ENSEMBLE

Volume 7 (4) October-December, 2019

CEFIPRA

PROCESSES FOR BETTER CLIMATE PREDICTIONS

Newsletter of the Indo-French Centre for the Promotion of Advanced Research

Editor's Note

Dear Readers,

It gives me immense pleasure to share yet another successful Indo-French collaboration supported by CEFIPRA on "Tropical Tropopause Layer" (TTL) which is a key component of the climate system.

CEFIPRA was also represented at "2nd Knowledge Summit", which focused on innovation, creativity and partnerships at Lyon, France held during 17-18 Oct, 2019. The event, organized by French Embassy, provided a platform for researchers, innovators, students, industry forums etc of both countries, to participate in interactive sessions, on priority areas such as Aeronautics and Space, Agriculture and Food Processing Artificial Intelligence and Mathematics, Eco-Energy & Renewable Energy, Marine Sciences, Smart Cities: Electric Mobility, Smart Cities: Urban Planning & Architecture, Strengthening Employability & Entrepreneurship and Valorizations of Natural Resources from Plants.

CEFIPRA organized its 64th Scientific Council and 35th Industrial Research Committee Meetings during 18-22 Nov, 2019 in India to review the progress of ongoing projects & select new projects for funding.

On culmination of yet another year in promoting Indo-French collaborations, CEFIPRA looks forward to working together with all its stakeholders to build and fortify new partnerships between India and France.

Wishing our readers a joyous & productive New Year - 2020
Bonne Année - 2020

Dr. Purnima Rupal
Director, CEFIPRA

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Editor-in-Chief:
Dr. Purnima Rupal
Director - CEFIPRA

Editor and Layout Support:
Dr. Payal Prakash
Scientific Associate

Published by:
CEFIPRA
5B, India Habitat Centre, Lodhi Road,
New Delhi - 110003 (INDIA)

Impact of the Indian Monsoon Convection on the Tropical Tropopause Layer and Climate

CEFIPRA Project Ref No. 5607-1

Dr. Bernard Legras
LMD, Paris
France

Prof. K. Mohanakumar
ACARR, CUSAT, Cochin
India

Background: The tropical tropopause layer (TTL), which extends over the 14 -18 km altitude region, is the gateway of moisture, chemical constituents, and various pollutants from the convectively active troposphere to the radiatively sensitive stratosphere. The change in climate is expected to influence the tropopause layer through enhanced large-scale upwelling of air and changes in tropical convection, air temperature, chemical composition, and cirrus clouds.

During summer, the dominant transfer through TTL occurs over the Asian summer monsoon in a region of very high anthropogenic emissions that are carried aloft by convection. Over the Tibetan plateau, the convection is very efficient in carrying boundary layer compounds to the stratosphere. An aerosol layer has also been observed over Asian Summer Monsoon area. Its composition is still badly known but it is suspected to be of anthropogenic origin and showed a dramatic increase over the last decade.

Potential applications: Progress in understanding the TTL together with the Asian summer monsoon is one of the major challenges in Climate science. To achieve this task, co-ordinated observational and modelling studies were carried out. The project took the opportunity of new observations, by the airborne *Stratoclim* campaign in 2017 over Nepal and India along with satellite datasets and modelling to advance our understanding of the processes ruling the composition of the TTL and the path of air parcels going through. The project also benefited from correlated ground-based measurements made in India, in particular by the new ST wind profiler operated at CUSAT, Cochin by the Indian Partner.

The main goal of this project was to use the opportunity of StratoClim to develop new collaborations between the French and Indian teams based on their common interests and complementary scientific experience.

Experimental campaign: The StratoClim aircraft campaign took place from 27 July to 10 August 2017 and provided an extensive dataset of observations of air composition inside the Asian Monsoon Anticyclone. Using the M-55 *Geophysica* aircraft, 8 flights were conducted over the Nepal and Northern Indian region. Flights mainly carried out air sampling in the layer between 15 and 20 km and lasted around 3 to 4.5 hours. Out of the 8 flights, 4 took place during local morning hours while the remaining 4 were conducted during local afternoon hours. One of the flights took observations over a large convective system that developed on the boundary between Nepal and North India.

On board instruments provided high temporal resolution (1 Hz) of CO concentration, with an accuracy of 3% and a sensitivity of 1-2 ppbv, and ozone concentration with accuracy better than 8%.

Results: A coupled trajectories-satellites analysis (see fig.1) allowed us to describe the geographical distribution of the possible convective sources. The convective air seen by the aircraft is originating mainly from local sources, like North India, Nepal and Tibetan Plateau, injected at heights between 14 and 15 km, with ages around 5 days when sampled at lower level (~15 km), increasing gradually to more than 20 days when at higher altitudes ~20 km).

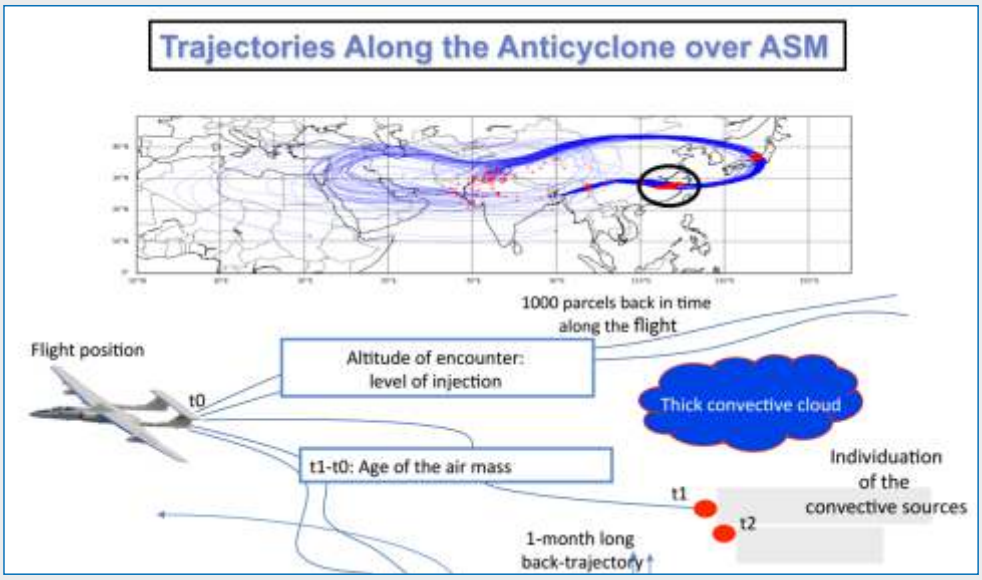


Fig. 1: StratoClim flight campaign, and the estimation of the age of air mass trajectories along the Asian summer monsoon anticyclone

Among the flights sampling the North Indian region, flight on 6th August 2017 (see fig.2) sampled a clear plume of pollution of Chinese origin. Two distinct peaks in the CO concentration were observed, associated with air masses linked to a dominant Chinese contribution (>90%). The polluted air masses originated from a very localized spot of convective sources across the Sichuan Basin. Such air is associated to very young ages of 0 to 5 days. The anomalies of CO up to 80 ppbv respect to the surrounding air of Indian origin. The remaining air is characterized by the age of 2 weeks or more, being associated to a complete recirculation around anticyclone before being sampled by the aircraft.

The big CO peaks are associated to very local pollution from the Indochina Peninsula (Pen), with an age of transport of the order of few hours, captured during the deep dive of aircraft down to 15 km. The analysis of the level of injection suggests that those CO peaks are associated to deep convection with cloud top detected at 15.5 km for the Chinese air and 16 km for the Pen air. Generally, the South Chinese air and the Pen air appear to be injected at higher altitudes respect to the other sources (mainly below 15 km), except over the Tibetan Plateau, and the convective injections are very localized.

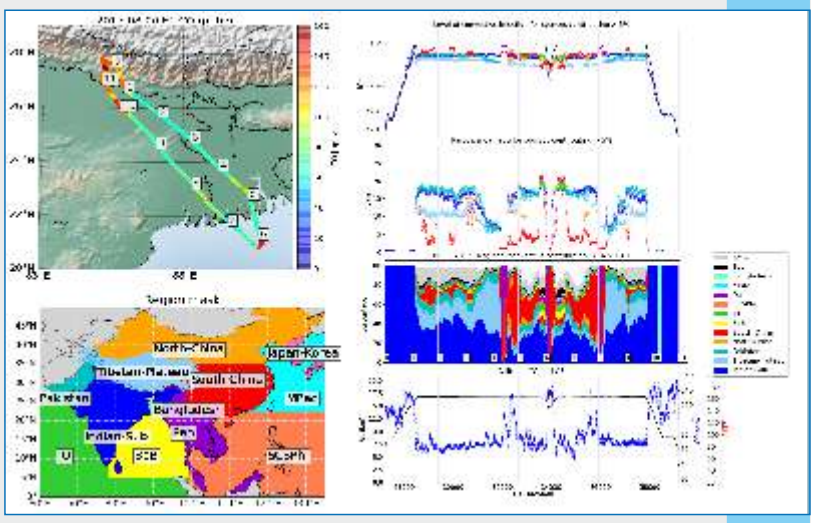


Fig. 2: Back-trajectories analysis of convective sources on an intense convective day (6th August 2017). Panel left top represents the flight path, left bottom shows the source regions for the AMA region.

The identification of the major convective sources and the time taken by the air parcel (age) to reach TTL from these sources are important to study the transport process through TTL. In TRACZILLA model, ERA-Interim data with kinematic convention is used to track the convective source and age in both active and break phases of the monsoon as defined from precipitation index over India. The parcels were released from different chosen pressure levels at 1o latitude-longitude grid over the Indian region, and the major convective sources were identified.

The study reveals that the major convective sources of air at 200 hPa are from west and east of central Bay of Bengal, Tibetan plateau, Andhra Pradesh, Orissa, and Eastern central Indian region. The presence of monsoon trough over the Bay of Bengal during the active phase is favourable for the development of deep convection over this region. The westward movement of monsoon depression formed over the Bay of Bengal and its interaction with the Eastern Ghats would aid in the formation of deep convection through orographic lifting over Orissa. Major convective sources are also located over Vietnam, the Gulf of Thailand and Malaysia. A small region over the north Arabian Sea closer to the Gujarat coast is the sole convective source from the Arabian Sea. The time taken by air parcel to reach 200 hPa level from major convective sources is about one or two days.

The percentage of convective sources and age of the air parcel from different regions during the break phase shows that the China region acts as major convective source during the break phase, with around 12-13 % from South China and about 7 % from North China. The next major contributions are from the Bay of Bengal and the Tibetan region, which are around 7 % and 5 %, respectively. As compared to the Bay of Bengal, the percentage of the convective source from the Arabian Sea is low of about 2 %, and the contribution from Central Africa is around 4%. The relatively higher contribution from convective sources in the Chinese region may be attributed to the strong convective activity due to the shift of ITCZ to South China during July and August. As compared to other regions, the air parcel from South China would take less time (approximately 19 days) to reach TTL. It would take more than 25 days for the air parcels from the Arabian Sea, Bay of Bengal, and Africa to reach TTL.

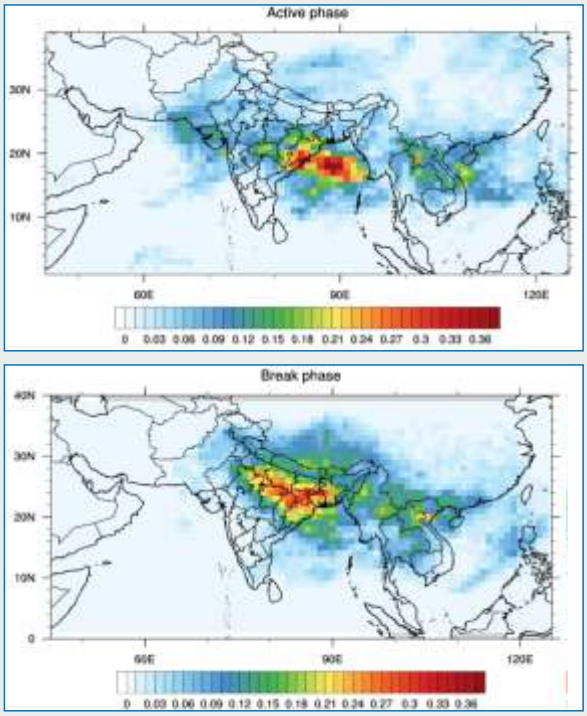


Fig. 3: The left, respective right, panels show the distribution of convective sources in the active, respective break, phases of the monsoon during summer 2017 for parcels released over India at 200 hPa.

As the break phase is in progress, South China serves as a main convective source for the air parcel at 100 hPa and the source contribution from this region is significantly higher than from other regions considered in this study. On average, the convective influence of this region is about 14 %, and the air parcel would take around 16 days from this region to reach TTL. Though the Bay of Bengal also has convective sources, their share is half of that of South China. The convective sources from the Arabian Sea are less and also need more time (approximately 29 days) to reach TTL. This might be due to the lower frequency of occurrence of deep convection over this region during monsoon season. There is a considerable amount of convective sources found over Central Africa, and the age of air parcel from this region is approximately 25 days.

Major Outcome: A main conclusion is that the ascent over Asia is broad with a mean speed of 1.1 K/day in potential temperature and an escape time of 13 days, confirming that the AMA is a weak confiner. Therefore, the age of air is not maximum but minimum at the core of the anticyclone, due to the fast renewal by fresh convective air. The cross-over of the ascending and descending air outside the convective tower is located at 363 K, slightly above

the zero level of clear sky radiative heating rate at 360 K. The convective sources for the rising air tend to concentrate over North India and the Tibetan plateau in addition to a broad distribution that covers Asia land and surrounding seas.

The reinforced contribution of Northern India and the Tibetan plateau arises because, in these regions, deep convection detrains higher than the other Asian regions, and because they are located just beneath the core of the anticyclone. The lifting motion above the clouds is, however, not reinforced over these regions and no preferential convergence to them is observed. The maritime region surrounding Asia contributes less to the AMA core but they dominate the overall flux across the 380 K surface. They also dominates the return flow of the Hadley Walker circulation in the lower layers.

Manpower Development: Two young scientists, Dr. Silvia Bucci and Dr. Ajil Kottayil, and one Junior Research Fellow are associated with this project. This CEFIPRA project gives a platform for interaction of these young researchers under the leadership of both PIs of the project, and they made substantial contributions to the outcome of the project. The team is intended to continue the collaborative work in the future.

Future Prospects of this Project: The outcome of the CEFIPRA project, open more extensive areas of further research in this field. Some of exciting areas are: (i) Vertical transport of air through the TTL region during the onset, active and break phases of Indian Summer Monsoon and its conditions in modulating troposphere stratosphere exchange processes, (ii) Water vapour transport and other pollutants in the troposphere is pumped into the lower stratosphere during the formation of tropical cyclones in the Bay of Bengal and the Arabian Sea, through the TTL region -- the nature of this air transport due to the cyclonic convection is an interesting area of investigation -- and (iii) The formation of thin cirrus in the outflow of the monsoon as remnants of convection or in situ condensation, and their evolution under climate change.

In situ observations using high resolution Stratosphere Troposphere Wind Profiler Radar at CUSAT, satellite observations and modelling studies gives an unique opportunity to explore the above mentioned future activities, which is expected to provide a detailed understanding of the chemical, dynamical and radiative processes of the air reaching the tropical lower stratosphere and its role in climate.

Acknowledgments: The Project team would like to express our sincere gratitude to CEFIPRA for providing financial support for the entire duration of the three year project, and also supported the visits. It gives us an opportunity for interaction of expertise in different areas and exchange our knowledge and information. **Thanks are due to European Community for the StratoClim Project support. The hospitality provided by LMD, Paris and ACARR, CUSAT, India during the visits of the team members are also acknowledged.**

by Prof. K Mohankumar

Raman-Charpak Fellowship - Expert Committee Meeting

Raman-Charpak Fellowship aims to facilitate the exchange of doctoral students between India and France in order to broaden the scope and depth of future engagements in ST&I. The French Masters' students have been included in the programme from year 2016 onwards. This year, the Call for Applications for French Masters' students was launched on 15 April, 2019 with deadline of 31 October, 2019. The Expert Committee meeting for selection of French Masters' students was held on 18 December, 2019 at Office of CEFIPRA, New Delhi and was attended by area experts from different institutes/organizations, representatives from granting agency and CEFIPRA officials. Dr. Purnima Rupal, Director, CEFIPRA welcomed all the participants and briefed them about the background of programme. A total of 4 French Masters' students were selected for the award of Raman-Charpak Fellowship-2019. Director, CEFIPRA appreciated the cooperation and support received from Department of Science and Technology (DST), GOI & French Embassy in India for the Programme.

6th Annual Lecture Series

Prof. Sanghamitra Bandyopadhyay,
Director, Indian Statistical Institute
Professor, Machine Intelligence Unit
Kolkata

CEFIPRA organises lectures under its Annual Lecture Series Programme. In the year 2012, CEFIPRA, initiated this to commemorate 25th year's celebration with intent to increase the interactions between the best S&T minds and young students/researchers from India and France.

The first lecture was delivered by Prof. Jules Hoffmann, Nobel Laureate (Physiology/Medicine 2011) in India in 2012. CEFIPRA organised 6 Lectures under the series in India and France alternately.

6th Lecture under Annual Lecture Series of CEFIPRA was delivered by Prof. Sanghamitra Bandyopadhyay, Director, Indian Statistical Institute, Professor, Machine Intelligence Unit, Kolkata on 15 Oct., 2019 at Sorbonne Université, Paris(title: Optimizing Multiple Objectives for Clustering) and Université Paris-Est Crétail, Paris (title: Advances in Multi-objective Optimization and Applications in Clustering and Computational Biology). She delivered lecture on 15 & 16 Oct., 2019 at Sorbonne Université, Paris, Université Paris-Est Crétail, Paris and Laboratoire d'Informatique de Grenoble, France.

Meeting with Atos Officials

A meeting was held between Mr. Luc Saint-Jeannet, Vice President of Special Projects Atos, Mr. Arvind Bajaj, CEO and Ms Feli Visco Department of IT, Economic Services, Embassy of France in India with Director, CEFIPRA and scientific staff on 23rd October at CEFIPRA office. Mr. Luc Saint-Jeannet delineate the Objective of the meeting is to understand CEFIPRA and its activities and provide information about Atos. This French entity is digital multinational company that specializes in super computers (high performance and quantum). They won a contract under India's National Supercomputing Mission and are building supercomputers with the Center for Development of Advanced Computing, Ministry of Electronics and IT. They have installed a supercomputer at three educational places in India.

2nd Indo-French Knowledge Summit

The second edition of the Indo-French Knowledge Summit, dedicated to higher education, research and innovation was organized at the University of Lyon, France during 17-18 October, 2019. The two-day Summit was organised by the Embassy of France in India, in partnership with the Université de Lyon, Campus France and emlyon business school, on the French side, the Ministry of Science and Technology and the Ministry of Human Resource Development (MHRD) on the Indian side. More than 300 participants from Indian and French academia, competitive clusters & start-ups, corporate houses, research organisations, and public authorities participated in the Summit. The session also highlighted various mobility programs that facilitate the mobility of students and scholars were presented.

Director, CEFIPRA invited as a panelist in the session "New Models of Franco-Indian Partnerships and Financial Mobilization". She also interacted and shared several opportunities for the joint research and collaboration with the French representatives.

Thematic Sessions on priority areas viz. Aeronautics and Space, Agriculture and Food Processing Artificial Intelligence and Mathematics, Eco-Energy & Renewable Energy, Marine Sciences, Smart Cities: Electric Mobility, Smart Cities: Urban Planning & Architecture, Strengthening Employability & Entrepreneurship and Valorisation of Natural Resources from Plants were organized.

The event was inaugurated by Mrs Frédérique Vidal, Minister of Higher Education, Research and Innovation of France in presence of H. E. Mr. Vinay Mohan Kwatra, Ambassador of India to France.

64th Meeting of Scientific Council

The 64th Meeting of Scientific Council (SC) was organized during18 -21 November, 2019 at Bhubaneswar, India. The Scientific Council reviewed 45 pre-selected new proposals submitted under the Collaborative Scientific Research Programme (CSRP) of CEFIPRA. The SC also evaluated 9 mid-term & 16 completed projects. The Council also considered six proposals for workshops / seminars for support.

35th Meeting of Industrial Research Committee

The 35th Meeting of Industrial Research Committee (IRC) was organized on 22 November, 2019 at CEFIPRA, New Delhi. The Committee evaluated three new proposals received under the Industry Academia Research and Development Programme (IARDP) of CEFIPRA and reviewed the completed and ongoing projects. The Committee selected two proposals for seminars supported under this programme.

12th Meeting of the Finance Sub-Committee

The 12th meeting of the Finance Sub-Committee (FSC) chaired by Additional Secretary / Financial Adviser, DST, was held at CEFIPRA, New Delhi on 13 December 2019. The meeting was attended by representatives from DST and Embassy of France in India and Director, CEFIPRA with officials from the Centre.

India R&D Ecosystem Conclave

Keynote Address delivered by Prof. K Vijayraghavan, Principal Scientific Advisor to Government of India

Director CEFIPRA at the Panel discussion on "Women in Science and Deep Tech Start-ups"

The Indian R&D Ecosystem Conclave was held on 17-18 Dec., 2019 at New Delhi. The event was co-organized by Office of Principal Scientific Adviser (PSA) to the Government of India, Department of Industrial Policy and Promotion (DIPP) and Confederation of Indian Industry (CII). The objective of the conclave was to foster India's R&D ecosystem & to improve India's international ranking in the Global Innovation Index 2020 by addressing data gaps. Prof. Vijayraghavan, in his keynote address emphasized on the importance of investing in the R&D in order to increase India's R&D ranking at the Global level.

Dr. Purnima Rupal, Director, CEFIPRA was invited to participate as a Panelist in the session on "Women in Science and Deep Tech Start-ups". The session focused on personal journey in Science and Technology of the panelists and the role of Government in promoting women scientists and women deep tech entrepreneurs.

Meeting with CNRS Delegation

A meeting between Prof. Ashutosh Sharma, Secretary, Department of Science and Technology (DST) and the French National Center for Scientific Research (CNRS) delegation led by Prof. Antoine Petit, Président-Directeur Général, CNRS was organized on 16 Dec., 2019 to identify the areas for future Indo-French collaboration. A CNRS delegation was visiting India to mark the 80 years of establishment of CNRS.

Dr. Purnima Rupal, Director, CEFIPRA participated in the meeting with CNRS delegation. Prof. Antoine Petit, Président-Directeur Général, CNRS mentioned that CEFIPRA was a unique tool in international cooperation & CNRS has been a major recipient of CEFIPRA grant.

Meeting between CNRS delegation & DST Officials

Prof. Antoine Petit, Président-Directeur Général, CNRS with Prof. Ashutosh Sharma, Secretary, DST

Forthcoming Seminars

- Seminar on "GOa ATlantic (GOAT) Cooperation project on Marine Science and Technology IIT Goa - Naval Group - Campus Mondial de la Mer (CMM)" during 20-24 January, 2020 at Brest, France.
- Seminar on "Optimization, Variational Analysis and Applications" during 2-4 February, 2020, at Institute of Science, Banaras Hindu University (BHU), Varanasi.

Raman Charpak Fellow

Hear what our fellows have to say!

Ms. Mandira Majumder
PhD Student
Indian Institute of Technology (ISM)
Dhanbad

Host Institution/University : Université de Lille Institut d'Electronique, de Microélectronique et de

Nanotechnologie (IEMN-UMR CNRS 8520), Université de Lille - Sciences et Technologies, VILLENEUVE D'ASCQ Cedex

Duration : 6 months

The Raman Charpak Fellowship (RCF) has strengthened several skills necessary for being a part of important research group; working in team, communication skills, conceiving and establishing a research idea. The RCF also enabled me to significantly expand my international network of contacts in the field of energy storage materials. The research outcomes of this project in the form of scientific publications will be highly valuable in building the foundation for my future career prospective. I am confident that, together with the reputation of the host, the skills that I comply with this project will enable me to attain a competency to receive nice opportunities for post-doctoral research in future. Being placed in an international research group I hope for substantial strengthening of the ties with the European scientific community and establishment of a network with strong potential for fruitful collaborations in near future. This RCF project enriched my doctoral thesis with a new field of expertise i.e., MOFs. The detailed study done in understating the electrochemical phenomenon exhibited by MOFs (both in pristine or in other forms) would help me understand better the basic underlying aspects of the other electrode materials and key features requisite for any electrode material to show excellent electrochemical performance. The host encouraged me to participate in several seminars and also help other/discuss work with PhD students who are also working in similar field. I also got opportunity to participate in instrument training including FTIR, SEM, RAMAN, and TGA.

Mr. Anthony HURIER
Master Student
Université Pierre et Marie Curie
Paris

Host Institution/University : Indian Institute of Science, Bangalore

Duration : 2 months

I have been lucky to learn the existence of the Raman-Charpak Fellowship thanks to one of my professors at University Paris-Sud (France), one year ago. I am grateful for this because my successful application to the Raman-Charpak fellowship, for a two months Master internship, gave me the chance to work during summer 2019 in the Indian Institute of Science (IISC) of Bangalore. My welcoming department was the Centre for High Energy Physics, where I worked under the supervision of Prof. B. Ananthanarayan and several of his PhD students. Working with them was very fruitful, I consider myself very fortunate to have been part of this team during two months.

The research work I have done in the Centre for High Energy Physics was focused of some mathematical aspects of Quantum Field Theory. More specifically, we studied hypergeometric functions of several variables and, among others, obtained a new analytic continuation formula for the Appell series F4 which appears when one is interested in the calculation of some specific Feynman diagrams in particle physics. This analytic continuation is not yet available in the literature, and we will therefore soon submit a publication on this subject. I also learned how to apply a recent method for computing Feynman integrals: the method of brackets.

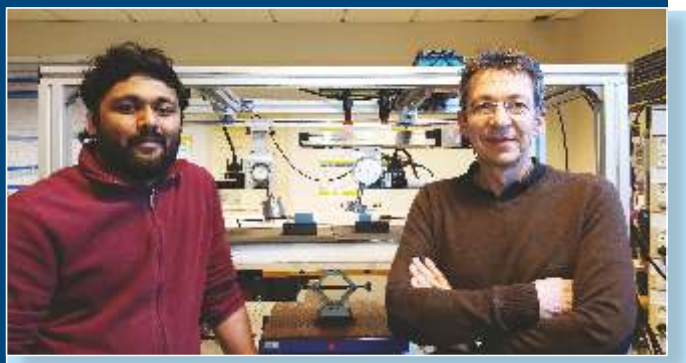
The RCF is a great opportunity for French students. Coming in India is very interesting; it allowed me to open my mind and to discover a new culture. It was a great experience where I learned how to adjust myself in a foreign country. Besides, this stay improves my professional experience. I hope to come again in this fabulous country.

Host Institution/University : Institut National de Recherche en Sciences et Technologies pour l'Environnement et l'Agriculture (Irstea), Villeurbanne

Duration : 6 months

The research work done under Raman-Charpak Fellowship during my stay, has enriched my research. Dr. Sébastien Proust (Researcher, UR Riverly, Irstea, Lyon-Villeurbanne, France). In Irstea lab, I faced the new dimensions of research and work culture. The laboratory facility at Irstea was very advance and very sophisticated measuring instruments were used. I have enjoyed a lot by doing my all experiments with these facilities and also these facilities helped me a lot to finish my all experiments in time. In the project work, I focused on experimental work which is part of my doctoral thesis on 'Unsteady open-channel flows over a rough-bed with and without vegetation' and data analysis. I have performed experiments, data treatment by python code and analysis of results. The research work done under Raman-Charpak Fellowship was so valuable for my doctoral thesis. CEFIPRA is a unique platform for research in France for Indian research scholar. I was so lucky, being selected as the Raman-Charpark fellow-2018, in 'Engineering Science' to work at Irstea, centre de Villeurbanne, France for six months. In this regard, I am grateful to all CEFIPRA personnel in New Delhi, India and Campus France, France for their necessary help in many ways throughout the process. I, really, enjoyed the enchanting beauty in France along with bunches of students coming from different countries and cultures across the globe. It was a great time meeting with other people, exchange views and making friendship, which made life easy and enjoyable.

Mr. Jnana Ranjan Khuntia
PhD student
National Institute of Technology
Rourkela



Dr. Sreedhar Puliyakote (PhD Student) with
Prof. Michel Castaings (University of Bordeaux)

CEFIPRA EMAT Project

I joined the CEFIPRA-EMAT project which was a collaboration between University of Bordeaux in France and IIT Madras as well as IISc Bangalore in India, with Ariane Group as industrial partner. Each academic partner had one PhD student working towards his/her thesis which was part of the project. I was selected as the student to carry out the work taken up by University of Bordeaux under the supervision of Prof. Michel Castaings.

There were frequent interactions between the partners where discussion of the respective work was presented by each partner to others during videoconferencing leading to discussion on how the work can be proceeded.

As the student doing PhD in the French institute, I had the opportunity tovisit the Ariane Group's site in Bordeaux to carry out multiple discussions as well as present my work to various researchers in Ariane Group thereby receiving a lot of new perspective to the way I could carry on the work.

The objective of the work was to devise a method of using ultrasonic guided waves to interrogate adhesive joints between composite panels and thus estimate their strength. Samples were provided by Ariane Group and many discussions with the people in Ariane helped me understand better the method of fabrication as well as the characteristics of the materials used, which were all useful during the experimentation phase of the project.

As part of the CEFIPRA project, I had the opportunity to visit the Indian academic partners for one month to carry out collaborative research work.

I was able to spend 15 days each, during August 2018, at CNDE lab in IIT Madras and Department of Aerospace Engg. in IISc Bangalore, which was spent on combined discussions as well as experiments using the facilities available at those labs. This mobility program also involved the other two PhD students visiting France which meant we had the opportunity to host them for a month during which we shared the results from our respective work through numerous discussions which ultimately helped shape the course of our theses better.

ANNOUNCEMENTS

- CEFIPRA supports proposals for high quality research groups through collaborative research projects in following Priority themes under CSRP - AI & Big Data; Science for sustainability; Quantum Materials and Addressing Biological Questions Using or Developing Mathematical, Computational or Physical Approaches.

  Deadline of 15th Jan., 2020

- Call for Proposals for Seminars/Workshops/Training Schools under CSRP (Academia-Academia)

  Deadline of 15th Jan., 2020

- CEFIPRA supports innovation centric proposals under the framework of Industry-Academia Research & Development Programme (IARDP). It is aimed at supporting joint R&D+I projects of industrial relevance by means of "2+2 Mode of Partnership" (R&D+I projects with the participation of at least one Indian and one France research institution as well as one Indian and one France industry partner).

  Thrust Area: All the areas of technology of interest to the Industry are supported.

  Deadline of 1st Feb., 2020

- Call for Proposals for Thematic Seminars/Workshops/ Training Schools under IARDP (Industry-Academia) in following thematic areas: Natural Product and Cosmetics; Nano toxicology and Smart and Digital manufacturing.

  Deadline of 1st Feb., 2020

- Call for Proposal (s) for Indian & French Companies/ Industries/ SMEs. On behalf of Technology Development Board (TDB), this joint call is implemented by the Indo French Centre for the Promotion of Advanced Research (IFCPAR/CEFIPRA) under TDB-CEFIPRA-Bpifrance, a public investment bank) Programme for Indian and French Industries in following targeted areas Aeronautics; Automotive and Biotechnology with special emphasis to Health Biotechnology

  Deadline of 31st Mar., 2020

CALL FOR PROPOSALS

under IARDP - Thematic Seminars/Workshops/Training Schools

(Deadline for submission of Proposals 1st Feb., 2020)

CEFIPRA organises seminars/workshops/Training Schools in topics of current relevance and interest to both India and France in the areas of Science &Technology. Such events help in initiating interactions among scientists and technologists of the two nations and are expected to result in collaborative research projects.

For a seminar to be organised under CEFIPRA

- Involvement of at least 4-5 leading groups from different institutions of both the countries
- Involvement of the young scientists of the hosting country as a part of the attendees is encouraged
- Participants are expected to be present during entire duration of the seminar
- Seminar can be either held in India or in France

Seminars/Workshops/Training Schools organised in India and France should be almost equal in number with equal weightage if organised in France or India.

Financial Support

- Financial support is provided for domestic and international travel and logistics arrangements relevant to the event.
- The budget estimate should be realistic as possible. The budget estimate can vary upto a maximum of 25 K euros (approx. 20 lakhs).

The following are necessary for submission of proposals of seminars/workshops

- Seminar proposal must be jointly submitted by a French and an Indian coordinator
- There can be maximum 25-30 participants from the host country and 10-15 participants from the other country

The proposals for Seminars/Workshops under IARDP (Industry-Academia) are received for the deadlines of February 1st and July 1st each year.

THE PROPOSALS SHOULD BE SUBMITTED ON WEB-ONLINE SUBMISSION SYSTEM OF CEFIPRA. Link: **www.cefipraonline.in**

The three thematic areas are:

Theme 1: Natural product and Cosmetics
Theme 2: Nano toxicology
Theme 3: Smart and Digital manufacturing

Mobility of Indian Scientists/researchers supported under CEFIPRA projects during October-December, 2019

S.No.	Project / Programme Title	Institutional Affiliation	Institution Visited
1.	p-adic aspects of automorphic forms and their L-functions	**Mr. Mladen Dimitrov** CNRS / University Lille 1 Lille	**Prof. Anantharam Raghuram** Indian Institute Science Education and Research (IISER) Dr. Homi Bhabha Road, Pashan Pune
2.	From molecules to aerosols and dust particles: applications to the physics and chemistry of planetary atmospheres and the interstellar medium	**Dr. Ludovic Biennier** Institut de Physique de Rennes & **Prof Robert Georges** (Co-PI) Institute of Physics UMR6251 du CNRS - Université, de Rennes 1 Rennes	**Prof. E. Arunan** Indian Institute of Science Bangalore
3.	Enhanced CO_2 adsorption and its photo-electrochemical conversion using semiconductor-metal complex hybrids	**Dr. Rabah Boukherroub** Institute for Electronics Microelectronics and Nanotechnology, (IEMN, UMR CNRS 8560) Avenue Poincaré Villeneuve	**Dr. Suman Lata** CSIR-Indian Institute of Petroleum Dehradun
4.	Interactions between dynamical systems, geometry, and number theory	**Prof. Yann Bugeaud** Institut De Mathématique de Marseille, Marseille	**Dr. Anish Ghosh** Tata Institute of Fundamental Research (TIFR) Mumbai
5.	Tuning the interfacial Dzyaloshinskii-Moriya interaction in ultrathin magnetic films: toward the stabilization of skyrmions in spintronics devices	**Dr. Sougata Mallick** (Post Doc) & **Prof. Vincent Jeudy** Laboratoire de Physique des Solides Universite Paris-Sud Orsay	**Dr. Subhankar Bedanta** Laboratory for Nanomagnetism and Magnetic Materials (LNMM) National Institute of Science Education and Research (NISER) Bhubaneswar
6.	Petrologic, Os isotopic and platinum-group element (PGE) geochemical studies of the Archean komatiites from the Singhbhum craton (eastern India): implications for chemical differentiation of the Earth and prospects for Ni-Cu-(PGE) sulfide mineralization	**Dr. Laurie Reisberg** Centre De Recherches Pétrographiques Et, Géochimiques (CRPG), CNRS Université de Lorraine Nancy	**Prof. Sisir Kanti Mondal** Jadavpur University Kolkata
7.	Boron-controlled CO_2 reduction	**Dr. Ramaraj Ayyappan** (Post Doc) & **Dr. Sylviane Sabo-Etiene** Laboratoire de Chimie de Coordination Toulouse	**Prof. Sundargopal Ghosh** Indian Institute of Technology Chennai

Mobility of Indian Scientists/researchers supported under CEFIPRA projects during October-December, 2019

S.No.	Project / Programme Title	Institutional Affiliation	Institution Visited
8.	Glimpses of New Physics	**Mr. Avik Banerjee** (Student) Saha Institute of Nuclear Physics (SINP), Bidhannagar Kolkata	**Dr. Emilian Dudas** Centre de Physique Théorique Ecole Polytechnique 91128 Palaiseau
9.	Phase transitions in sub-saturation nuclear matter and applications to core-collapse supernova and nuclear experiments	**Dr. Gargi Chaudhuri** Variable Energy Cyclotron Centre Department of Atomic Energy Bidhannagar Kolkata	**Prof. Francesca Gulminelli** University of Caen, Laboratoire de Physique, Corpusculaire, 6 Bd du MaréchalJuin, 14050 Caen
10.	Modeling Soft Glassy Flow from Micro to Macro Scale	**Dr. Panaki Chaudhuri** & **Dr Suman Dutta** (Post Doc) Institute of Mathematical Sciences Chennai	**Dr. Kirsten Martens** Laboratoire Interdisciplinaire de Physique,Av. de la physique Grenoble
11.	Tuning the interfacial Dzyaloshinskii-Moriya interaction in ultrathin magnetic films: toward the stabilization of skyrmions in spintronics devices	**Dr. Subhankar Bedanta** & **Mr. Brindaban Ojha** (Stu) Laboratory for Nanomagnetism and Magnetic Materials (LNMM) National Institute of Science Education and Research (NISER) Bhubaneswar	**Dr. Stanislas Rohart** Laboratoire de Physique des Solides Universite Paris-Sud, F-91405 Orsay
12.	Metal chelators derived from imidazole thiones and selones for detoxification	**Prof. Gouriprasanna Roy** Shiv Nadar University Gautam Buddha Nagar Greater Noida	**Dr. Pascale Delangle** INAC / SyMMES, Team Reconnaissance Ionique et Chimie de Coordination, CEA Centre de Grenoble Grenoble
13.	High performance formation control in the presence of uncertainties and communication constraints	**Prof. S Srikant** Indian Institute of Technology Mumbai	**Dr. Irinel Constantin Morarescu** Centre De Recherche En Automatique De Nancy (Cran), Umr7039, Lorraine Nancy
14.	LORIC: LOng-Range Interactions in ultraCold gases	**Prof. Sadiqali Abbas Rangwala** Raman Research Institute Bangalore	**Dr. Olivier Dulieu** Laboratoire Aimé CottonBat 505, Université Paris-Sud, Paris

CALL FOR PROPOSALS

under CSRP - Thematic Research

(Deadline for submission of Proposals 15 Jan, 2020)

CEFIPRA considers and supports research groups through high quality collaborative research projects in advanced areas of basic and applied science to nurture scientific competency in India and France. For upcoming cycle the thematic research specifically aims at contributing to solving important societal challenges. The four areas research themes covering cross-disciplinary (or interdisciplinary) issues.

Eligibility to apply

Principal Collaborators and Joint Collaborators (Indian & French) should have permanent position in an Indian or French University / R&D Institution. They should meet national level eligibility criteria with respect to the operation of grants and age of retirement.

Funding support for the proposals

- Manpower (PhD/Post-doctoral/Master students positions for French Partners; JRF/SRF/RA/Master students for Indian Partners)
- Purchase of consumables
- Travel (International & domestic)
- Equipment (only to Indian Partners : Minor equipment and accessories which are essential for the project with a limit of max. of 10% of total approved budget of the project (max. 20.000Euros))

The four thematic areas are:

Topic 1 : AI & Big Data

The aim of the thematic is to promote new research on the use of Artificial Intelligence (AI) and Big Data. The thematic will be structured around (but not limited to) the following areas:

- Applied Artificial Intelligence and real-life applications of AI
- Cyber-Physical Systems (CPS)
- Internet of things (IoT)
- Machine Learning / Deep Learning Applications
- Cloud / Edge Internet of Things
- Distributed Big Data Analytics
- Intelligent Agent Applications
- Data and Model reduction

There should be significant novelty in the computer science aspect of the proposal.

Topic 2 : Science for Sustainability

It includes, but not limited to, fundamental research on

- Better practices for the preservation of water resources
- Zero or low carbon emission technologies for an increased climate action
- The preservation of ecosystems and biodiversity
- Minerals resources and recycling technologies
- Science and policy for sustainability

Topic 3 : Quantum Materials

Quantum materials are materials where the quantum mechanical effects underline their physical properties, being dominated by quantum fluctuations, quantum entanglement, quantum coherence, topological behavior. The research in this interdisciplinary area which may include theory/modeling, advanced instrumentation, materials synthesis, knowledge of nano- and meso-scale science is at the intersection of physics, material science and engineering.

Key-words: Novel phenomena in topological materials like Topological Insulators. Dirac and Weyl semimetals, Quantum Spin Liquids, superconductors and their hybrids with possible applications such as ultra-sensitive sensors, Heterostructures of 2D materials, Discovery and growth of novel high-quality quantum materials by different methods, Quantum Materials Theory

Topic 4 : Addressing Biological Questions Using or Developing Mathematical, Computational or Physical Approaches

Elaboration of concepts, development of novel approaches or use/adaptation of innovative methods of physics, mathematics and computational sciences for addressing biological questions. A particular attention will be paid to the following fields (not limited): Data acquisition, treatment and analysis, interoperability; Predictive analysis; Simulation; Quantitative biology; Mechano biology; Single molecule studies.

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For further information, please contact:
Director
Indo-French Centre for the Promotion of Advanced Research (IFCPAR)/
Centre Franco-Indien pour la Promotion de la Recherche Avancée (CEFIPRA)
5B, Ground Floor, India Habitat Centre, Lodhi Road, New Delhi - 110 003, India
Tel: 011 2468 2251, 2468 2252, 2463 3567, 4352 6261 | Fax: +91-11-2464 8632
E-mail: director.office@cefipra.org ; Website: www.cefipra.org