ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 7, Issue, 01, pp.11345-11348, January, 2015

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

HELIOGRAPHIC DISTRIBUTION OF MAJOR H-α SOLAR FLARE DURING SOLAR CYCLE 23

[1,*]Brajesh Choudhary, [2]Mukesh K. Jothe, [1]Mahendra Singh, [1]Mahendra Mehra and [3]Pankaj K. Shrivastava

[1]Department of Physics, Govt. M.V.M. Bhopal (M.P.) India
[2]Department of Physics, Govt. M.G.M. P.G. College Itarsi (M.P.) Pin 461111, India
[3]Department of Physics, Govt. P.G. College Rewa (M.P.) Pin 486001, India

ARTICLE INFO

Article History:
Received 10th October, 2014
Received in revised form
26th November, 2014
Accepted 10th December, 2014
Published online 23rd January, 2015

Key Words:
Solar Flare,
Sunspot Number.

ABSTRACT

In this paper we investigated the heliographic longitudinal as well as latitudinal distribution of major H-α solar flares (flares of high optical importance imp ≥ 1) for the solar cycle 23 periods 1996-2010. This period of investigation includes the ascending as well as descending period of solar cycle 23. The study reveals that for heliographic latitude majority of solar flares confined between latitude 10°-30° for both northern and southern hemisphere. Whereas for heliographic longitude we observed approximately symmetric occurrence of solar flares. The H-α solar flare occurrence dominates during increasing phase of the solar cycle achieve a peak value in middle part of solar cycle (year-2000) and show an abnormal decrease during descending phase of solar cycle. The occurrence of solar flare also compared with yearly mean sunspot number and noticed that solar flares follows the solar cycle with maximum number observed in the year 2000-2001 during the maxima of solar cycle 23.

INTRODUCTION

The phenomenon of solar flare generate large amount of matter and radiation into space in a short duration. The location of active regions on the sun can be determined by solar flare observations. The longitudinal distribution of major solar flare has been studied by Badaruddin and Yadav (1982). They found an almost equal distribution of solar flare in both eastern and western hemisphere of the sun. Yadav *et al.* (1983) has also reported the absence of east-west asymmetry. The latitudinal distribution of solar flare has been investigated by Howard (1974) and found that about 95% of the total solar flare is confined to latitude below 40° in both the hemisphere of the sun. Roy (1977) studied the north-south distribution in the data of major solar flare, sunspot number and found the dominance of northern hemisphere over the southern hemisphere in all these categories. Joshi *et al*. (2006) investigated north-south distribution of solar flare during solar cycle 23 for the period 1996-2003. They found that the flare activity during this cycle is low compared to previous solar cycles indicating the violation of Gnevyshev-Ohl rule. Joshi *et al* also found that the flare activity dominates the northern hemisphere during the rising phase of the solar cycle (1997-2000). Mishra *et al.* (2008) study the heliographic distribution of solar flare during solar cycle 23 for the period 1996-2006 and found that the occurrence of bright solar flare is maximum in northern hemisphere during increasing phase and in southern hemisphere during decreasing phase of solar cycle 23 in both hemispheres. Shrivastava *et al.* (2011) study major H-α solar flare heliographic distribution in longitude around the sun for the period 2001-2006 and noticed that an almost equal number of solar flares occurred in both the eastern and western hemispheres. In the present study, we try to focus on the complete period of solar cycle 23 and investigate the heliographic longitudinal as well as latitudinal distribution of major H-α solar flares, the quadratic distribution of 1B, 2B, 3B, 4B type solar flare over the solar disk, the yearly solar flare frequency distribution and the occurrence of major H-α solar flares along with the sunspot number for the period 1996-2010.

Corresponding author: Brajesh Choudhary,
Department of Physics, Govt. M.V.M. Bhopal (M.P.) India.

Data and analysis

In the present study solar flares data published in the solar geophysical data book have been selected for the period 1996-2010. All major solar flares which have optical importance imp ≥ 1 have been selected. To study the spatial distribution of solar flares with respect to heliographic latitude and longitude we have calculated the number of solar flare in the interval of 10°. Since the number of solar flares above 50° is very small the number of flares occurring above 50° merged in one group. The north-south asymmetry index is described by asymmetry index

A = (N-S)/(N+S)

RESULTS AND DISCUSSION

It is well known that cosmic ray intensity particularly at neutron monitor energies varies with an 11-year period in anti-phase with the solar activity cycle (Shrivastava, Shukla and Agrawal 1993; Singh, Nigam and Shrivastava 1996). Generally the solar activity cycle is represented by sunspot number. Besides sunspot number the solar flares is another feature that indicates the solar activity. We are interested in the location of active regions producing major solar flares. Figure 1 and 2 shows the heliographic latitudinal and longitudinal distribution of major solar flare on the solar disk.

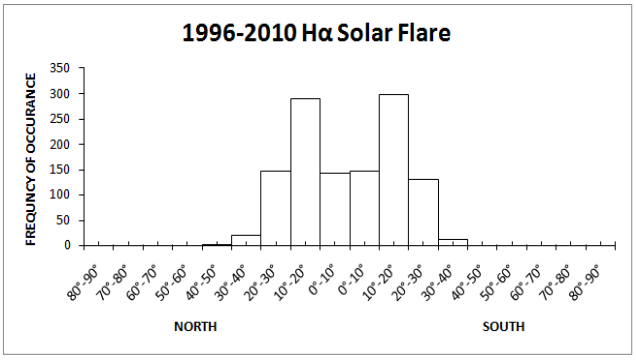


Figure 1(a). Latitudinal distribution of all H-α solar flare on the solar disk for the period 1996-2010

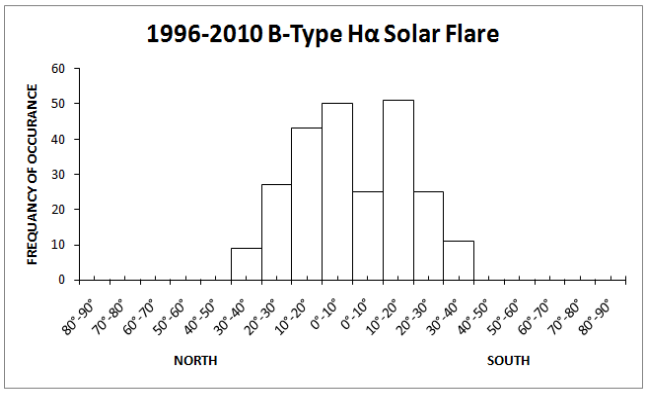


Figure 1(b). Latitudinal distribution of all B-type H-α solar flare on the solar disk for the period 1996-2010

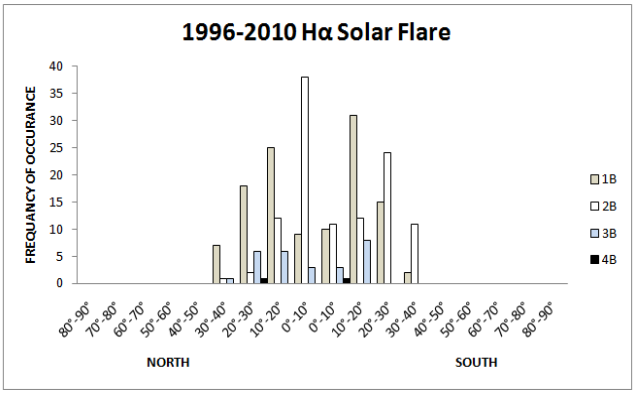


Figure 1(c). Latitudinal distribution of 1B, 2B, 3B, 4B-type H-α solar flare on the solar disk for the period 1996-2010

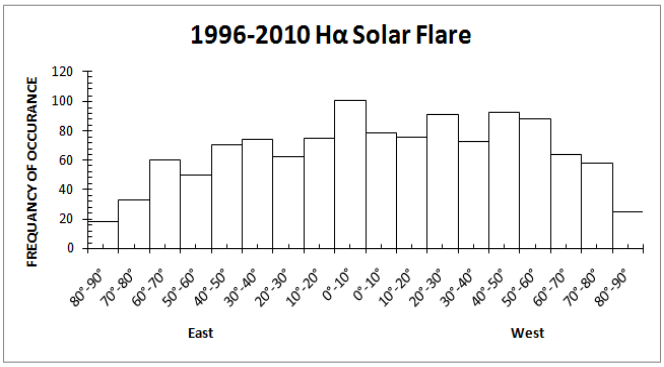


Figure 2(a). Longitudinal distribution of all H-α solar flare on the solar disk for the period 1996-2010

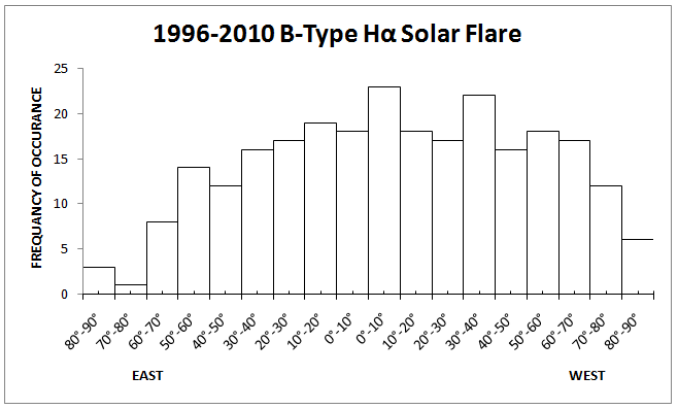


Figure 2(b). Longitudinal distribution of all B-type H-α solar flare on the solar disk for the period 1996-2010

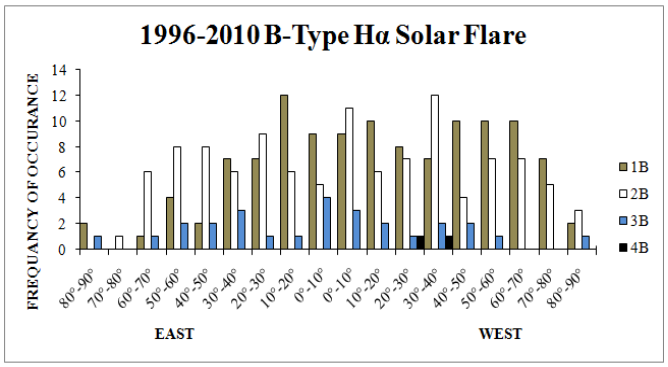
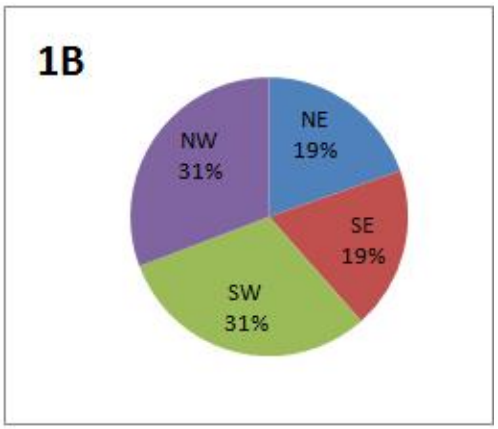
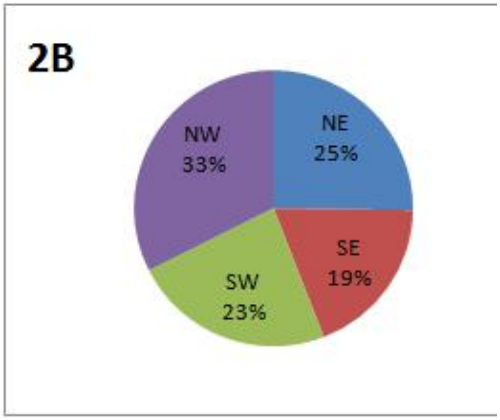
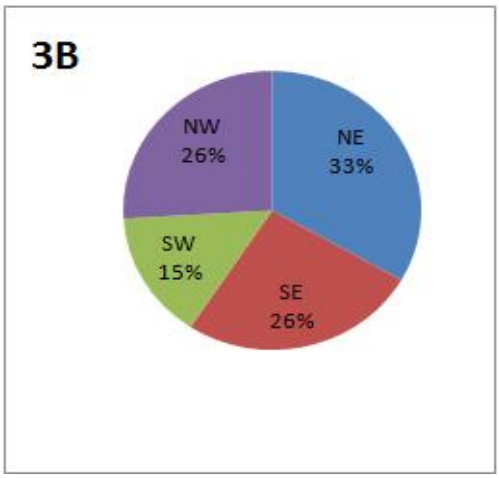


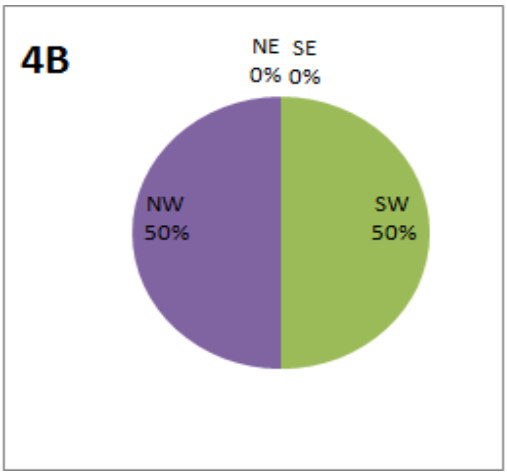
Figure 2(c). Longitudinal distribution of 1B, 2B, 3B, 4B-type H-α solar flare on the solar disk for the period 1996-2010

In is noticed that the distribution of major solar flare are approximately symmetrical between longitude 40°-50° in both the eastern and western hemisphere. The majority of solar flare are confined between latitude 10°-30° in both the northern and southern hemisphere. The heliographic distribution of major solar flare in quadrants area of the solar disk is shown in Figure 3. It is found that the distribution of type 1B solar flare is equal over the solar disk for northern and southern hemisphere while type 2B and 3B solar flare occurred more in northern hemisphere as compared to southern hemisphere whereas type 4B solar flare are found to occur equally in NW and SW region of the solar disk. The occurrence of total B-type solar flare is more in northern hemisphere as compared to southern hemisphere.









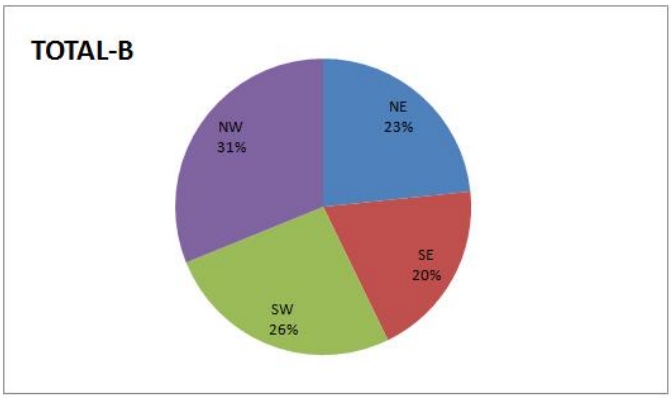


Figure 3. Quadratic distribution of all B-type H-α solar flare during period 1996-2010

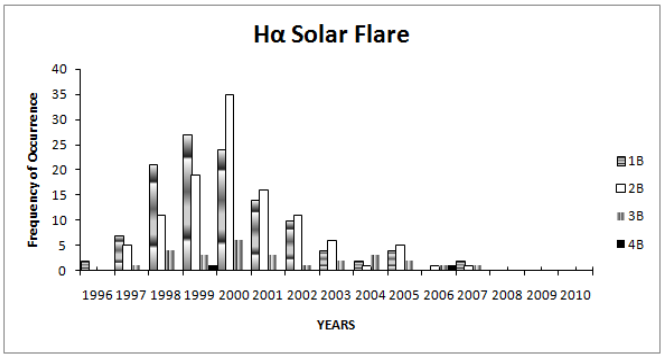


Figure 4. Yearly frequency distribution of H-α solar flare for the period 1996-2010

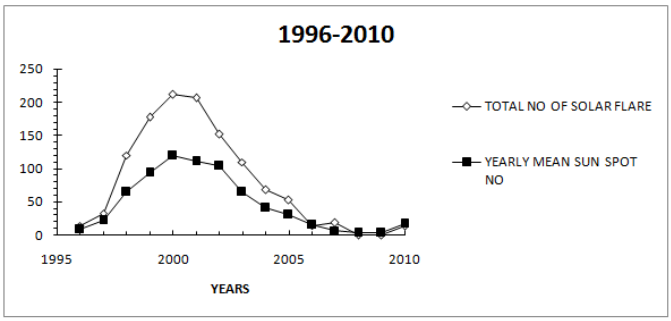


Figure 5. Occurrence of major solar flare with mean sunspot number for the period 1996-2010

The frequency distribution of major solar flares for the period 1996-2010 (shown in Figure 4) reveals that the major H-α solar flare dominates during increasing phase of the solar cycle, achieve a peak value in the middle of the solar cycle and show an abnormal decrease during the descending phase of the solar cycle 23. The yearly occurrence of major solar flare along with the sunspot number is shown in Figure 5. It is evident from this figure that the occurrence of the solar flares follows the solar cycle with maximum number observed in the year 2000-2001 during the maxima of solar cycle 23.

REFERENCES

Badruddin, Yadav, R. S., 1982, *Ind. Jou. Phys*., 56B, 68.
Howard, R., 1974, *Solar Phys.,* 38, 59.

Joshi, B., Pant, P. and Manoharan, P. K., 2006. *Jou. Astrophysics, 151*-157.

Kopp, G., Lawrence, G. and Rottman, G. 2005, *Solar Physics,* 20(1-2), 129-139.

Mishra, A. P. and Mishra, B. N., 2008, *Ind. Jou. Radio and Space Phys.*, Vol.37, 237-243.

Roy, J. R., 1977, *Solar Phys.,* 52, 53.

Shrivastava, P. K., 2005, 29th ICRC, I, 355-358.

Shrivastava, P. K., Jothe, M. K. and Singh, M., 2011, *Solar Physics,* 269, 401-410.

Shrivatava, P. K. and Singh, N., 2005, Chinese Jou. Of Astron. Astrophysics, vol.5, no.2, 198-202.

Temmer, M., Veronig, A. and Hanslmeier, A., 2002, *Astonomy and Astrophysics,* 390,707.

Yadav, R. S., Badruddin, Yadav, N. R. and Agrawal, S. P., 1983, Proc.18th int. cosmic ray conf., 4, 227.

****