Here we receive radio waves from the Universe.

What can we learn?
Using optical telescopes, the most familiar type of telescope, we can see celestial objects which emit visible light. However, in space there are also cold (about -260°C) gas and dust, which comprise the interstellar medium and do not emit light. Astronomers think the materials for star formation and the origins of life are hidden in this interstellar medium. The interstellar medium emits radio waves with various wavelengths based on its components. Radio telescopes receive these radio emissions.

What can we see?

Optical telescopes and radio telescopes
A collaboration between these two types of telescopes reveal various aspects of the Universe.

Let’s compare the optical and radio images of “The Triangulum Galaxy (M33)” located about 2.5 million light-years from the Earth.

Observation by the Subaru Telescope (NAOJ)  Observation by the Nobeyama 45-m Radio Telescope and ASTE (NAOJ)

Star clusters appear bright when observed by an optical telescope. This image is similar to what our eyes would see. In contrast, radio telescopes observe the cold gas and dust (interstellar medium) invisible to optical telescopes, showing us the distribution. In this way, we can study the Universe more thoroughly with observations by different kinds of telescopes.

NAOJ Nobeyama Radio Observatory works to advance “Radio Astronomy” which can resolve the enigmas of the Universe.

Stamp here!!

NobeYama

Nobeyama Radio Observatory

Awaken your curiosity!

Contact
Address: 462-2, Nobeyama, Minamimaki, Minamisaku, Nagano, 384-1305
Phone: +81-267-98-4300
Homepage: http://www.nro.nao.ac.jp/en/

Visiting
The visitors’ area is open free of charge. The self-guided tour takes about 1 hour.
Open Time: 8:30 ~ 17:00 (standard)
Open every day except for the New Year’s season (Dec.29 ~ Jan.3)
Open House Day: Nobeyama Campus holds a special open house day once each summer to introduce our facilities and the latest radio astronomy.

Access
JR Kouni-Line: 40 minute walk from Nobeyama Station.
Via the Chubu Odan Expressway about 20 km from the Nagasaka Exit, about 30 km from the Sutama Exit.
Via the Chubu Odan Expressway about 30 km from the Yachio Kogen Exit.

(2021.5)
45-m Radio Telescope

One of the largest diameter telescopes for millimeter astronomy in the world

Diameter: 45 m
Weight: about 700 t
No. of Antennas: 1
Frequency: 1 ~ 150 GHz
Angular Resolution (max.): 0.004° (corresponding to a decimal visual acuity of about 4)

The 45-m Radio Telescope collects extremely weak signals from celestial objects. We developed the antenna, one of the largest for millimeter wavelength observations, and the state-of-the-art receivers on our own. More than 30 years after it was established in 1982, this telescope continues to be active at the forefront of research unveiling the Universe.

Nobeyama Radio Polarimeters

Valuable long term observations

Diameters: 25 cm ~ 3 m
No. of Antennas: 6 mounts 8 parabolic dishes
Frequencies: 1, 2, 3.75, 9.4, 17, 35, 80 GHz

The Nobeyama Radio Polarimeters observe the strength and degree of circular-polarization of microwaves coming from the Sun. Continuous observations exceeding 60 years are rare in the world; this unique data is very important for investigating the long-term variation of the Sun. The data is open to the public and used for global education and research.

Nagoya University Nobeyama Radioheliograph

Diameter: 80 cm
Weight: about 600 kg
No. of Antennas: 84
Frequencies: 17, 34 GHz
Angular Resolution (max.): 0.0014° (corresponding to a decimal visual acuity of about 12)

The Nobeyama Radioheliograph uses 84 parabolic antennas to obtain radio images of the Sun. In 2015, the Solar-Terrestrial Environment Laboratory at Nagoya University assumed operation of the Radioheliograph.
What kind of observations does the Nobeyama 45-m Radio Telescope perform? What types of celestial objects are astronomers interested in? Let’s look for them in the star chart.

The celestial objects in this star chart are always above us. Celestial objects which appear in the daytime can’t be seen because they are drowned out by daylight. But radio waves from them can be received with radio telescopes in the daytime. The observation season at NRO is mainly winter (Dec. – May), when the radio sky conditions are very good. We explore the Universe non-stop around-the-clock during the season.

Watching the Birth of a Star
Study of Star Formation [in the constellation Orion]
This study aims to elucidate the star-forming mechanism by detailed radio observations of the interstellar gas which becomes the material for stars.

Pursuing the Origins of Life
Study of Interstellar Molecules [in the constellation Taurus]
Various types of molecules, such as water and ammonia, are scattered throughout interstellar space. Astronomers use radio observations of these molecules to investigate chemical processes in outer space, in pursuit of the origins of life.

Important Result from the 45-m Telescope
Discovery of a Black Hole [in the constellation Canes Venatici]
Through 45-m Radio Telescope observations, astronomers discovered a rapidly rotating (1000 km/sec) disk of gas. Investigations based on this result were the first in the world to prove the existence of a black hole.

A Map for the Next Generation
The Galactic Plane Survey [the area between the constellations Aquila and Cygnus]
This is a project to take wide-field radio images along the Milky Way and make a distribution map of the molecular gas which serves as the material for stars. This map will serve as a valuable “guidebook” for new studies to look for star-forming regions or explore the Galactic history.

Catch the Beat of the Galaxy
Study of the Galactic Center [in the constellation Sagittarius]
Radio observations revealed unique phenomena in the Galactic center region. Here astronomers investigate the dynamic activities of the Galactic central black hole and its surrounding environment.