R011-09
C 会場 ： 11/24　PM2（16:05-18:05）
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豊川強度偏波計プロット画像のデータベース作成と過去の大フレアの規模推定

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Database for scanned daily plots of Toyokawa Radio Polarimeters and estimation of the size of past large solar flares

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We conducted a project to scan microfilm images of time-series plots of solar radio wave (1, 2, 3.75, and 9.4 GHz) intensity and polarization observed at the Nagoya University Atmospherics Research Institute (now the Institute for Space-Earth Environmental Research) in Toyokawa in 1958-1978 and to preserve and publicly display them as a digital image database. The digitization process was completed, resulting in about 57,000 image files and about 35 GB of data. Since the data and associated metadata were organized, we created a database with DOI and made it available to the community (DOI:10.34515/DATA.TORP-00000).

Estimating the magnitude of past large solar flares that occurred before the 1980s, when solar X-ray monitoring by the GOES satellite was not yet available, will provide important information for understanding past space weather events such as geomagnetic storms and GLEs. It is known that there is a correlation between the 17 GHz peak flux and the GOES soft X-ray peak flux. Here, we examine whether this correlation also holds for low-frequency microwave data. Considering the spectrum of gyrosynchrotron radiation from accelerated electrons in solar flares, 9.4 GHz is expected to observe the most optically thin microwave radiation among the four frequencies observed by Toyokawa Radio Polarimeters (ToRP). Therefore, we first examined the correlation between the 9.4 GHz peak flux and the GOES X-ray peak flux. The flare events used were approximately 600 events observed at 9.4 GHz by the Toyokawa-Nobeyama Intensity Polarimeter from 1990 to 2014, during which GOES soft X-ray observations were active. A correlation coefficient of approximately 0.7 was obtained, demonstrating that it is possible to estimate the GOES X-ray class from the 9.4 GHz peak flux.

Thus, for the first time, we quantitatively estimated the light curves of two large solar flares observed in 1956 February by the ToRP using this relationship (Matsumoto et al., PASJ, 2023). The second flare resulted in the GLE with the greatest flux and the hardest spectrum in the observational history.