The astronomical observatory of the Land of Blue Skies

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The astronomical observatory of the land of blue skies

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Abstract. The Astronomical Observatory of Mongolia is presented. Besides a heritage steeped in rich culture and tradition, Mongolia offers endless steppes and blue skies of such intensity that they gave the country its name. This astronomically advantageous feature, the high level of education and motivation among its young inhabitants, plus the fact that there are few observatories in Central Asia, make Mongolia a very suitable place for astronomical observations.

1. Mongolia

Mongolia, the huge, land-locked country between China and the Siberian part of Russia, is one of the least densely populated places on Earth. Open to the Western world only since 1990, its population and economy are developing at an impressive speed. The literacy level of its inhabitants is 98 %, though half of the population still adopts the nomadic lifestyle. Mongolia joined the International Astronomical Union in 2006.

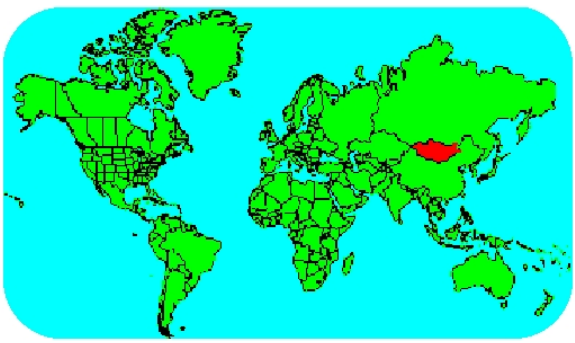

Figure 1. Mongolia on the world map.

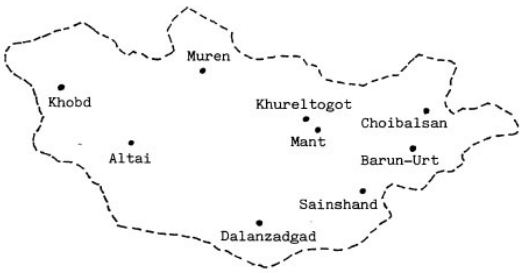

Figure 2. Map of meteorologically studied sites in Mongolia (see Section 3) [1].

2. Khureltogot Observatory

The Astronomical Observatory of Mongolia (latitude: 47.85 degrees N, longitude: 107.1 degrees E, altitude: 1620 m) is located on the Bogd Mountain, about 15 km south of the capital city Ulaanbaatar. The site is named Khureltogot. The Astronomical Observatory was founded during the first International Geophysical Year (1957-1958) by the initiative of astronomer Mrs. S. Ninjbadgar in close collaboration with scientists from Russia and Germany. The construction of the main buildings started in 1957 and three telescopes produced by Carl Zeiss (Germany) were installed.

From the early years onwards, the following research activities were undertaken: determination of time and latitude in a network of astronomical observatories; observation of near-Earth artificial satellites and asteroids; observation of solar active phenomena; recording and study of earthquakes; investigations of the telluric magnetic field and its variations; study of impact of atmospheric turbulence on seeing quality. There was a lively collaboration, mainly with Russia, and many Mongolian astronomers were trained in Russia.

Figure 3. Dome of the coronograph.

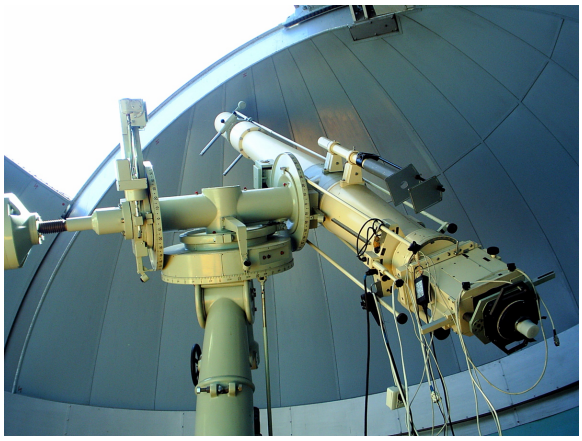

Figure 4. Telescope: Carl Zeiss manufacture.

During the collapse of the socialist system in Mongolia, astonomy and other fundamental sciences were in a difficult situation because of insufficient financial support. At present, the restoration of the fundamental sciences is taking a strong pace in Mongolia. In 1996, the Research Center of Astronomy and Geophysics of the Mongolian Academy of Sciences was founded, and the astronomical observatory has become part of it. With modern information technology, the earlier scientific directions of the observatory are being continued and expanded. Nowadays, about 20 astronomers belong to the observatory staff.

The infrastructure consists of the main building with offices and a lecture room, a building (and a Mongolian tent) providing lodging, the buildings (mostly domes) hosting the coronograph, a permanent GPS station, the Coudé refractor, the meridian circle and the 45-cm Meade Schmidt-Cassegrain telescope. The telescopes and instruments are used for both scientific and educational purposes. As an example, see the solar image obtained with the coronograph (Fig. 6).

3. How good is the Mongolian site?

Batsukh et al. (1995) [1] carried out a detailed study to determine the number of astronomical observation hours (NAOH) for several sites in different regions of Mongolia (Fig. 2) based on their own observations and on long-term meteorological data. Their results prove that several sites in Mongolia compare well with some foreign international sites, such as La Silla and Cerro

Figure 5. D. Batmunkh focusing on a Sunspot.

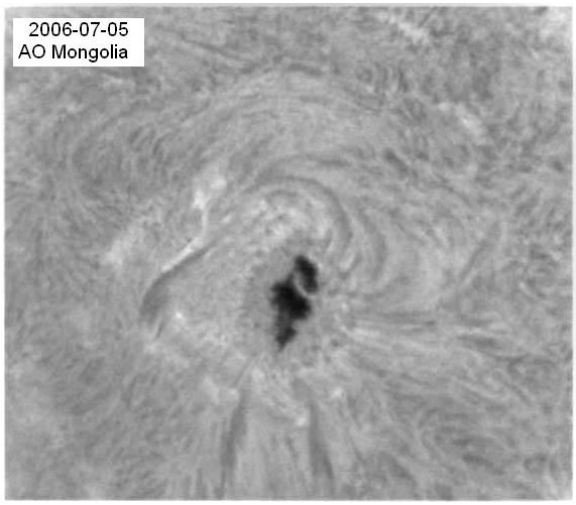

Figure 6. Sunspot observed with the coronograph (Apogee CCD camera U4).

Tololo. At Khureltogot, for example, the probable number of astronomical observation hours was determined to be 1900, close to the value obtained for La Silla [2]. A main advantage of the observing sites are a near-absence of strong wind and a small mean humidity. A possible disadvantage is the large daily fall of air temperature due to the continental climate. The greatest contribution to the annual NAOH is from the autumn-winter months. This distinguishes the average daily distributions of the NAOH from those in other sites in Central Asia (Fig. 7).

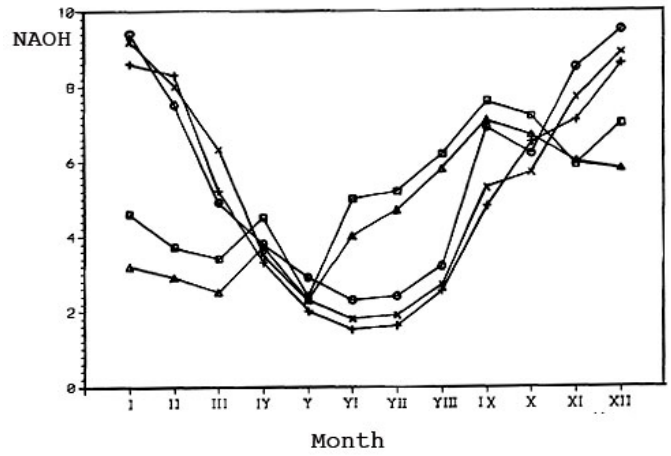

Figure 7. Daily mean distribution per month of probable NAOH (number of astronomical observation hours) for three Mongolian sites and for two sites in Middle Asia. Circles: Khureltogot, +: Dalanzadgad, ×: Muren, squares: Khairabad, triangles: Sanglock. Figure reference: [1].

4. Conclusions

Given the availability and quality of its infrastructure, its location close to the capital Ulaanbaatar, and the available scientific staff, the Mongolian Observatory has great potential for international collaborations. The telescopes at Khureltogot observatory can be used successfully for scientific and educational purposes.

Table 1. Monthly and annual mean values of climatic parameters at Khureltogot.

Mean values of	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
wind speed (m/s)	1.1	1.4	2.3	3.5	4.0	3.4	2.7	2.5	2.5	2.0	1.3	0.8	2.3
relative air humidity (%)	75	73	66	50	47	56	65	65	64	65	72	75	64
air temperature (degrees C)	-27.4	-23	-11.2	-0.5	7.9	14.0	17.1	15	7.5	-1.6	-15.3	-25.5	-3.5
daily fall of air temperature	15.3	17.5	17.3	16.8	16.9	16.0	14.1	15.2	15.9	17.3	16.1	15.2	16.1

Its longitude make this site a very valuable addition to many ground-based telescope networks, such as WET (Whole Earth Telescope), DSN (Delta Scuti Network), the Blazhko Project, SONG (Stellar Oscillations Network Group), etc. Even a small telescope which requires only a reasonable budget and maintenance level can deliver extremely valuable data for variable star research.

Figure 8. Main building of the Mongolian observatory.

Figure 9. View from the observatory site at Khureltogot.

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