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Large Aperture Radio Telescopes at Kashima Space Research Center

1. Forward

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Completion of the first large antenna at Kashima dates back to 1963. This was a 30-m parabolic antenna that was originally provided for satellite communications in the 1964 Tokyo Olympics. However, in his memoirs (published in March 1991) commemorating the 25th anniversary of the Kashima Space Research Center, Michio Onoe, the first director of the Kashima branch, says "I can now confess that what I really wanted to do was to look at radio stars." With this in mind, the antenna was constructed, and radio astronomical observations began in 1966 in cooperation with the Tokyo Astronomical Observatory. These observations would make significant contributions to the field of radio astronomy in Japan. It was not long, though, that the need arose for an antenna with even better surface accuracy, and a decision was made to build a new 26-m parabolic antenna. This antenna was completed in 1968, and the 30-m parabolic antenna was dismantled in 1975 after fulfilling its role. Though developed mainly for space-communications research, the 26-m antenna was actively used for radio astronomy observations as well due to its good surface accuracy and high efficiency. The above achievements eventually led to research in Very Long Baseline Interferometry (VLBI), and in this regard, the first successful Japan-U.S. VLBI experiment was held in November 1983 and the first measurement of Pacific plate motion in history was performed in 1985. Then, on the basis of a supplementary budget in fiscal year 1987, a decision was made to construct a 34-m parabolic antenna that would focus on VLBI research. This antenna would lead to achievements not only in geodetic VLBI but also in radio astronomy and astrophysics. The 26-m antenna, meanwhile, would fall under the jurisdiction of the Geographical Survey Institute (GSI) in 1992, but would continue to be active in geodetic VLBI playing a major role in uniting the Japan geodetic coordinate system with the international coordinate system. However, with the construction of a GSI 32-m antenna in Tsukuba and the effects of aging taking its toll, a decision has been reached to dismantle the 26-m antenna in a few years. The 34-m antenna is expected to play an important role in the years to come not only as a major observation station but also as one for new VLBI technical developments.

With the 20th century coming to a close, the original plan for this special edition was to overview the role played by the Kashima 34-m antenna built with the 1987 supplementary budget in conjunction with the role of the Radio Astronomy Applications Section, and to describe scientific achievements. However, the large Kashima antennas built before the 34-m antenna also had important roles in making great contributions not only to Japanese radio astronomy but also to the fields of world radio astronomy and space geodesy. With this in mind, and despite an initial decision in the planning stage to limit antenna achievements to those of the 34-m antenna, it was eventually decided to include the other antennas as well. The title of the special edition, "Large Aperture Radio Telescopes at Kashima Space Research Center", therefore refers to achievements up to the 26-m antenna in addition to those of the 34-m antenna. Most of the authors contributing articles for this special edition are current and former members of the Radio Astronomy Applications Section, and the others are from closely related research institutions. As authors might be too young to provide coverage of the 30-m antenna, Kashima's first large antenna, we have had to exclude on its achievements. In this regard, it is recognized that the flowering and expansion of radio-astronomy research typical of current VLBI is simply an extension of the broad-minded and dynamic research environment of the 30-m antenna era.

As a compendium of achievements associated with Kashima's 26-m and 34-m antennas, it is sincerely hoped that this special edition will serve as a helpful reference in VLBI and radio astronomy and contribute to the further development of these fields in the 21st century.