Newsletter

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Ionospheric Response to Transit of Interplanetary Magnetic Clouds

Interplanetary magnetic clouds (Bubbles) are structures in the solar wind wherein the magnetic field (B) is higher than the average ($\geq$ 10nT) and changes direction smoothly from a large southern (northern) direction to a large northern (southern) direction across the structure. The clouds typically last for $\sim$ a day at Earth (implying a characteristic radial dimension of 0.25 A.U. at 1 A.U.) and are currently considered as interplanetary manifestations of solar coronal mass ejections (CMEs). Geomagnetic activity can be expected to respond to the passage of clouds because they possess a large southward interplanetary magnetic field (IMF) over a part of their $\sim$ 1 day duration at Earth. Recent studies demonstrated that clouds indeed produce geomagnetic disturbances with characteristics consistent with the well-known sensitivity of geomagnetic activity to IMF orientation and solar wind flow speed (*e.g.*, Zhang & Burlaga 1988: *J. Geophys. Res.*, **93**, 2511). The discovery of magnetic clouds and the subsequent studies strongly linking them with the forms of solar activity that are known to lead to CMEs on the one hand, and with geomagnetic storms on the other, have revealed a new facet of solar-terrestrial relationships wherein a logical and transparent cause-and-effect sequence prevails. The response of near-Earth space environment to the passage of magnetic clouds merits investigations in view of the clear perspective it provides of the coupling between interplanetary, magnetospheric and ionospheric variabilities on short timescales.

We have undertaken a detailed study of the behaviour of equatorial ionosphere in relation to the transient of a class 1 magnetic cloud (*i.e.*, 'negative' cloud with shock association) at the Earth during 1967 January 13-15. The cloud did cause an intense sudden commencement (SC) type geomagnetic storm ($|\mathrm{Dst}|_{\mathrm{max}}$, 176nT). An earlier study of the changes in solar wind-magnetosphere coupling brought about by this cloud and their relationship to the characteristics of the attendant geomagnetic storm (as seen in AE, Dst indices) showed that the magnetosphere acts as a direct-driven system (Perrault & Akasofu 1978: *Geophys. J. R. astr. Soc.*, **54**, 547).

Analysis of quarter-hourly ionograms of Kodaikanal (dip 3.5°N) revealed the occurrence of a prominent, short-lived, westward disturbance in the equatorial zonal electric field during the initial phase of the geomagnetic storm induced by the cloud's passage. The electric field disturbance manifested as a sudden and abnormal descent of the entire bottomside F-region for a short duration (1845–2030 LT), in temporal coincidence with the decay phase of an auroral substorm and asymmetric ring current that developed at the onset of the geomagnetic storm. The decay of the substorm as well as the asymmetric ring current is triggered by a conspicuous northward swing of IMF B_z and bears a close temporal association with a decrease in polar cap potential drop (ϕ) estimated from IMF parameters. The values of vertical drift velocity estimated from the time rate of change of the height of bottomside F-region and corrected for chemical loss effects indicated the amplitude (max) of the electric field disturbance to be $\sim$ 1.9 mV m^{-1}. The evidenced electric field perturbation finds a logical interpretation in terms of prompt penetration of substorm-associated high latitude electric fields to the dip equator as its polarity is consistent with the model results (*e.g.*, Senior & Blanc 1984: *J. Geophys. Res.*, **89**, 261). This is an important addition to the current knowledge of penetration of electric fields in the sub-auroral ionosphere, because observations available to date indicate that transient electric fields manifest preferentially and with large amplitudes in the midnight-dawn sector near the geomagnetic equator, due to sudden decreases in magnetospheric convection/polar cap potential (Fejer 1991: *J. Atmos. Terr. Phys.*, **53**, 677). This feature, in fact, is well predicted by the models. But the models also indicate that transient westward electric fields ought to prevail at equatorial latitudes in the 18–21 LT sector due to sudden decreases in magnetospheric convection. Explicit observational evidence for such electric fields is not available so far. Our finding, therefore, validates the global convection models as regards the polarity of the perturbation in equatorial zonal electric field due to decreases in magnetospheric convection for the dusk-midnight sector also. The duration and amplitude of the evidenced electric field disturbance do not, however, seem to agree with the model values. This discrepancy in the details of the observed and predicted characteristics of transient electric fields reaffirms the current view that though the basic mode of low-latitude penetration of magnetospherically generated electric fields is understood, comprehension of physical processes that control the magnitude and duration of the perturbations is at a nascent stage.

Another unique feature of the transient response of equatorial ionosphere to the cloud passage is the remarkable increase in electron density at and below the F layer peak over Kodaikanal, that accompanied the rapid and spectacular downward motion of the layer in the post-sunset hours mentioned above. The response is considered unique because the fate of nighttime F layer near the dip equator is governed by chemical loss and plasma transport, and when the layer is below 300 km it has to decay as a rule due to enhanced chemical loss, while what is observed is exactly the opposite. For example, at 230 km, where the time evolution of N_e changes due to the electric field disturbance are seen for a major part of its manifestation, N_e increased by a factor of 30 between 1915 and 2030 LT. Reports of such fast and prominent increase in N_e are quite uncommon in the literature. An earlier theoretical study (Tan 1982: *J. Atmos. Terr. Phys.*, **44**, 377) indicates that the peak electron density (N_m) can increase in a limited altitude range above 250 km, if a sufficiently large downward drift prevails such that the plasma compression induced by drift overcomes the chemical loss (βN_e). Evaluation of the relevant parameters (β and hence the drift required for an increase in N_m according to theory and the drift implied by the observed changes in h_m when N_m increased) showed that the theoretical condition holds good in the altitude range 250–395 km. This confirms that the observed increase in N_m is due to ionization convergence rate exceeding the βN_e loss rate, when the layer as a whole experienced a large downward drift because of the penetration of substorm-related electric fields into the equatorial ionosphere.

Further details have been presented in *Planetary and Space Science*, **40**, 519, 1992. Prominent ionospheric disturbances are also apparent in the main and recovery phases of the geomagnetic storm induced by the magnetic cloud. Detailed study of these is in progress and will be reported later.

J. Hanumath Sastri, H. N. Ranganath Rao
& K. B. Ramesh

Solar Cycle No. 22: Is this the Second most Active Cycle?

The mean of daily relative sunspot (RSS) number indicates the extent of activity of the solar cycle. The size of the solar cycle may be associated with the physics of solar dynamo. The study of a solar cycle becomes important because the solar activity has direct effect on communication systems, geomagnetic activity, upper atmospheric modelling and satellite orbital decay.

We are obtaining daily broadband (yellow light) pictures of the sun at Kodaikanal using 6-inch refractor on all the available clear days. The monthly mean sunspot numbers are plotted in Fig. 1 for cycle 22 (1986 Jan - 1992 Feb). Also shown for comparison are the mean monthly sunspot number for the most active solar cycle (19) observed in the modern period. The 13-month running mean known as, 'smoothed sunspot number' (Howard, R. 1977,*Illustrated Glossary for Solar and Solar-terrestrial Physics*, D. Reidel, Dordrecht, p. 7) were computed using the relation

$$\bar{R} = \frac{1}{24}(R_{-6} + R_{+6} + 2\sum_{-5}^{+5} R_i)$$

where $\bar{R}$ is the smoothed sunspot number and R_i is monthly mean sunspot number of the ith month. Note that for this analysis we have used the data from Kodaikanal only. The smoothed sunspot number has a maximum value of $R(M) = 194.5$ for solar cycle 19. It is less by 6.8 in comparison with the maximum value $R(M) = 201.3$ determined by Robert Wilson (1990, *Solar Phys.*, **125**, 143) from a different data set. The small difference between these two may be due to non-availability of data on a few cloudy days at Kodaikanal, poor seeing conditions or quality and emulsion of photographic plate. The value of $R(M)$ for cycle 22 from Kodaikanal data

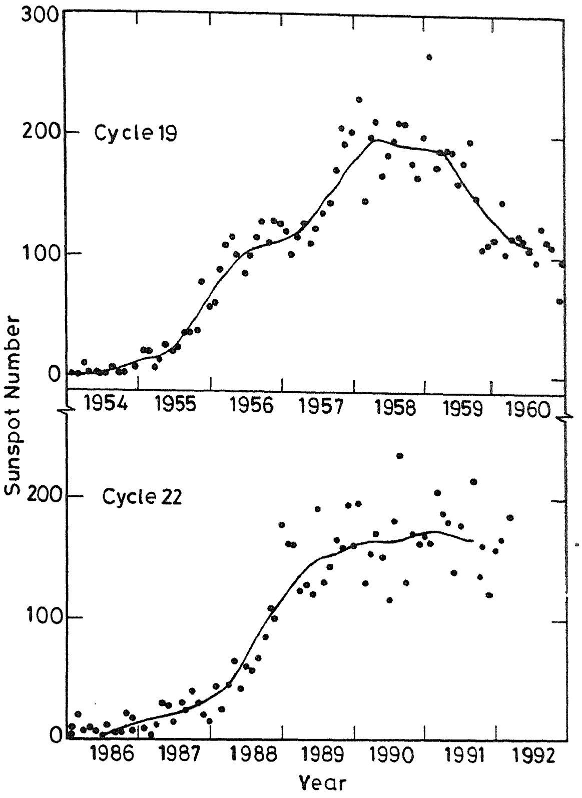

Fig. 1. Plot of monthly mean sunspot number against time for the solar cycle numbers 19 and 22. The curves drawn represent the smoothed sunspot number for these two cycles.

is 173.6. The value for cycle 21, the second most active cycle known before cycle 22, is 157.6 as obtained from the Kodaikanal data. From the values for cycles 19,21 and 22 given in Table 1, one may conclude that the sunspot cycle 22 is now the second most active cycle after the 19th solar cycle observed in the modern period (since 1818). The sun appears to have reached its peak activity during 1990 August – 1991 July whereas it was predicted to attain maximum amplitude during 1989 December – 1990 May. The shapes of the smoothed sunspot number curves indicate that in cycle 22 the sunspot activity stayed at its peak for a longer duration than usual.

Table 1. The values of maximum smoothed sunspot $R(M)$ number for four solar cycles.

Solar cycle	$R(m)$	
	Kodaikanal	R.M.Wilson
19	194.5	201.3
20	112.9	110.6
21	156.7	164.5
22	173.6	–

M/s P. Paramasivan, P. Michael, T. Md. Khan and V. Muniyandi obtained the photoheliograms used in this analysis.

Jagdev Singh, P. S. M. Aleem, G. S. Suryanarayanan & R. Selvendran

PKS 2126–158 : The most X-ray-Luminous Object in the Universe*

PKS 2126-158 is one of the brightest radio-loud quasars (m_v = 17.3; M_V = −30.0) with an emission redshift z_{em} = 3.27. We report here its first X-ray (0.1–1.10 kev) spectrum observed with EXOSAT. Power law + fixed absorption (galactic hydrogen column density = 4.85 × 10^{20}cm^{-2}) model fits the spectrum well (χ^2_{red} = 0.90 for 25 degrees of freedom). The model suggests that PKS 2126-158 is a flat spectrum source (α = 0.3 ± 0.15). The observed spectrum and the best fit model convolved through the detector response are shown in Fig. 1. No soft excess emissions are present as can be seen from the residuals. Thermal bremsstrahlung + fixed absorption model also fits the spectrum well (χ^2_{red} = 0.82) and the derived rest frame plasma temperature is 6.4^{+40}_{-4} keV. Measured hard X-ray (2-10 keV in the observer's frame) flux of this source is (7.3 ± 0.8) × 10^{-12} erg cm^{-2}s^{-1} and the corresponding luminosity is (2.3 ± 0.3) × 10^{48}erg s^{-1} (H_0 = 50km s^{-1}Mpc^{-1}, q_0 = 0). To our knowledge no comparable AGN has been detected in the hard X-ray range. Thus we report that PKS 2126–158 is the most luminous AGN in which hard X-rays (> 35 keV at source) have been detected (detailed results will appear in *Astr. Ap.*).

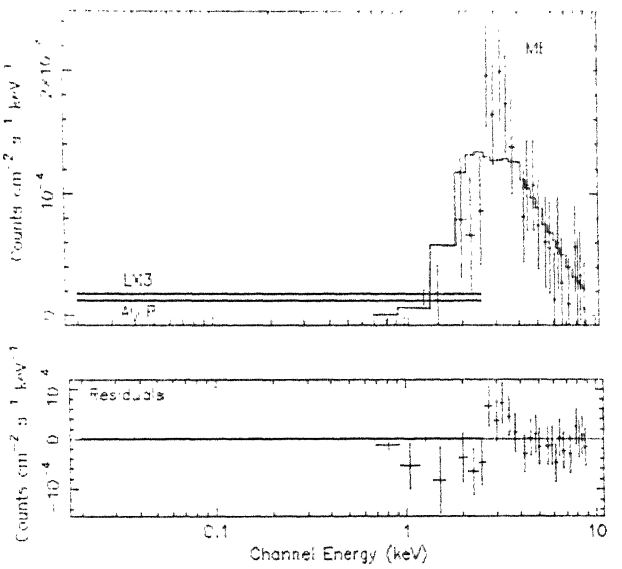

Fig. 1. Observed spectrum (+) of PKS 2126-158 fitted with a simple power-law + fixed absorption model (solid line). The lower panel shows residuals of the fit.

We are grateful to Prof. J. C. Bhattacharyya for his support and encouragement in all respects. Our thanks to the EXOSAT observatory staff at ESTEC who helped us to get the data from the archives and provided us with the XSPEC software package.

K. K. Ghosh & S. Soundarajaperumal

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*X-ray spectrum was obtained from the EXOSAT database.

Novae in Outburst and Quiescence

Novae belong to the cataclysmic variable class of objects, which includes dwarf novae, recurrent novae and classical novae. These systems undergo outbursts ranging from $\Delta m \sim$ 2–5 mag for dwarf novae, 7–9 mag for recurrent novae, to 9-> 14 mag for classical novae, with the inter-outburst periods being $\sim$ weeks to years for dwarf novae, $\sim$ decades for recurrent novae and $\sim 10^4$ years for classical novae. Cataclysmic variables are interacting binary star systems consisting of a Roche-lobe filling secondary, on or near main sequence, losing hydrogen-rich material through the inner Lagrangian point onto an accretion disc that surrounds the primary, which is a white dwarf in most cases. A classical nova outburst is caused by a thermonuclear runaway on the surface of the white dwarf primary, whereas in dwarf novae the outburst is due to accretion disc instabilities, caused by factors such as enhanced mass transfer.

Novae serve as valuable astrophysical laboratories. The physics of accretion onto compact, evolved objects, thermonuclear runaways on semi-degenerate surfaces, line formation and transfer processes in moving atmospheres, and formation of dust in the ejected matter are some of the astrophysical problems that can be understood better by detailed studies of novae. Such problems are also encountered in other instances of ejection of matter such as supernovae and planetary nebulae.

In this study we present optical spectroscopic data of the classical novae LW Serpentis 1978, V 443 Scuti 1989 and of the recurrent nova RS Ophiuchi 1985, obtained during outbursts. Spectroscopic data of the recurrent novae T Coronae Borealis, RS Ophiuchi and T Pyxidis and the classical nova GK Persei 1901 obtained during quiescence are also presented. Also, CCD images of the shells of GK Persei, and T Pyxidis are presented. Most of the data used in the study were obtained with the 102 cm reflector at VBO. In addition, some data obtained at ESO, made available by H. W. Duerbeck and also some archival data from IUE, made available by A. Cassatella are made use of. All data were reduced at VBO using the locally developed RESPECT software package (Prabhu & Anupama 1991, *Bull. astr. Soc. India,* 19, 97), as also the STARLINK package with locally developed application routines. These data have been used to study the physical conditions in the nova envelopes, and the components of the binary system.

The outburst spectrum of the moderately slow nova LW Ser 1978 compares well with that of a typical nova. Based on moderate-resolution Hα-line profile, a kinematical model for the shell of LW Ser is proposed. The spectrum of V 443 Sct 1989, also a moderately slow nova, compares well with LW Ser at similar epochs. The fluxes in emission lines have been used for determining the physical conditions in the ejected material. Spectra observed during oscillations in the light curve show that the variations are mostly in the continuum, and hence imply a change in photospheric radius.

CCD images of the shell of nova GK Per obtained in the lines of [N II] and [O III] are used to determine the expansion of the shell by comparison with data available in literature. The shell is asymmetric with bulk of the emission arising in the southwest quadrant in the [N II] image. There is a difference in the distribution of [O III] and [N II] emission suggesting chemical inhomogeneities. A comparison of the images obtained in 1990 with the published images obtained in 1984 shows that the mean proper motion of knots is 0.173 arcsec yr^{-1} in the polar cone region, whereas it is 2–3 times higher in the equatorial region. An initial velocity of 1100 km s^{-1} and a deceleration of 1.5 km s^{-1} yr^{-1} are derived for the equatorial region whereas the corresponding values for the polar region are 1500 km s^{-1} and 12.5 km s^{-1} yr^{-1}, respectively. The spectrum at quiescence is decomposed into those of K0-2IV secondary and the hot accretion disc. The mass transfer rate is estimated to be $\sim 10^{-9}$ $M_\odot$ yr^{-1}. The He/H abundance in the accretion disc is ≤ 0.24.

Fluxes in the Hα, He I and He II emission lines during the outburst of RS Oph have been used to determine the electron density and helium abundance (He/H= 0.16) in the envelope. Based on an estimate of the number of hydrogen and helium ionizing photons, the temperature and radius of the ionizing source have been determined. The results obtained during the late stages of outburst are consistent with the primary being a white dwarf rather than a main sequence star as has been suggested by some workers. The coronal line fluxes have been used to determine the temperature in the coronal line emitting region. Spectra obtained during quiescence indicate that the secondary is an M0 ± 1 giant. The presence of strong O I 8446 Å emission line implies presence of Lyβ fluorescence and a high temperature for the ionizing source. The quiescence spectrum is decomposed into the spectra of cool secondary and hot accretion disc. The mass transfer rate is estimated to be $\sim 10^{-6}$ $M_\odot$ yr^{-1}. The long wavelength cutoff in the accretion disc spectrum has been identified at 1.6μm; this implies that the outer radius of the disc is $\sim 2.4 R_\odot$. Spectra of the recurrent nova T CrB obtained during its quiescence phase (1985–1990) show that the secondary is an M4 ± 1 giant. The emission lines in the spectra are variable in strength. The Hα flux shows a secular variation over the timescale of observations ($\sim$ 2400 days). Superposed over this is an orbital phase dependent variation with maxima at $\sim$ 0 and 0.5 phase. The estimated mass transfer rate is $\sim 10^{-7}$ $M_\odot$ yr^{-1}.

Images of T Pyx in [N II] and [O III] reveal a bright shell ejected in the 1944 outburst and a faint extension due to the 1920 outburst. Comparison of VBO and ESO images show the expansion of the bright shell by 0.2 ± 0.1 arcsec in 3 years. The differences in [O III] and [N II] images suggest the presence of chemical inhomogeneities as in the case of GK Per. The spectrum of the nova at quiescence is dominated by the accretion disc, and has a high degree of excitation. The estimated mass transfer rate is $\sim 10^{-8}$ $M_{\odot}$ yr^{-1}, and He/H abundance is ≤ 0.24.

G. C. Anupama

(Synopsis of the thesis titled *Studies of Classical and Recurrent Novae* for which the Bangalore University has awarded its Ph.D. degree. Further details are available in Prabhu & Anupama 1987, *J. Ap. Astr.*, **8**, 369; Anupama & Prabhu 1989, *J. Ap. Astr.*, **10**, 237; Anupama & Prabhu 1991, *Mon. Not. R. astr. Soc.*, **253**, 605; Anupama, Duerbeck, Prabhu & Jain 1992, *Astr. Ap.*, submitted; Anupama & Prabhu 1992, *Mon. Not. R. astr. Soc.*, submitted.)

Improving the Hα Flare Patrol with the Spectroheliоscope at Kodaikanal

A Spectroheliоscope loaned by the Mount Wilson Observatory was set up at Kodaikanal in the year 1934 to monitor the optical solar flares and active regions on the sun. G. E. Hale (1929, *Ap. J.*, 70, 265) had developed the concept of this spectroheliоscope and got one made to be used at Mount Wilson Observatory. Later, a similar one was developed at Mount Wilson Observatory to be sent to Kodaikanal for collaborative work.

The 4-inch coelostat system collects the sunlight and directs it to a 3-inch objective of 24.5 feet focal length. Thus a 2.7-inch image is formed on the entrance slit of the spectroheliоscope. A 3-inch mirror of 19 feet focal length makes the light beam parallel and feeds it to a grating of 600 lines per mm. A mirror identical to the collimating mirror collects the diffracted light from the grating and focuses the spectrum on the exit slit which isolates the first order Hα line of the spectrum. Two Anderson prisms mounted on the same rod are kept in such a way that one comes in front of the entrance slit and the other in front of the exit slit. These are rotated together at an adjustable high speed so that the observer can see two-dimensional image of the sun in Hα line. While observing, one can adjust the second mirror of the coelostat to bring the desired portion of the sun at the entrance slit. A precalibrated line-shifter near the exit slit helps in determining the line of sight velocity of moving material in active regions.

This instrument has been in use since 1934 but over the last decade or so the image quality had become rather poor. It was not possible for the observer to identify Hα structures like mottles, filaments, prominences, and small and less intense active regions on the solar images. Therefore, we could observe only a few big and very intense solar flares during the last decade or so and missed a large number of small and weak flares. To improve the Hα flare patrol the following steps were taken in December 1988.

Table 1. Hα flare and other activities observed in 1989–91.

Date	Activity	Duration	Importance
10-2-89	Flare	46	4N
8-5-89	Flare	46	2N
14-5-89	APr	200	2
5-1-89	BSL	77	2N
15-1-90	EPL	69	2B
19-1-90	Flare	–	1N
21-1-90	Flare	–	1N
21-1-90	Flare	37	2B
6-2-90	BSL	15	1
6-2-90	BSL	7	1
1-3-90	Flare	19	SF
22-3-90	Flare	–	2N
8-4-90	Flare	46	3B
15-4-90	Flare	56	3N
25-4-90	DSD	115	1
8-2-91	limb,Flare	48	2N
18-5-91	Flare	19	3b
11-6-91	Flare	74	4B
2-10-91	Flare	–	1N
5-12-91	Flare	26	2N

As a first step all the mirrors of coelostat and spectroheliоscope were aluminized. The tube and the slits of the spectroheliоscope were cleaned. The grating of the spectrograph had gone bad due to fine dust deposition on the surface. This led to large amount of scattered light in the spectroheliоscope which reduced the contrast between different features of the sun and made it difficult to locate small, less intense active regions. Therefore, this grating was replaced by a new one of 300 lines per mm blazed at 2.0μm in the first order. In the present set up the exit slit isolates third order Hα line. Schott OG1 glass filter has been kept behind the entrance slit to cut off the blue and green portion of the spectrum. Due to the change of grating the dispersion of the spectrum is larger and the calibration of the line-shifter different. The new and old values are given below.

	Old value	New value
Thin glass plate	0.04 A/div	0.026 A/div
Thick glass plate	0.25 A/div	0.163 A/div

After the change of grating and alignment of the spectroheliоscope, the spectral quality has greatly improved and the observer is able to see filaments, prominences and even weak brightening very clearly. The improved performance is evident through the data on some of the observed events shown in Table 1.

Jagdev Singh

Working Group for National Large Optical Telescope

The Indian astronomy community expressed the need for setting up a large optical/IR telescope while deliberating on facilities for the 8^{th} Five Year Plan, during the national meeting held at IIA in August 1989. Subsequently, workshops sponsored by the Dept. of Science & Technology were organized at IIA in October 1989 to discuss the scientific requirements for such a telescope and to broadly define the requirements of a site which should be identified. One of the major recommendations of these workshops resulted in the formation of a Working Group under the aegis of the DST in December 1989, with the following members: S.N. Tandon (IUCAA; Chairman), J.N. Desai (PRL), H.S. Mahra (UPSO), A.K. Pati (IIA), A.K. Saxena (IIA), B.N. Karkera (CSIO) and J.K. Sharma (DST).

The Working Group is to define the performance parameters for the telescope, to define a minimal set of focal plane instruments, to evolve a conceptual design for the telescope and instruments keeping in view the requirements of the community, the advances in technology as well as available capability. A search for a suitable site fulfilling the minimum requirements as laid down during the workshops (October 1989) is also to be organized by the Working Group.

Within the terms of reference of the Working Group, at IIA, A.K. Saxena has been studying the general feasibility of the optics systems, including optical design, active/adaptive optics systems, optical fabrication, aluminizing plant and related aspects. A.K. Pati has been examining aspects relating to observing configurations, focal plane instruments meeting the broad requirement of astronomers, aspects relating to automation, and is also pursuing a preliminary search for possible sites. Some aspects involve the coordinated activity of Working Group members but here, the work being done by members from IIA is mainly discussed.

The working group has had several meetings during which questions of aperture size, optical configurations, availability of mirror blanks, mechanical designs, possible methods of implementing state-of-the-art technology as well as possible sites have been discussed in some detail. A. K. Saxena has explored the availability of mirror blanks of sizes from 4 to 8 metres; blanks of either size can be obtained if a decision is taken quickly and an order placed. Due to various constraints it would appear more prudent to first build a 4 metre class telescope employing modern technological innovations before attempting a larger instrument.

The methodology for preliminary site selection being followed by A.K. Pati involves examining detailed topographical maps of possible regions, selecting several locations on the basis of topography as well as available meteorological data, and evolving a method for analysing satellite imagery of the Indian subcontinent to determine which of the locations is cloud-free to the extent of justifying on-site measurements. The topographical maps were obtained from the Survey of India and regions covering the Himalayan ranges in the states of Uttar Pradesh, Himachal Pradesh and the Ladakh region have been analysed to yield several possible locations of interest. The required optical/infrared performance of the telescope necessitates a high-altitude site. On an experimental basis, some images taken by the INSAT 1B satellite have been obtained from the Indian Meteorological Department and efforts are under way to evolve a method of analysing them. The analysis is also of interest to the National Solar Vacuum Telescope Working Group and some aspects are carried out jointly.

A. K. Saxena & A. K. Pati

newsline

Ch. V. Sastry who was away at the University of Mauritius for installation of the Mauritius Radio Telescope, has returned and assumed the position of Director (Acting) since 28 January 1992.

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J.C. Bhattacharyya assumed the Emeritus Professorship at the Institute on 1 March 1992. He has been nominated a member of the Institute's Research Advisory Committee on Instrumentation. J.H. Sastri has been nominated Member-Secretary of Indian National Committee for Solar-Terrestrial Physics (INSCOSTEP) of INSA, New Delhi for a three-year term from July 1991. He will also be serving on the Editorial Board of *Indian Journal of Radio and Space Physics* (CSIR, New Delhi) for a three-year term beginning January 1992. A. Peraiah has been elected vice-president of the Astronomical Society of India for the term beginning 1992. Ram Sagar has been appointed Associate Editor of the *Bulletin of the Astronomical Society of India*. V. Krishan has been elected Secretary of the Plasma Science Society of India for the term beginning 1992.

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Y.D. Mayya attended the third Canary Islands Winter School on Star Formation in Stellar Systems, Tenerife, 2–13 December 1991. S.K. Jain attended the design review meeting of the Extreme Ultraviolet Spectroheliometer project at Stanford, in February 1992. M.H. Gokhale attended the IAU Coll. 137 on Inside the Stars, Vienna, Austria, 13–17 April 1992. He also visited the Institut für Astronomie, Zurich and MPI for Astrophysik, Munich. N.K. Rao visited the University of Texas at Austin, McDonald Observatory and Lick Observatory for four weeks in November – December 1991 under CSIR–NSF exchange of scientists program, for collaborative work on hydrogen-deficient stars and for studying the fibre-linked coudè and cassegrain spectrographs. C. Sivaram is on a visiting professorship at Dipartimento Di Fisica Dell' Università Di Ferrara, Italy for 2 months since April 1992. K.R. Sivaraman presented a paper titled 'Green Coronal Emission and the Solar Cycle' in the Twelfth NSO/Sacramento Peak summer workshop on the Solar Cycle 15–18 October 1991. Following this he spent about three weeks at NSO, Tucson.

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Visitors to the Institute between 1991 October and 1992 March include W. Kalkofen, Harvard Smithsonian Centre for Astrophysics, Cambridge, Massachusetts (September 1991); R. Howard, NSO, Tucson (December 1991); T. Gehrels, Univ. Arizona (October 1991); I. I. Romanyuk, Special Astrophysical Observatory, Russia (November 1991); N. Gopal Swamy, University of Maryland (January 1992); P.K. Sahu, Institute of Physics, Bhubhaneswar (since March 1992); J. Adam, Heidelberg (February – March 1992).

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C. Sivaram has been promoted as Associate Professor in October 1991. A. Peraiah and Ch.V. Sastry have been promoted as Senior Professors, and G. Srinivasalu as Scientific Officer SD from April 1992.

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A winter school on Stars and Stellar Systems was held at VBO, 23–31 December 1991 to generate interest in astronomy and astrophysics amongst students and teachers from colleges. A mini-workshop on Astrophysical Plasmas cosponsored by IUCAA and IIA was held during 2–6 March 1992.

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The Institute hosted the 13th meeting of the expert panel for Thermal and Optical Measurements (of the National Coordination of Testing and Calibration Facilities) on 10 January 1991. The third group monitoring workshop of All India Coordinated Program for Ionospheric and Thermospheric Studies, 26–28 February 1992, was hosted by the Institute.

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The Institute established stalls at the Science & Technology exhibition of the DST at the 79th Indian Science Congress at Vadodara during 3–8 January 1992, and at Vidhana Soudha, Bangalore on 28 February 1992.

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G.C. Anupama was declared qualified for the Ph. D. degree of Bangalore University in November 1991. She left IIA in October 1991 and joined IUCAA as a postdoctoral fellow. P. Bhaskaran joined as Visiting Fellow in November 1991. R.D. Prabhu (JAP, IISc) has undertaken his research work at the Institute. M.S. Sundara Rajan joined as Scientific Officer SD in December 1991. He was earlier working at GMRT, Pune. He will work on the correlator systems at Gauribidanur and the radio telscope being set up at Mauritius.

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The Ph. D. program for the year 1992–93 will commence from August 1992. Advertisements calling for applications have already appeared in the newspapers.

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R. K. Kochhar inaugurated on 11 January 1992 an astronomical observatory housing a 14-inch Celestron telescope at Sri Ramakrishna Vidyashala, Mysore. He has been appointed a member of the Standing Advisory Committee of the Positional Astronomy Centre, Calcutta.

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A satellite link between Kavalur and Bangalore has been established since February 1992, and is in regular use for communication.

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A.P. Jayarajan was given a farewell on 25 March 1992. During his service of over three decades, he had made many optical elements and telescope mirrors including the 2.34 m primary for the VBT. He was awarded the VASVIK award for material sciences and technology in 1985. After his retirement in 1982 as Head, Optics Division, he was associated with the Institute as a full-time consultant till 29 February 1992.

P. Padmanabhan, who was a Section Officer in billing section passed away on 21 December 1991 following a road accident on 18 November 1991.

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colloquia

The following lectures were given at IIA between 1991 November 1 and 1992 March 31:

1. Models of voids in the expanding universe (Alberto Chamorro, Univ. Basque State, Spain).
2. Nobel prize in physics, 1991 : P. G. de Gennes (S. Chatterjee, IIA).
3. Facilities and research programs at the 6m telescope of the Special Astrophysical Observatory, USSR (I. I. Romanyuk, Special Astrophysical Observatory, USSR).
4. Primordial and oscillating components of Sun's poloidal magnetic field (M. H. Gokhale, IIA).
5. Deterministic chaos in time series (R. Pratap, Cochin Univ.).
6. A novel vibration analyzer (S. Chatterjee, IIA).
7. Photon multiplicity detector (Y.P. Viyogi, Variable Energy Cyclotron Centre, Calcutta).

8. Are coronal shocks piston-driven? (N. Gopalswamy, Univ. Maryland, USA).
9. Variability in blazars (U.C. Joshi, PRL, Ahmedabad).
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11. A simple 3-D line-transfer in accretion disk modelling (Johannes Adam, Heidelberg, Germany).
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16. Publication pattern of physicists and astronomers in India (A. Ratnakar, RRI, Bangalore).

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