

A consideration on the MU radar: its past, present and future

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The MU was constructed in Shigaraki , 30 km south-east of Kyoto in 1984.

Since the construction, the facility has been in good operation open for visiting scientists for just 20 years, producing many scientific papers by many scientists not only working for the facility operation but also visitors domestic and abroad. Even now, the facility remains, probably, the best in the world as an MST (Mesosphere, Stratosphere and Troposphere) radar with active antenna array which is computer-controlled and can swing the radar beam instantly to almost any direction.

Before the construction, there had been a long period for preparing the construction. The first idea for the construction had appeared so early and so naively in my mind in the 1950s that no detail is now clear except for my dream or desire as to how it could be possible to realize a radar facility which gets echoes from the ionosphere for analyzing the echo spectrum to obtain information of the ionosphere, just done in astronomy in observing distant stars.

However, real endeavors were initialized in the late 1960s for organizing a group of scientists who are interested in dynamics of the mesosphere called the ignerosphere then. I consider that the MU radar project is a sort of success story which came true only with the existence of this group. The group member was really excellent and colorful; they belonged mainly to the SGEPS, Meteorological Society and Electronic Communication Society. Since no effective observation for the mesosphere was possible then , the basic issue was to find a suitable observation idea together with techniques. Starting with unrealistic idea as using an anti-aircraft gun once used during the War for sending some sensors to the mesosphere , we finally reached the idea to construct a radar system when I happened to attend an international symposium for the equatorial aeronomy in Nigeria in the early 1970s. At the symposium Ron Woodman, Peru, reported his by-chance observation of mesosphere echoes with his giant Jicamarca IS radar during the time for observing the ionosphere. This inspired us to construct the MU radar whose design, however, worried and pleased us through many modifications of the original version. There were enjoyable ideas as to construct a system on board a ship as a big oil tanker in no demand then, a triple-static system with the central station at the Tanegashima for transmission as well as observation and two other stations in Uchinoura and Yamagawa, respectively, only for reception.

The necessary condition for our system was to observe the mesosphere as a MST radar and the ionosphere as an IS radar, because I realized that the condition was very necessary for our geophysics in Japan where non such powerful ground- based facilities were available and we were much behind the U.S.A, England and Europe. This was time when the Middle Atmosphere Program was just in preparation internationally. Such a good timing helped us so much for our success.

Although the MU radar is the first grade, it remains the second grade as an IS radar because of not-enough sensitivity depending on the output power, the real situation, which I am regretting deeply not only for our original desire but also intense supports from ionophysists Note that IS radar observation is now in strong demand, with ingenious satellite observation, to give a breakthrough for outstanding problems of coupling between the lower and upper-atmosphere.