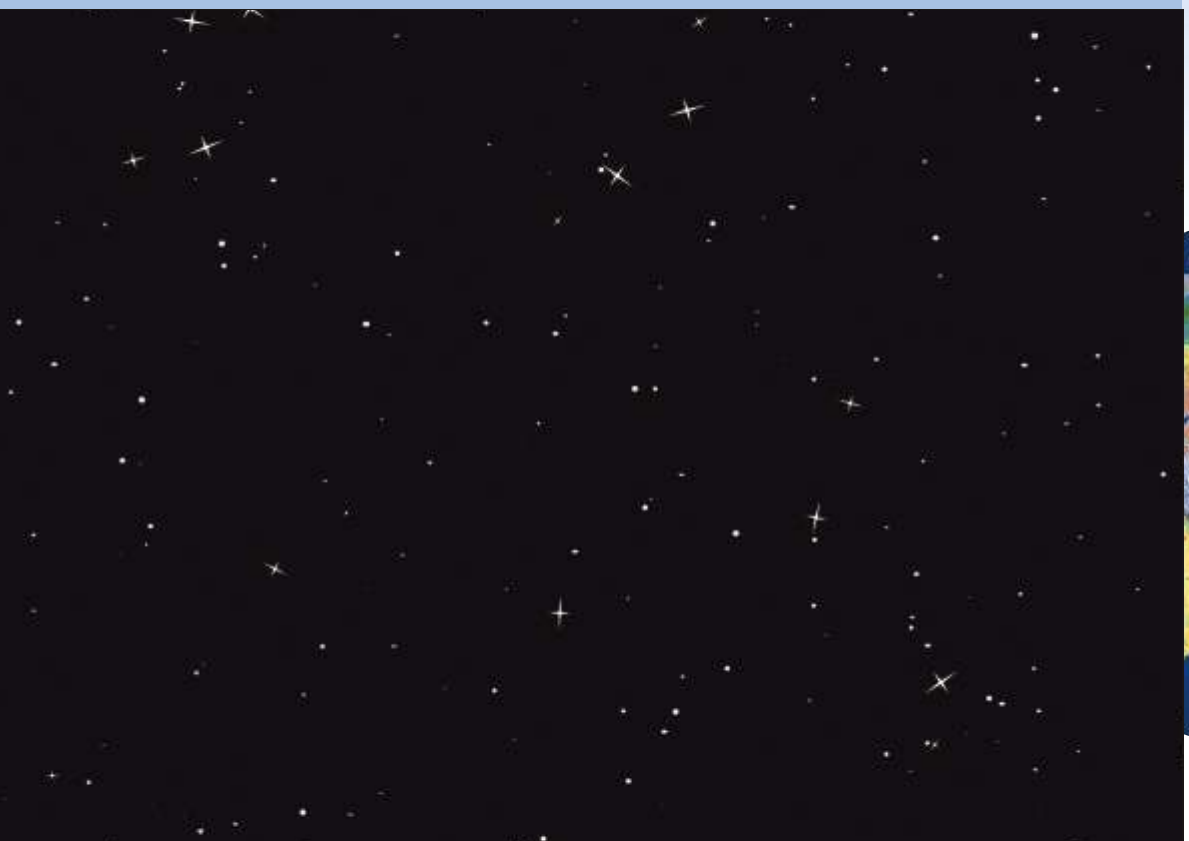
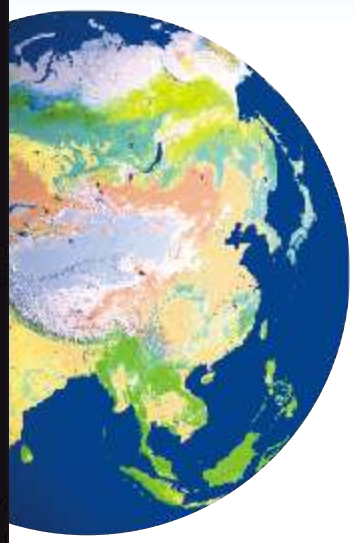
PILOT PROJECT ABSTRACT

Space and Atmospheric Science
PG Course (Phase-I)





Ozone layer over the Bolivian Altiplano: A model

Supervisor
Dr. R. Ramesh
PRL, Ahmedabad, India

Mr. Eduardo Rodrigo Palenque Vidaurre
Laboratorio de Ozono y RUV,
Institute de Investigaciones Fisicas
Universidad Mayor de San Andres, Campus Universitario
La Paz, Bolivia

Bolivia is a country where more than half of the population lives in high-altitude regions, and it is concentrated around the city of La Paz and the shore of the Titikaka lake. As this region, the North altiplano is located in the tropical latitudes, and above the 3800 masl; the solar UVB radiation dose is very high. In the last years, the depletion of the ozone layer produced an increase of the UV radiation reaching the Earth's surface. This can lead to severe problems for the human health as well as the inhibition of plant growth, crop failure, etc. Therefore, the laborattorio de Ozono y Radiaci_n Ultravioleta, at the UMSA, has started a program to study these phenomena. One preliminary result was the finding of even less total ozone above the Bolivian altiplano from the satellite data (TOMS- NASA). One of the possible explanations for that ozone depletion could be linked to a dynamical process involving gravity waves, which will be the aim of this project.

Studies of ionisation irregularities in the middle latitudes

Supervisor
Prof. H.S.S. Sinha
PRL, Ahmedabad, India

Mr. Sin Sun Chol
The institute of Remote sensing and Geoinformatics
State Academy of Sciences
Pyongyang, DPR Korea

The study of ionization irregularities gives very valuable information about the nature of the electric field and the currents in the ionosphere. A knowledge of the properties of these irregularities would be very useful in planning high frequency communication links. In our country studies on the ionization irregularities were made about ten year ago. The scientists of the institute of Remote sensing & Geoinformatics made the measurements of irregularities of electron density and electron temperature in the middle latitudes. It is planned to use the existing data on the ionization irregularities and also acquire some more data to understand the nature of these irregularities.

Study of the radiative properties of the atmosphere

Mr. Hong Bong-Ki
The institute of Remote sensing and Geoinformatics
State Academy of Sciences
Pyongyang, DPR Korea

Supervisor
Dr. A. Jayaraman
PRL, Ahmedabad, India

The radiative properties of the atmosphere is very important not only to determine the thermal budget of the atmosphere but also to identify the characteristics on the Earth's surface by using satellite remote sensing. In our country the research work on remote sensing is newly begun and has no data about radiative properties of the atmosphere. Therefore, in this project I propose to determine the radiative properties of the atmosphere in middle latitude every season and every level.

Laser sounding of the atmosphere

Mr. Chittathuru Rambabu Rao
Atmospheris Science Division,
Sri Venkateswara University
Tirupathi, India

Supervisor
Mr. K. Raghunath
NMRF
Gadanki (AP) SAC, Ahmedabad, India

Pulsed-light techniques of probing the atmosphere have been greatly extended by employing lasers as energy sources in instruments called 'lidars'. Apart from the basic capabilities of lidar for detecting back scattering from atmospheric constituents , possibilities exist for more sophisticated techniques based on the wave nature of the energy. The basic capabilities of lidar, however make it possible to observe the atmosphere with previously unknown resolution and sensitivity. Apart from providing new information about clouds, lidar has shown that the concentration of the particulate matter content of clear air is highly variable and that such variations can indicate the structure and motion of the clear atmosphere.

Optical imaging of plasma depletions

Mr. P.K. Rajesh
Department of Physics,
University of Kerala
Kerala, India

Supervisor
Prof. H. Chandra
PRL, Ahmedabad, India

Optical imaging is one of the powerful techniques for probing the earth's upper atmosphere. Imaging studies are based on the various chemical reactions that are taking place in the ionosphere. The formation of the ionosphere itself, is a result of the various photochemical reactions that are induced by solar radiation. Molecular oxygen (O2), molecular nitrogen (N2), and atomic oxygen are the most important chemical species in the ionospheric altitudes. In the ionosphere they undergo various chemical reactions and are excited or ionized. These excited elements are responsible for the phenomena called airglow. Photo-ionisation, photo-dissociation, attachment reactions, charge exchange reactions etc. are the different types of chemical processes that give rise to airglow emissions, which may be in UV, visible or IR .regions of the electromagnetic spectra.

Geomagnetic storms and their effects on the f region of the ionosphere

Ms. Titiek Setiawati
National Institute of Aeronautics & Space
Ionospheric Research & Development Centre (LAPAN)
Bandung, Indonesia

Supervisor
Prof. V.V. Somayajulu
IMP, VSSC
SAC, Ahmedabad, India

The magnetosphere changes give rise disturbances in the geomagnetic field and the ionosphere through magnetosphere-ionosphere interactions. The F region of the ionosphere is a very sensitive indicator of magnetic storms, which can be identified by changes in the peak of electron density. The F region is the most important part for radio communication. The main problem in HF radio communication is the rapid changes in the ionospheric characteristic during the storms. In the normal condition, the HF link is based on the monthly median values of the maximum usable frequency (MUF), however the MUF's will be effected by such disturbances. The main object of this project is to know the behavior of the critical frequency of the F region during the storms. This result can be used to determine the departure of the MUF's from their monthly median during the disturbed days.

Influence of troposphere parameters on total ozone content

Supervisor
Dr. Shyam Lal
PRL, Ahmedabad, India

Ms. Bujidmaa Borkhuu
Institute of Meteorology and Hydrology
Ulaanbaatar, Mongolia

The objective of the project is to do a correlative study of total ozone content with mid-latitude tropospheric properties. The tropospheric properties such as tropopause height, temperature etc. are found to effect the total ozone content. The total ozone content is obtained from ground based ozonometer (M-124, Russian) measurements and from TOMS data. The ozonometer data for one station in Mongolia (st. Shainshand) is available for the period from 1988 to 1993. TOMS data is available from 1975 onwards. The tropospheric parameters are available for the same period. These parameters are derived from the data obtained from radiosonde (meteorological balloon measurement). It is aimed to compare the correlation results obtained, using data from TOMS and from ozonometer separately.

Study of the radiative properties of the atmosphere

Supervisor
Prof. D.K. Chakrabarty
PRL, Ahmedabad, India

Mrs. Sarantuya Ganjuur
Department of Space Science, Meteorology & Hydrology,
National University of Mongolia
Ulaanbaatar, Mongolia

In this project attention has been concentrated upon the aspects of climatology, which are environmentally important such as change of temperature and rainfall. Mongolia is situated in the heart of Asia. The climate is characterized by slight precipitation, large seasonal variation in temperature and very dry air. The large desert region includes the Gobi and other smaller desert areas. A desert steppe type of climate surrounds these desert regions. Summers are warm and continental cooling results in extremely cold winter. Since the climate is not favorable for habitation a large section of the heart of Asia is devoid of meteorological data.

Photometric & spectroscopic observation of VW Cephel eclipsing binary star

Mr. T Chandana Peiris
Arthur C Clarke Institute for Modern Technologies
Moratuwa, Sri Lanka

Supervisor
Dr. U.C. Joshi
PRL, Ahmedabad, India

Many stars are variable in their light output either due to internal changes or to an occasional eclipse by a binary partner. The photometry of binary stars is one of the most important observational techniques in astronomy. The binary stars may be detected by various means of observation and their classification as, Visual, Astrometric and Spectroscopic, is therefore, based on the technique by which they were discovered. If the distance of a visual binary star is known, the relative orbit of one of the stars with respect to the other and the orbital period distance can be used to calculate the sum of the masses of the two components. Astrometric observations offer the possibility of discovering stars of low mass, less than 0.06 solar mass, which are unobservable directly due to their low luminosity. Spectroscopic binaries appear as single stars, but periodic shifts in the positions of the spectrum lines, or doubling of the lines, reveals the presence of two stars.

Theoretical aspects of astrophysical problems - the first cycle of solar proton-proton reaction with outgoing neutrino flux

Mr. Turdimurat M Tursumuratov
14 Apt, 47, 1 "A" Lisunov Str.
Tashkent, Uzbekistan

Supervisor
Prof. Anjan S Joshipura
PRL, Ahmedabad, India

There has been a revolution in astronomy and astrophysics over the last 40 years. The prime reason for this has been the opening up of the whole of the electromagnetic spectrum for astronomical observations. This revolution would not have been possible without the theoretical investigations as well as the development of new techniques for making astronomical observation both from the ground and from space. The study of Solar wind is only one part of the subject of solar-terrestrial relations, which has become a discipline of the greatest importance. It has been established that the level of solar activity can influence the terrestrial environment. Objectives of the project are to study Solar energetic particles and the Coulomb effects on scattering amplitudes for astrophysical processes, the first cycle of Solar p-p reaction.

Ground based study of ionospheric plasma depletions

Mr. Pankaj Kumar Mishra
Institute of Technology, Banaras Hindu University
Varanasi, India

Supervisor
Prof. H.S.S. Sinha
PRL, Ahmedabad, India

Ionospheric plasma depletions are large-scale structures of electron density, wherein the electron density shows very large variations, at times reaching as large as three orders of magnitude. These large-scale structures are formed over magnetic equator and they move upwards to higher altitudes and then diffuse along the magnetic field lines to low latitude regions. Plasma depletions are associated with a unique night time phenomenon known as Equatorial spread F (ESF). The most intriguing property of plasma depletions is that they are observed only on a few ESF nights and not on all nights. Using all sky optical imaging system, these plasma depletions can be observed from ground. By using 630 nm and 777.4 nm nightglow emission lines, ionospheric plasma depletions can be imaged where they are located in 250 $\pm$ 25km and around 350 $\pm$ 25 km altitude ranges, respectively. It is planned to study the scale-size, degree of depletion, tilt with reference to geomagnetic north-south, velocity of movement of plasma depletions, etc., by suitable image processing of 630 nm and 777.4 nm images taken in rapid succession from a low latitude stations.

Retrieval of wind speed from satellite data

Ms. Falguni Patadia
M O G/RSA
SAC, Ahmedabad, India

Supervisor
Dr. Rashmi Sharma
SAC, Ahmedabad, India

Multi frequency Scanning Microwave Radiometer (MSMR) is a four frequency (6, 10, 18, 21 GHz), dual polarized microwave passive instrument on board IRS-P4 satellite with a 2 day repeativity. The parameters obtainable from this instrument are atmospheric columnar water vapour content, sea surface, wind speed, sea surface temperature and cloud liquid water content. Any satellite derived observation has to be validated before use. Information of winds over the ocean is a critical parameter for the various oceanographic and atmospheric studies. In this project work, validation for different wind speed ranges will be carried out. It is also planned to study large scale features over a longer duration of time on global and regional basis

Ionospheric tomography

Mr. Kalyan Kumar Bhuyan
Department of Physics,
PO Dibrugarh University
Assam, India

Supervisor
Prof. H. Chandra
PRL, Ahmedabad, India

Coherent Radio Beacon Experiment (CRABEX) have been proposed on board GSAT-2 to be launched in early 2002. CRABEX has beacons at 150 MHz and 400 MHz along with 1 MHz modulation to measure Faraday rotation, Differential phase and modulation phase. A chain of 12 receivers is proposed to be set up covering the region from dip equator to the northernmost region. As Total Electron Content (TEC) data would be available, at a chain of receivers in India, an appropriate algorithm would be developed for tomographic reconstruction of the Indian zone ionosphere. The TEC will be calculated using IRI model ionosphere and the two- dimensional image of the Indian zone ionosphere will be reconstructed using this algorithm. It is also planned to superimpose large-scale plasma structures, as seen in equatorial spread-F conditions and test the feasibility of reconstruction of such structures.

Atmospheric Aerosols

Mr. Pawan Kumar Gupta
School of Physics, Devi Ahilya Vishwavidyalaya
Indore, India

Supervisor
Prof. A. Jayaraman
PRL, Ahmedabad, India

Solar radiation is absorbed and scattered by the various atmospheric gases and aerosols before reaching the Earth's surface and the amount of absorption and scattering varies with the wavelength of the incoming solar radiation. By measuring the attenuation of the incoming solar radiation, one can estimate the amount of the absorbing and scattering constituents of the atmosphere. In the present project the attenuation of solar radiation in visible region using hand held Sunphotometer for seven different wavelengths, will be made. The output from the instrument will be used to calculate the total atmospheric optical depth and by subtracting the contributions due to Rayleigh scattering by air molecules and absorption by ozone, aerosol optical depth will be obtained. A computer programme will also be developed to calculate the solar zenith angle at the time of observation, to normalize the data. It is planned to make regular aerosol optical depth measurement over Indore for one-year period from May 2001 to April 2002. The data will be analyzed for seasonal variation in the columnar aerosol loading over the measured site.

Study of ozone using satellite data

Mr. Toktoyev Zamirbek Smatovich
Kyrgyz Technical University
Bishkek, Kyrgyz Republic

Supervisor
Dr. Varun Sheel
PRL, Ahmedabad, India

Ozone plays a crucial role in life on the earth. In the stratosphere, it screens out biologically harmful solar ultraviolet radiation, keeping it from reaching the surface. Such ultraviolet radiations are destructive for genetic cellular material in plants and animals, as well as human beings. In the troposphere ozone acts as a greenhouse gas. It absorbs earth's outgoing infrared radiation at 9.6 μm thereby participating in the global warming. Increase in the tropospheric ozone is not only important in stratosphere but also in the troposphere and at the surface. The distribution of ozone depends on chemical, physical, and dynamical processes occurring in the middle atmosphere. It is not possible to reproduce in a laboratory all the chemical reactions and motions of ozone that occur in the real atmosphere. Ground-based and in-situ techniques do not provide sufficiently detailed information. Observations from satellites provide detailed information on atmosphere, which give us better opportunity to understand the ozone distribution. Data available from various satellites will be used for the study of ozone in the earth's atmosphere.

The potential of GIS techniques in the study of climatic variation

Ms. Garelmaa Dashnaym
Hydrometeorological Institute
Ulaanbaatar, Mongolia

Supervisor
Mr. S.K. Pathan
LPPD/FLPG/RSA
SAC, Ahmedabad, India

The weather in Mongolia is characterized by extreme variability and short-term unpredictability in the summer. From a cursory look of weather data of the country, one can notice that wide variations in precipitation, temperature, relative humidity and pressure across the country. Such weather poses severe challenges to human and livestock survival. Therefore, it is planned to study these variations over a period of time and establish the relationships between weather parameters such as precipitation, temperature, humidity and pressure. The weather data (type of clouds, precipitation, temperature, pressure and relative humidity) collected over central part of Mongolia for the last five years will be used for the study.

Study of convective clouds

Ms. Dagva Maasuren
Aviation Meteorological Center
Ulaanbaatar, Mongolia

Supervisor
Prof. S.P. Gupta
PRL, Ahmedabad, India

Clouds are aesthetically appealing and exciting phenomena of the atmosphere. There are different types of clouds which give rise to thunder storm, rain and hailstorm. The convective clouds play a significant role in changing phenomena of the weather. By studying the convective cloud, one can predict the temperature of the atmosphere, heavy rain, shower, gust, thunder and lightning. In this project, characteristics of thunder-cloud which affect the weather will be studied. It is planned to use satellite cloud images of NOAA and GMS over Mongolia for this study. Above study will be used for aviation forecast.

Total ozone measurement over Kathmandu using Brewer spectrophotometer

Mr. Narayan Prasad Chapgain
Department of Physics,
Tribhuvan University
Lalitpur, Nepal

Supervisor
Prof. Shyam Lal
PRL, Ahmedabad, India

Ozone is one of the most important minor constituents in the earth's atmosphere. It absorbs the harmful solar ultraviolet radiation from about 240 nm to 290 nm and it provides a benevolent environment for life forms to survive on the earth. In addition, ozone is an important greenhouse gas. It absorbs earth's outgoing infrared radiation at 9.6μ thereby participating in the global warming. Increase in the tropospheric ozone is also harmful for human health and for vegetation. The systematic ozone measurement in Kathmandu is not done till now. Recently, Tribhuvan University has got a Brewer instrument for making total ozone measurement. It also measures UV radiation and SO2 concentration. It is planned to study the diurnal and seasonal variations of total ozone over Kathmandu in the year 2001, as part of project work.

Design of proton precession magnetometer

Mr. Pismenniy Dmitriy Alexandrovich
Tashkent Scientific Research Institute
of Space Engineering (TSRISE)
Tashkent city, Uzbekistan

Supervisor
Dr. R N Misra
PRL, Ahmedabad, India

Magnetometer is an instrument for measuring the strength and sometimes the direction of magnetic fields. Magnetometers are used to measure variations in the earth's magnetic field due to ionosphere current or in order to locate mineral deposits, archaeological sites, buried treasure, or submerged objects such as submarines or shipwrecks. They are also used to calibrate electromagnets and permanent magnets and to determine the magnetization of materials. A widely used modern absolute instrument is the proton-precession magnetometer. It measures a voltage induced in a coil by the precession of magnetically polarized protons in ordinary water. The systematic measurements of the earth's magnetic field in Uzbekistan is not done till now. In this project, a proton-precession magnetometer will be designed & fabricated to measure absolute value of earth's magnetic field. Diurnal and seasonal variation of earth's magnetic field will give interesting information about middle-latitude region of our planet. Ms. Gerelmaa

Spectral imaging studies of main belt asteroids of Kuiper belt objects

Ms. Harsha S Kumar
School of Pune & Applied Physics
Mahatma Gandhi University
Kerala, India

Supervisor
Prof T Chandrasekhar
PRL, Ahmedabad, India

This report describes a study of the reflectance spectroscopy of asteroids, meteorites and the objects beyond the inner solar system(> A U) known as the Kuiper Belt Objects. Asteroids represent the only existing remnant planetesimals dating back to the formation of our solar system. They are also considered to be the source for most of the meteorites. Reflectance spectroscopy has emerged as an important technique in determining the mineralogical surface composition of asteroids and meteorites. Here, the current questions being raised on the asteroid-meteorite relationship and in linking the meteorites back to their parent bodies are also addressed. Known meteorites are derived from number of asteroids. The question of why abundant meteorites have rare meteoritic analogues has to be explored further. The understanding of physical nature and distribution of Near Earth Asteroids (NEAs) become important with the realization that their collision on Earth can cause regional to global devastation on our biosphere.

Multiwavelength studies of mesospheric airglow emissions

Ms. Uma Kota
Physics Department,
Andhra University
Visakhapatnam, India

Supervisor
Prof H.S.S. Sinha
PRL, Ahmedabad, India

Air glow emission profiles can be used to deduce atmospheric densities and to understand reaction mechanisms and kinetics responsible for these emissions. The vertical profile of the emission lines can be studied by rocketborne measurements. An instrument carrying multiple photometers on board RH 300 Mark II rockets, is planned to be launched from Thumba, to study different emission lines. In this project, attempts have been made to explain causative mechanisms for different emissions and their expected brightness. Some details of the proposed instrument have also been described here.

Estimation of Fried's parameter at USO lake site

Mr. Nirvikar Dashora
Udaipur Solar Observatory
Udaipur, India

Supervisor
Prof. P. Venkatakrishnan, USO
PRL, Ahmedabad, India

The Earth's atmosphere offers highly turbulent medium for the waves propagating through it. The turbulent atmosphere is a major problem in optical astronomy as it drastically reduces the angular resolution of telescope, to the order of one arc second. Besides this the meteorological conditions also play a major role. The Fried's parameter r_0 at any astronomical site, contains information about the statistical measure of seeing at a site. The Udaipur Solar Observatory (USO) is second of its kinds in the world for its situation at the lake site .The lake site has been a suitable tool to overcome the air turbulence and has been exploited well at USO. Unfortunately the lake has completely dried up leading to possible changes in seeing conditions. The aim of this project is to measure the Fried's parameter at Udaipur Solar Observatory (USO) Lake Site when lake completely dried up.

Near infrared spectroscopy of asteroids

Mr. Vikas Singh
Physics Department,
MLS University,
Udaipur, India

Supervisor
Prof. T. Chandrasekhar
PRL, Ahmedabad, India

The physical nature , distribution ,formation and evolution of asteroids are necessary to understand the formation of planets. In our solar system, asteroids are the direct link that can provide information about the evolution of our solar system. Asteroids occupy the transition region between the rocky terrestrial planets and the outer gas giants . the asteroids are also of interest since they are the source of meteorites. The fundamental goal of asteroid spectroscopy is to establish link between meteorites and asteroids. The near infrared spectroscopy has emerged as a very important tool in understanding the mineralogical interpretation of the asteroids using ground based studies and also helpful in understanding the different spectral types and features of asteroids. We are planning to take the reflectance spectra of many asteroids ,having magnitude less than m=12, from Mt. Abu telescope, and classify them according to their spectral properties and match this classification with the standard ones.

The study of J H K photometry of comet C/2000 WM-1 linear

Mr. Sumit Kumar
Physics Department
Gurunanak Dev University
Amritsar, India

Supervisor
Dr. U.C. Joshi
PRL, Ahmedabad, India

The images of the comet C/2000 WM-1 Linear have been taken in infrared bands (J,H, K) with 1.2 meter Infrared telescope at Gurushikhar Mt. Abu. The report describes data analysis techniques. Some results have also been presented.

Simulation of photolysis rates in a box model

Ms. Javzmaa Gombosuren
Neo System Co. Ltd.
Ulaanbaatar, Mongolia

Supervisor
Dr. Varun Sheel
PRL, Ahmedabad, India

The major constituents of the Earth's atmosphere are N, O, and Ar. There are other gases, which are in low quantities and are divided in terms of levels of concentrations, viz. major gases, minor constituents and trace gases. The major gases are very long lived gases having natural sources but the other category of gases have natural or man made sources. Although tropospheric ozone is only a trace gas it plays a controlling role in the oxidation capacity of the atmosphere. Ozone and its photochemical derivative OH are the major oxidants for most reduced gases. The aim of the project is to simulate photo-dissociation rates of a few important reactions in the troposphere related to ozone chemistry. The attenuation of UV radiation by stratospheric ozone limits photochemical activity in the troposphere to wavelengths longer than 290 nm.

Long term temperature changes in the stratosphere over the Mongolian region

Mr. Munkhbat sedbazar
Aviation Meteorological Center , Mongolia
Ulaanbaatar, Mongolia

Supervisor
Dr. S. Ramachandran
PRL, Ahmedabad, India

Earth's Atmosphere is predominantly a nitrogen-oxygen atmosphere, these two gases occupying about 99% o by volume. A whole host of minor and trace constituents contribute to the remaining 1%, which include argon , carbon dioxide, water vapour, ozone, methane, oxides of nitrogen, carbon monoxide , hydrogen sulphide, ammonia etc. These,

along with aerosols, play a vital role in determining the conditions on the Earth's surface and in the biosphere. The minor constituents play distinctive and very important roles in the physico-chemical and related activities in the atmosphere. The sources and sinks of aerosols, their physical and chemical properties and their residence times are of special interest because they are a link in the chain of the removal process which returns gaseous pollutants to the Earth's surface. In this project we have tried to look at the increases in the stratospheric temperature due to volcanic eruptions. We used collected data from one Mongolian upper air temperature station, radiosonde data from 1976-1990s for 14 years, and isobar surface level for 70mb,50mb,30mb,20mb and did analysis at PRL.

Modelling of tropospheric ozone

Mrs. Oyunchimeg Dugerjav
Researcher, Environmental Research Section,
Institute of Meteorology & Hydrology
Ulaanbaatar, Mongolia

Supervisor
Dr. Varun Sheel
PRL, Ahmedabad, India

The atmosphere contains about 78% nitrogen, 21% oxygen and 1% noble and trace gases. One of the most important trace gas is ozone (O_3). Ozone is transported into the troposphere from the stratosphere where it is photo-chemically formed from oxygen molecules. It is deposited onto the Earth's surface and is involved in many tropospheric chemical reactions. Because the emissions of nitrogen oxides and volatile organic compounds have steadily increased in industrialized countries, the tropospheric ozone concentration has increased about 1-2% per year during the last 40 years(1988).Climate change, ozone depletion and pollution in the lower atmosphere and consequent health effects are coupled together. The investigation of global coupling needs both experiments and models.

Temperature inversion at lower altitudes over Ulaanbaatar, Mongolia and its effect on aerosol & trace gas dispersal

Mr. Erdenesukh Sumiya
Department of Meteorology & Hydrology,
National University of Mongolia
Ulaanbaatar, Mongolia

Supervisor
Prof. A. Jayaraman
PRL, Ahmedabad, India

The atmosphere is conventionally divided into layers in vertical direction, according to the variation of temperature with height. The troposphere which is up to about 15 km altitude, and is bounded above by the tropopause. The layer from the tropopause to about

50 km is called the stratosphere and is bounded above by the stratopause. The layer from the stratopause to about 85-90 km , is the mesosphere bounded above by the mesopause. Above the mesopause is the thermosphere .The troposphere is also called the lower atmosphere. It is here that most "weather" phenomena , such as cyclones, fronts, hurricanes ,rain, snow ,thunder and lightning occur. A layer in which the temperature increases with height is called inversion layer. Inversions can sometimes occur near the ground because of some meteorological and geographical conditions.

Solar furnace gamma ray telescope

Mr. Mirzasulton A Mamatkosimov
Institute of Material Science
Tashkent, Uzbekistan

Supervisor
Dr. R.N. Misra
PRL, Ahmedabad, India

The goal of the present project is to transform the double mirror multiheliostat Large Solar Furnace (LSF) into an astrophysical tool for the studies of cosmic rays (CR) and sources of ultra high energy Gamma radiation .The LSF has been designed for concentration of solar energy, to get a power of about 1000 kW during most part of the day. It was constructed in 1987 for conducting research in the field of material science, manufacture of refractory and super pure materials and also for testing of various devices and designs on background of nuclear explosions. Located in central Asia, in spurs of the Tien-Shan mountains 50 km from Tashkent, at the height of 1100 m above sea level (41° 20' N,69° 45' E), it has a good astroclimate. The LSF can be used at nighttime, as a multifunctional ground based Cherenkov telescope to register Cherenkov flashes from the Extensive Air Showers formed by proton and nuclear components of the Primary Cosmic Rays(PCR) as well as perform observations of Galactic and Extragalactic sources of Gamma radiation

Rocket-borne study of atomic Oxygen related night glow emissions

Ms. Alyana Radharani
Gajapathi (Dt.), Orissa , India

Supervisor
Prof. H.S.S. Sinha
PRL, Ahmedabad, India

PRL has proposed to conduct a rocket-borne experiment ABHA to make in situ measurements of volume emission rates of various airglow emissions in the altitude region 80-110 km and electron density fluctuations in the E region. The experiment is planned to be conducted from Thumba Equatorial Rocket Launching Station(TERLS),Thumba (8.55^{0}N,76.86^{0}E, 0.3^{0}N dip latitude). The airglow emissions,OI557.7nm green line,O_2(0-0)atmospheric band,O_2I Herzberg band, OH(8-3) Meinel band will be monitored using photometers while a Langmuir probe will be used to study the electron density fluctuations in the E region. The present project intends to study the known chemistry and reaction mechanisms of the above mentioned airglow emissions, parameters that can be measured from ABHA, design of the photometers and past experiments done in the same context.

Studies of plasma depletions and scintillations using GPS and VHF scintillation data

Miss. Malini Aggarwal
Physics Department,
Saurashtra University
Rajkot, India

Supervisor
Prof. Harish Chandra
PRL, Ahmedabad, India

Spatial irregularities of ionospheric electron densities scatter satellite radio signals and also lead to amplitude and phase variations. Amplitude scintillations induce signal fading and, when this exceeds the fade margin of a receiving system, message errors in satellite communications are encountered and loss of track occurs in navigational systems. Phase scintillations cause Doppler shifts and may degrade the performance of phase-lock loops, such as in Global Positioning System (GPS) navigation systems. They may also affect the resolution of space based synthetic aperture radars. The magnitudes of amplitude and phase scintillations and the temporal structure of scintillations need to be specified and predicted to provide support to operational communication and navigation systems. GPS system being set up at Rajkot (20^{0}N, 70.2^{0}E, dip latitude15.3^{0}N) can be used to study total electron content (TEC) and L band scintillations together with VHF scintillations (250 MHz) being recorded. Presently, the data will be examined to find the plasma depletions in TEC and its association with scintillation. The role of equatorial ionization anomaly in the equatorial scintillations will also be investigated.

Study of ionospheric plasma depletions using PRL's all sky optical imaging system

Ms. Madhavi Latha Vamanapalli
A.P. M.O.
Guntur, India

Supervisor
Prof. H.S.S. Sinha
PRL, Ahmedabad, India

Plasma irregularities are a unique signature of equatorial spread F phenomenon in the ionosphere. They are localized depletions and enhancements in plasma density. These irregularities have been observed over Kavalur (12.56°N, 78.8°E, and 4.6°N Dip), India during Jan-Feb, 2004 using PRL's All Sky Optical Imaging System operating at wavelengths 630 nm, 557.7 nm and 777.4 nm. For the present study, the data of 19th Jan 2004 from 2100 hrs to 0145 hrs (LT) for the emissions at the above mentioned wavelengths has been taken. The images have been analyzed using IRAF (Image Reduction and Analysis Facility) software. A number of plasma depletion parameters, viz., degree of depletion, east - west extent, tilt with respect to the geomagnetic field, inter depletion distance, drift velocity have been determined.

Sun-photometer study on seasonal and diurnal variations in aerosol optical depth spectrum over male

Mr. Ahmed Muslim
Beyruge, S.Fedu
Maldives

Supervisor
Prof. A. Jayaraman
PRL, Ahmedabad, India

Aerosols are solid or liquid particles suspended in the medium of air. They play a significant role in weather pattern and climate change apart from their effect on human health. Studying about aerosols is very important, especially for countries whom are totally depended on rain for drinking water such as Maldives located at 73 east and extends from 7degree north to 2 degree south. For the Pilot project it is planned to make regular aerosol optical depth measurement at three different wavelengths, viz., 400, 500 and 670-nm over PRL Ahmedabad, and the data will be used to understand diurnal variation over the area. The one year project to be carried out at Male' will differ from the pilot project in using 5 wavelengths, viz., 400, 500, 670, 750 and 860-nm and also in taking data for about a year to cover the duration of the two monsoons (SW and NE) which takes place over the area and also analyzing the data to understand both the diurnal as well as seasonal variations.

Long term changes in meteorological parameters over Mongolia

Ms. Munkhjargal Erdenebadrakh
Institute of Meteorology and Hydrology
Ulaanbaatar, Mongolia

Supervisor
Prof. Shyam Lal
PRL, Ahmedabad, India

Mongolia has unique environmental and climatic conditions because of its physical and geographical features. All kinds of natural and man made ecosystems as principle life support system are very vulnerable and sensitive to climate and weather conditions. Therefore, global climate change faced today by mankind would cause great concern for Mongolians. Accordingly understanding of present weather and how it will change in future are very important. Meteorological data collected from 16 weather stations in Mongolia have been used in this study. Time series analysis of the data from 1984 to 2003 years for atmospheric temperature, precipitation, humidity, wind speed and solar radiation have been carried out. The data have been analyzed using statistical methods and excel window program to study their variability and long term trends.

Analysis of changes in visibility and rainfall during 1993-2003 over selected locations in Mongolia and examination of possible human impact

Ms. Amgalan Ganbat
Institute of Meteorology and Hydrology
Ulaanbaatar, Mongolia

Supervisor
Prof. Harish Chandra
PRL, Ahmedabad, India

Climate Change is having a significant impact on the global environment. Climate condition and its change are one of the limiting factors for economic development of the country. This pilot project presents a study the effects of seasonal precipitation and visibility changes on the climatic conditions over Mongolia during the period of 1993-2003. Variations of the climatic conditions are studied using the data collected at the three meteorological monitoring stations, Ulaangom (West region), Ulaanbaatar (Center region) and Binder(East region). I also investigate the correlation between visibility variation and precipitation. Impacts of the change of visibility and rainfall over selected locations in Mongolia on the human life are also looked at. Detailed data analyses will be done for many stations in Mongolia as part of the thesis work.

Study of the binary system V367 Cygni

Mr. Ranawaka Arachchige Sujith Saraj Gunasekera
Arthur C Clarke Institute for Modern Technologies
Moratuwa, Sri Lanka

Supervisor
Prof. N.M. Ashok
PRL, Ahmedabad, India

V367 Cygni (HD 198287-8), V=7.04^{m}, B=7.66^{m}, P=18.^{d}6, Sp=A7 Iapevar, RA=20^{h}47^{m}59^{s}.6, DEC=+39º 17' 15".7 (J 2000) is an eclipsing binary system in Serpentids group. Previous studies on this system in spectroscopy shows that only the primary component is observed and this system has a shell-like spectrum, an indication of a gaseous stream of material surrounding the system. The underlying stellar spectrum is dominated by sharp shell lines and MgII (4481Aº) is the only clearly visible photospheric line. Previous observations on this system in photometry shows that it has a Lyrae type light curve with variations in depth of both minima as well as intrinsic fluctuations in the light curves. It was also found that the observed BVRI light curves fixed to a semidetached model with a disk around the invisible component could better explain the observed features of V367 Cygni. Mass transfer is taken place from less massive star to the more massive star. In our study, near-infrared spectra obtained from Mt-Abu observatory during December 2003 will be analyzed to study the circumstellar environment of this interesting binary star.

Nonlinearity in tropospheric chemistry models

Mr. Abdulaziz Shermukhamedov
Institute of Mechanics & Seismic Stability of Structures
Tashkent, Uzbekistan

Supervisors
Dr. Varun Sheel,
Dr. M.S. Santhanam
PRL, Ahmedabad, India

The production and loss of ozone is caused by processes which are distinctly different in the stratosphere than are encountered in the troposphere. Whereas the anthropogenic influence translates into a net ozone loss through homogeneous or heterogeneous chemistry in the stratosphere, the reverse is true for the troposphere. Due to increasing concentrations and emissions of CH_4, CO, NO_x by human activities the overall chemistry and concentration distribution of O_3 and OH in the troposphere is changing. Understanding of dynamically unstable chemical systems governed by non linear dynamic laws and containing feedback loops will lead to better understanding of ozone chemistry. In this work., we study the nonlinear rate equations governing the ozone chemistry. Using a simplified model we show that the bifurcation patterns and instability cycles exist in the governing equations for ozone chemistry in the atmosphere. For certain values of parameter, it could become irregular .this needs to be explored in real atmospheric chemistry model.

Characterization and observations of astronomical grade array detectors

Ms. Mubarak Vahidovna Gafurova
Physical Technical Institute,
Academy of Sciences of Uzbekistan
Tashkent, Uzbekistan

Supervisor
Prof. U.C. Joshi
PRL, Ahmedabad, India

Performance characterization of the IR camera PRL NIC has been attempted. The gain and the read noise vary from quadrant to quadrant. The performance of the camera is found to be as good as any other such camera in use at observatories across the globe based on similar NICMOS-3 detector. After processing the images of some star forming regions very clean images are obtained implying that the variation of the gain, dark count from quadrant to quadrant is taken care of.