MILLSTONE HILL INCOHERENT SCATTER RADAR

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MIT Haystack Observatory

MIT Haystack Observatory is an interdisciplinary radio science research center whose mission is to advance scientific research and technological developments in radio astronomy, geodesy (the study of the earth's size, rotation, and gravitational field), and geospace science (the study of space weather conditions between the sun and the earth).

Millstone Hill Geospace Facility

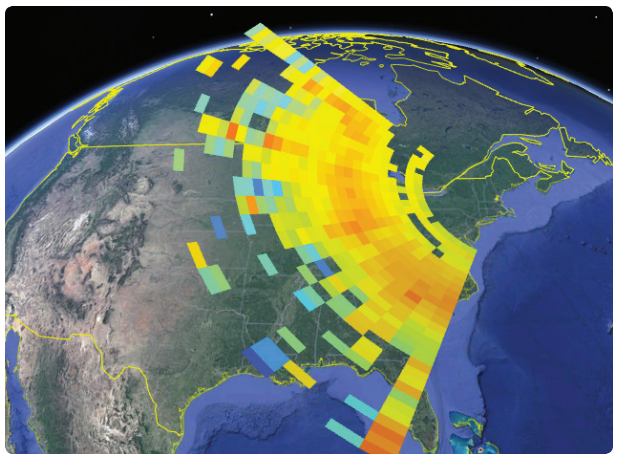
The incoherent scatter radar (ISR) geospace facility at Millstone Hill is funded by the National Science Foundation for studies of the earth's upper atmosphere and ionosphere. There are only nine ISRs in the world; Millstone Hill is the only ISR in the continental U.S.

The ISR technique uses radar—transmitted and reflected radio waves—to measure electrons in the ionosphere, which extends from about 60 miles to 600 miles above the earth's surface. The radar system uses a 2.5 megawatt transmitter in combination with large antennas and highly sensitive radio receivers. A steerable antenna (MISA) and a fixed-position antenna (zenith) make ionospheric measurements.

Millstone Hill Ionospheric Steerable Antenna (MISA)

The 46m Millstone Hill Ionospheric Steerable Antenna (MISA) is part of the MIT Haystack Observatory Millstone Hill Geospace Facility, located in Westford, Massachusetts. This fully steerable antenna was originally installed at the Sagamore Hill Air Force facility in Wenham, Mass., in 1963, and was moved to Millstone Hill in 1978.

The MISA is used primarily as a UHF radar antenna for measurements of the near-space environment using the incoherent scatter radar technique. The antenna provides wide radar coverage in latitude and longitude.



Zenith antenna

The 68m fixed Zenith antenna system was constructed in 1963 for use with the facility's UHF transmitter. The Zenith antenna system is used extensively for ISR operations at Millstone Hill.

Geophysical coverage

The favorable location of Millstone Hill at subauroral latitudes, combined with the great operational range afforded by the steerable antenna, permit observations over a latitude span encompassing the region between the polar cap and the near-equatorial ionosphere. The radar is capable of making observations over a range from 90 to 1000 km in altitude. Geographic coverage is from just short of the arctic circle to the north, past Florida to the south, to the central Atlantic Ocean to the east, and out to Iowa in the west.

◀ The range for which the ionosphere over North America can be measured by the Millstone Hill Incoherent Scatter Radar, scanning at an elevation of 4°.