Simeiz 22-m Radio Telescope as an IVS Network Station

A. E. Volvach, G. S. Kurbasova, L. N. Volvach

Abstract We briefly summarize the status of the 22-m radio telescope as an IVS Network Station. We also summarize the analysis of the ground and satellite measurements of local insolation in Crimea using NASA SSE observations.

1 General Information

The 22-m radio telescope RT-22 of the Radio Astronomy Laboratory is located at the foot of mount Koshka ("The Cat") at the shore of the Black Sea, 25 kilometers west from the city of Yalta (Figure 1). RT-22, the 22-meter radio telescope, which was set in operation in 1966, is among the five most efficient telescopes in the world.

The Simeiz geodynamics area consists of the radio telescope RT-22, two satellite laser ranging stations, a permanent GPS receiver, and a sea level gauge. The radio astronomical station Simeiz was founded in 1965. The first single dish observation was made in 1966. The first VLBI observation was made in 1969. The radioastronomical station Simeiz was included in international VLBI networks in 1980.

The parameters of the 22-meter radio telescope are presented in Table 1.

Radio Astronomy Lab of Crimean Astrophysical Observatory

Simeiz Network Station

IVS 2014 Annual Report

2 Activities during the Past Year and Current Status

During 2014, the Space Geodesy and Geodynamics stations regularly participated in the International Network programs — IVS, the International GPS Service (IGS), and the International Laser Ranging Service (ILRS).

During the period 2014 January 1 through 2014 December 31, the Simeiz VLBI station participated in ten 24-hour geodetic sessions. Simeiz regularly participated in the EUROPE and T2 series of geodetic sessions.

2.1 Solar Energy in the Crimea on the SSE Observations.

NASA's Earth science research program has supported satellite systems and research providing data important to the study of climate and climate processes. These data include long-term estimates of meteorological quantities and surface solar energy fluxes [1].

These satellite and model-based products have been shown to be accurate enough to provide reliable solar and meteorological resource data over regions where surface measurements are sparse or nonexistent, and they offer two unique features — the data is global and, in general, contiguous in time.

Crimea is located near the Euroasian tectonic zone of high seismic activity. This results in special local climatic and geophysical conditions [2, 3]. Base ground measurements needed to learn the features of local cli-

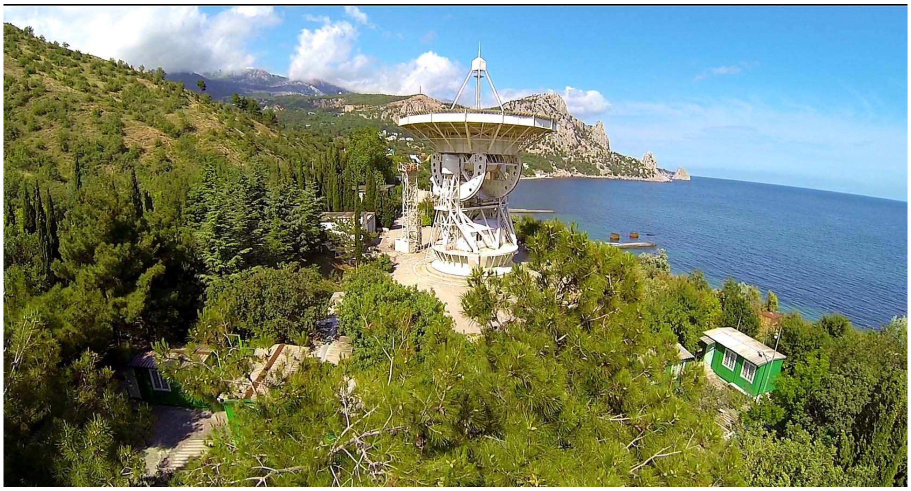

Fig. 1 The Simeiz VLBI station.

Table 1 The antenna parameters of the Simeiz station.

Diameter D, m	22
Surface tolerance, mm (root mean square)	0.25
Wavelength limit, mm	2
Feed System	Cassegrain system or primary focus
Focal length F, m	9.525
Focal ratio F/D	0.43
Effective focal length for Cassegrain system, m	134.5
Mounting	Azimuth-Elevation
Pointing accuracy, arc sec.	10
Maximum rotation rate, degree/sec	1.5
Maximum tracking rate, arcsec/sec	150
Working range in Azimuth, degrees (0 to South)	-270 ± 270
in Elevation, degrees	0 - 85

matic and geophysical parameters are insufficient. We use SSE-parameters for analysis of the distribution of the energy (solar radiation) incident on the surface of the Earth in Crimea in 2014. A summary of the estimated uncertainty associated with the basic solar and meteorological data (i.e. solar radiation, temperature, surface pressure, relative humidity, and wind speed) underlying the parameters available through SSE 6.0 is given in [1]. The uncertainty estimates were derived through comparisons with ground measurements. Quality ground-measured data are generally considered more accurate than satellite-derived values. But measurement uncertainties from calibration drift, operational uncertainties, or data gaps are often unknown or unreported for many ground site data sets [4].

The average insolation ($kWh/m^2/day$) is the amount of electromagnetic energy (solar radiation) incident on the surface of the Earth. The fraction of insolation at the top of the atmosphere which reaches the surface of the Earth depends on the local conditions.

The insolation clearness index (dimensionless) is a quantitative characteristic — the fraction of insolation of electromagnetic energy (solar radiation) at the top of the atmosphere that is incident at the surface of the Earth. The parameters of SSE for Sizing and Pointing of Solar Panels and for Solar Thermal Applications contain information about the insolation clearness index for any region of the Earth's surface. The distribution of the insolation clearness index over the surface of the Earth in Crimea is shown in Figure 2.

The graph in Figure 2 shows that the fraction of insolation at the top of the atmosphere which reaches the

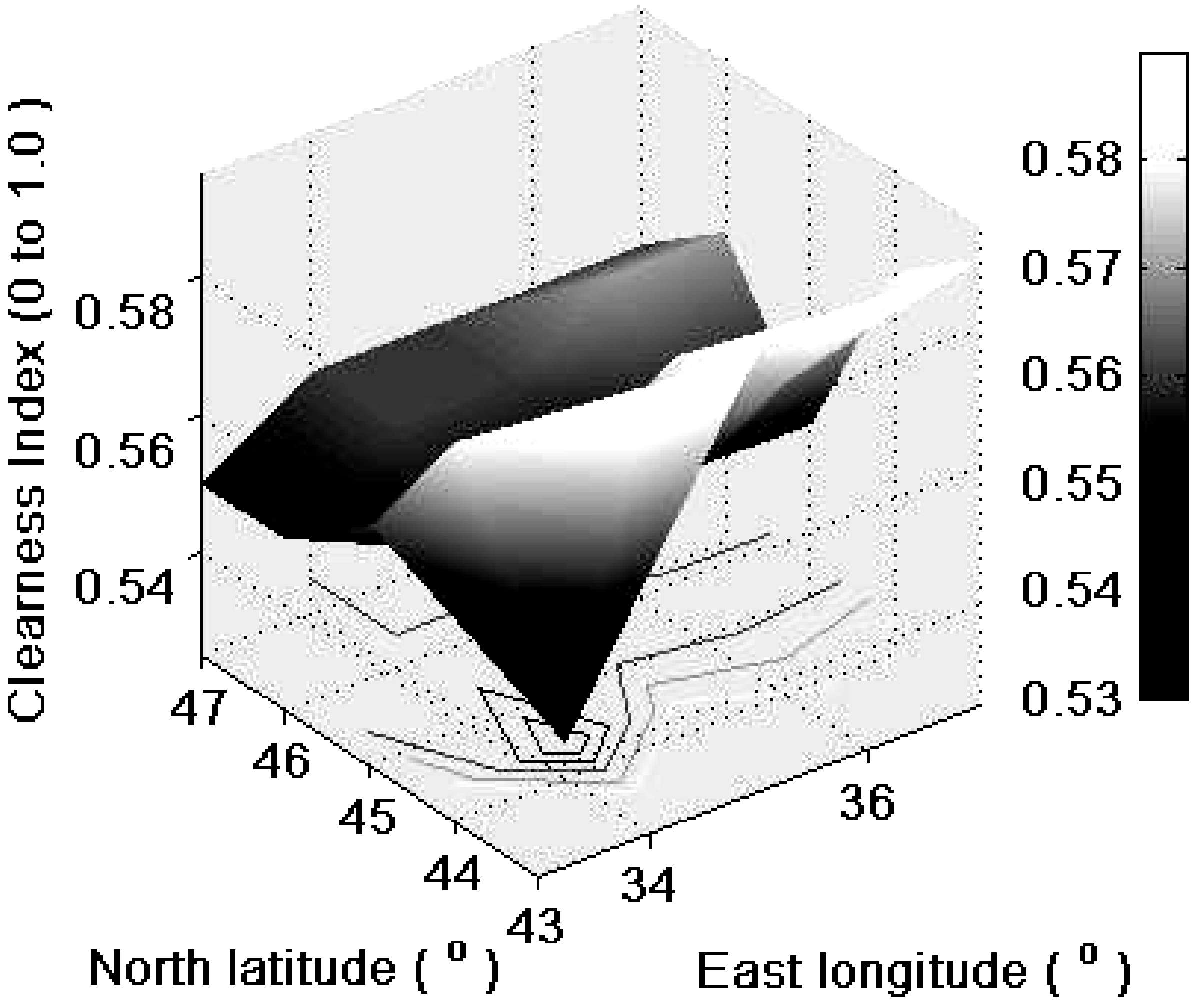

Fig. 2 The 2014 Annual Monthly Averaged Insolation Clearness Index (0 to 1.0) in Crimea.

surface of the Earth in Crimea increases in the south-east.

The incoming solar radiation raises the temperature of the Earth's surface. Analysis of variations of the Earth's surface temperature is useful for the study of local meteorological, geographical, and geophysical conditions.

Figure 3 is a graph of the 2014 Annual Monthly Averaged Earth Skin Temperature (° C) in Crimea. The Maximum Monthly Averaged Earth Skin Temperature is shown in Figure 3.

3 Future Plans

Our plans for the coming year are the following: to put into operation the VLBI Data Acquisition System DBBC, to upgrade the laser of SLR Simeiz-1873 station, and to set up a new GPS station near the Simeiz VLBI station.

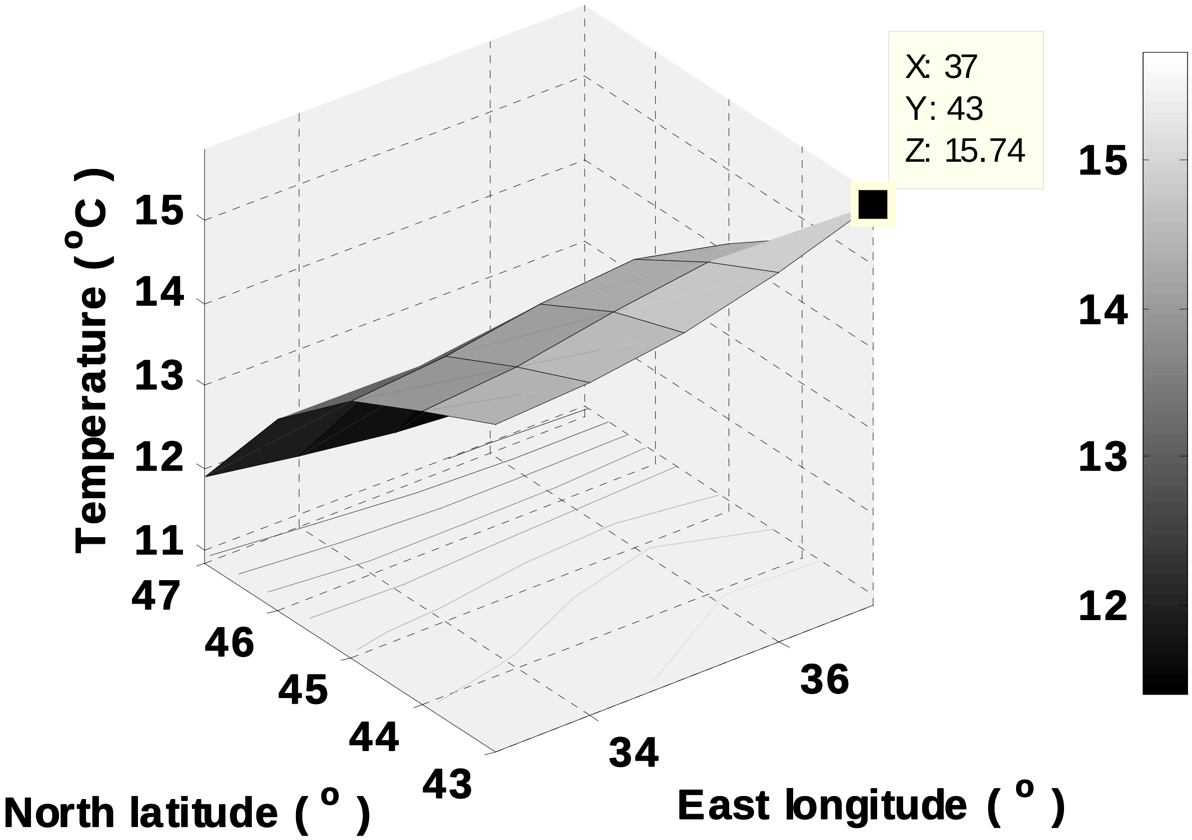

Fig. 3 The 2014 Annual Monthly Averaged Earth Skin Temperature (° C) in Crimea.

References

1. NASA Surface meteorology and Solar Energy. URL: https://eosweb.larc.nasa.gov/
2. Kurbasova G.S., Volvach A.E. *Space Science and Technology*, 20, pp.42-49, 2014.
3. Kurbasova G.S., Volvach A.E. CriMiCo2014 - 2014 24rd International Crimean Conference Microwave and Telecommunication Technology, *Conference Proceedings* Weber Publishing, 2014. Vol.2. P.1085-1086.
4. Volvach A.E., Kurbasova G.S. *International VLBI Service for Geodesy and Astrometry*, edited by K. D. Baver, D. Behrend, and K. L. Armstrong, NASA/TP-2014-217522, 2014. p.160-163.