Star Watching Promoted by the Ministry of the Environment, Japan

Seiichi Sakuma
2-21-9, Kami-Aso, Asao-Ku, Kawasaki 215-0021, Japan; hgc02554@nifty.com

Presented at the 100th Annual Meeting of the AAVSO, October 7, 2011; received December 14, 2011; accepted December 14, 2011

Abstract In 1987 the author suggested to Japanese government authorities to promote star watching as a means of campaigning for the prevention of air pollution. The "Star Watching" program still continues today. Recently, it became a campaign not only for the prevention of air pollution, but also a campaign to educate about light pollution, energy-saving, and the reduction of greenhouse gas. This paper summarizes twenty years of activity in the "Star Watching" program.

1. Introduction

For variable star astronomers, the visibility of faint stars is an important concern. I made a study of the visibility of stars in the Tokyo city district, derived from observations of the members of the Japan Astronomical Study Association. Simply, it is an index of visibility based on the difference of magnitudes between the faintest comparison star and the calculated limit depending on the diameter of the telescope used. The results show that the visibility of stars in Tokyo since 1952 (Sakuma 1956) has been becoming rapidly poor. Because Japan's environment problem became serious, an "Environment Agency" (later, the Ministry of Environment) was established in 1971.

In the 1980s, traffic and diesel engines caused severe air pollution. Under these circumstances, the Environmental Agency carried out a campaign for pollution prevention, with regard to air pollution—visibility (in the meteorological sense) observation by elementary school children, and water pollution—making 100 selections of clear fountains and streams. I suggested to the government authority to promote "Star Watching" as their next campaign in 1986. Recently, the astronomical part became a campaign not only for the prevention of air pollution but also light pollution, energy-saving, and the reduction of greenhouse gas.

2. Star watching

The outline of a method had been introduced by Isobe and Kosai (1991), Kosai and Isobe (1991), Kosai, Isobe, and Nakayama (1992), and Crawford and O'Meara (1991), early enough to be of use. I also introduced my "Star

Watching" project in the *AAVSO Newsletter* (Sakuma 1987, 1989). The method is as follows: Visual observations are carried out on a moonless night about one hour after sunset during January and August. Observers try to find the Milky Way in the constellations of Perseus, Gemini, and Monoceros in winter, and Cassiopeia, Cygnus, and Sagittarius in summer. Use of 7×50 binoculars is recommended for star counting in an area encircled by six bright stars in the Pleiades cluster in winter, and in an area of the triangle formed by α Lyr (Vega), ε Lyr, and ζ Lyr. I consult the AAVSO's charts for these areas (BU Tau, AY Lyr, and LL Lyr) to obtain the magnitudes of stars in the target area. The positions of stars which one sees are then drawn in a notebook.

The Photographic method is carried out by a camera with a focal length of 50 to 55 mm, an *f*-ratio brighter than 2.0, and a reversal color film with a speed of ISO 400. The camera is fixed on a tripod and is set in the center of the α Tau field in winter, α Lyr in summer. Three exposures of 80, 150, and 300 seconds without guiding are carried out after setting the *f*-ratio at 3.5 or 4.0. Three exposed films are used to measure the density of the sky background relative to standard stars in that field using a densitometer. This method will be adapted to the use of a digital single lens reflex (DSLR) camera this summer.

3. Summary of results

The number of observer groups in the project has kept steady at more than 300 through most of its twenty-year history (Figure 1). In summer 2010, there were 6,786 observers in 418 groups; in winter 2011, 3,033 observers in 313 groups contributed.

Binocular observation results (Figures 2 and 3) in winter show limiting magnitudes slightly down (brighter). Judging from the results of twenty-three fixed points (Figures 4 and 5), the background brightness of the sky does not change over the past 20 years.

Japan's northeastern area was attacked by an earthquake and tsunami on March 11, 2011. Power plants were destroyed. To avoid a total shutdown of electricity, a projected, or programmed, power failure was carried out for four months, until, oil- and coal-burning power plants could restart. This summer, the Ministry restricted heavy users of power by 15%, and recommended that citizens save as much power as possible. Consequently, the visibility of stars during this summer became better than in the past. The results of "Star Watching" of this summer were not announced until now.

4. Future development

The Ministry of Environment enacts a positive policy for the prevention of light pollution. A "Guideline for prevention of light pollution" was established by the Ministry in 1998 and revised in 2006. A "lights down" campaign was carried out when comet Hyakutake approached the earth on March 23–27, 1996, and when comet Hale-Bopp appeared on April 1–6, 1997. Such campaigns as star watching and lights down are becoming more and more important all over the world. For example, Dr. Kelly Beatty, of the International Dark Sky Association (IDA), at Kitt Peak proposed a "Great World Wide Star Count"; The British Astronomical Association's Centre for Dark Skies proposed a "Christmas and New Year Star Count"; and Dr. Mario Motta of the AAVSO gives talks on light pollution and adequate lighting. International cooperation can be expected the more that public awareness grows.

References

Crawford, D., and O'Meara, J. 1991, *Sky & Telescope,* **82**, 547.

Isobe, S., and Kosai, H. 1991, in *The Vanishing Universe*, ed. Derek, Cambridge Univ. Press, Cambridge, 1.

Kosai, H., and Isobe, S. 1991 in *Light Pollution, Radio Interference, and Space Debris*, ASP Conf. Ser., 17, ed. D. L. Crawford, Astron. Soc. Pacific, San Francisco, 35.

Kosai, H., Isobe, S., and Nakayama, H. 1992, *Sky & Telescope*, **84**, 564.

Sakuma, S. 1956, *Mem Japan Astron. Study Assoc.*, **1**, No. 3. (in Japanese).

Sakuma, S. 1987, *AAVSO Newsletter*, No. 2.

Sakuma, S. 1989, *AAVSO Newsletter*, No. 5.

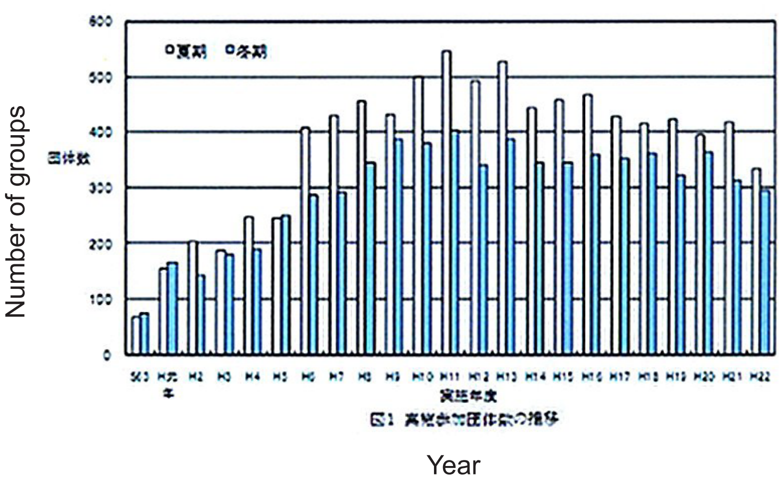

Figure 1. Growth in number of observer groups in the "Star Watching" project from 1988 to 2010. The number of groups has kept steady at more than 300 through most of its twenty-year history.

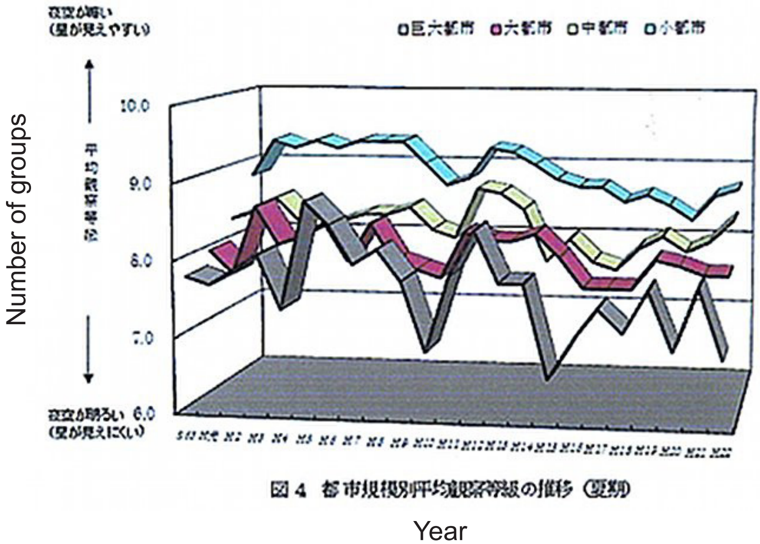

Figure 2. Binocular observation results 1988–2010, showing limiting magnitudes observed during winter seasons.

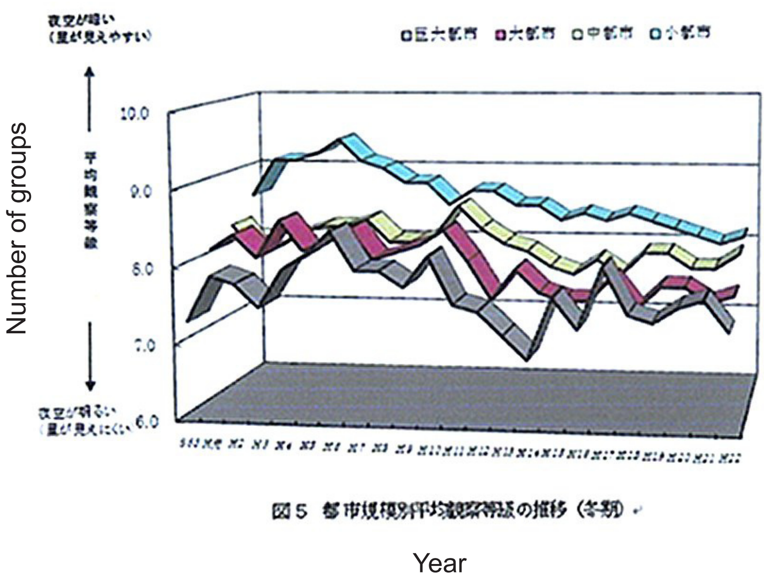

Figure 3. Binocular observation results 1988–2010, showing limiting magnitudes observed during summer seasons.

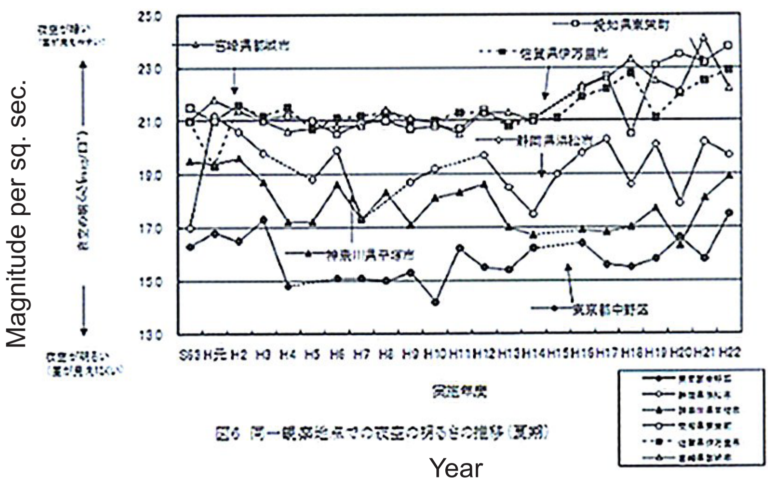

Figure 4. Results of photographic observations 1988–2010, summer seasons, showing magnitude per square second at several fixed points.

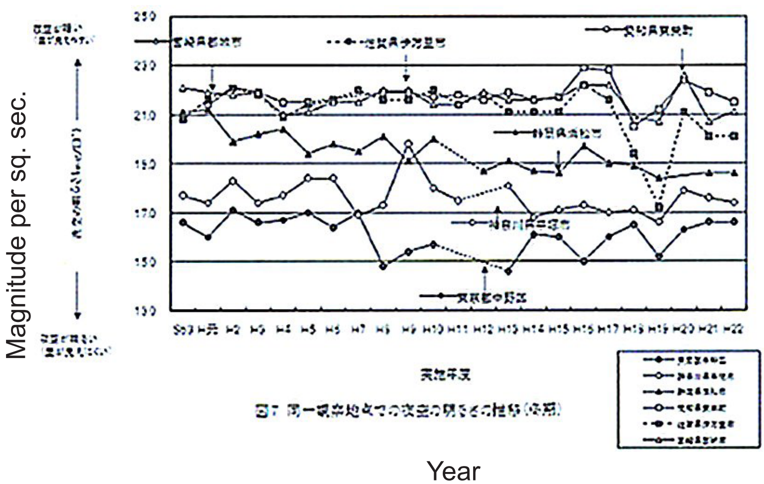

Figure 5. Results of photographic observations 1988–2010, winter seasons, showing magnitude per square second at several fixed points.