struggle. An ambulance took the girl to the hospital for treatment. Mr. Nagda has been a part of the security detail at USO since 2011. He was honoured with a Merit Award from the PRL Director and was presented with a memento from USO personnel on 26th January 2020 for his act of courage. PRL is proud of Mr. Nagda for his exemplary selfless action of saving a girl from the clutches of death.

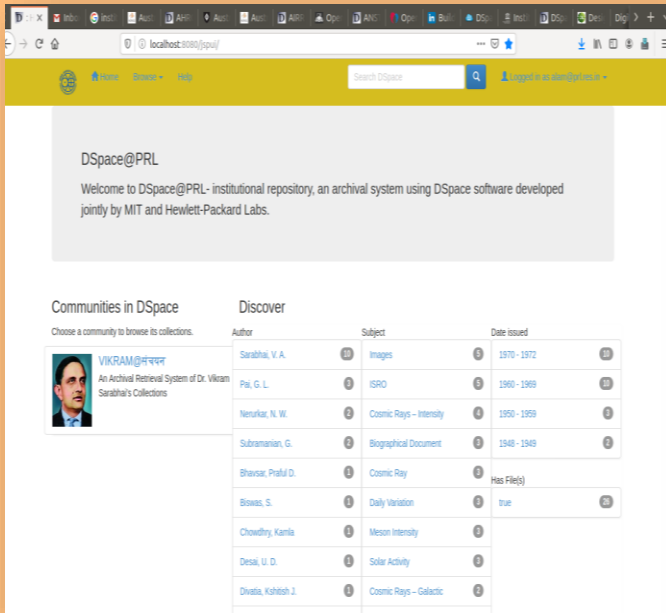


New Initiative at PRL

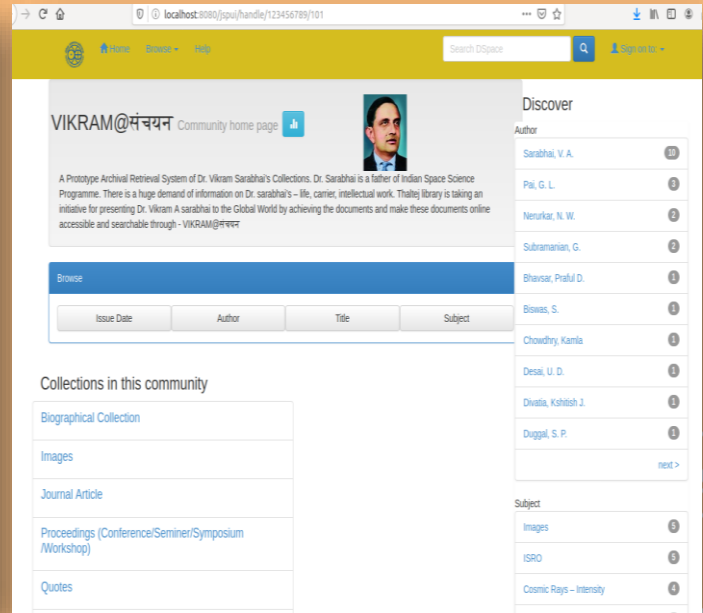
DSpace@PRL (Md Nurul Alam and Komal Patel)

Thaltej Library has taken an initiative to develop an Archival System - DSpace@PRL using DSpace in view of the mandate of Antriksh Gyan, ISRO Consortium and Open Source Software movement. It serves to identify, collect, store and facilitate retrieval of the intellectual output of PRL. To pay tribute to the founder of our Institute in his birth centenary year, Dr. Vikram Sarabhai's Collection - VIKRAM@संचयन has been created to begin with. VIKRAM@संचयन can retrieve the content by searching or browsing by author, title and subject. It is available in PRL LAN through the link <http://172.16.9.182:8080/jspui>. To access the repository a patron needs to add this IP (172.16.9.182) in the 'bypass proxy' option of the browser to go through the following contents:

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- ✓ Journal Article
- ✓ Proceedings (Conference/Seminar/Symposium)
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- ✓ Thesis



Author	Subject	Date issued
Sarabhai, V. A.	Images	1870 - 1972
Pai, G. L.	ISRO	1960 - 1969
Nesurkar, N. W.	Cosmic Rays - Intensity	1950 - 1959
Subramanian, G.	Biographical Document	1940 - 1949
Bhavsar, Praful D.	Cosmic Ray	Has File(s)
Bowles, S.	Daily Variation	true
Chowdhry, Kamla	Meson Intensity	
Desai, U. D.	Solar Activity	
Divatia, Kishish J.	Cosmic Rays - Galactic	



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- Chowdhry, Kamla
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- Duggal, S. P.

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Public Lecture

Dr. R. D. Deshpande, (Chairman, GSDN, PRL) delivered the 2nd PRL-IAPT Dr. Vikram Sarabhai Lecture-2020 on the topic "Water Resources of India: Challenges and Solutions" on 27th January 2020.

Happy Republic Day

The Editorial Team



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