Temporal variation of the surface brightness temperature of Mars during the global dust storm in 2018

*Hideo Sagawa[1], Shohei Aoki[2], Hiroyuki Maezawa[4], Hiromu Nakagawa[3], Yasumasa Kasaba[3]

1. Kyoto Sangyo University, 2. Institut d'Aéronomie Spatiale de Belgique (IASB), 3. Tohoku University, 4. Osaka Prefecture University

Mars atmosphere contains a certain amount of floating dust at all times. It is known that the dust opacity sometimes becomes very thick, forming a planet-encircling dust storm (a.k.a. "global dust storm"). Once a global dust storm occurs, it brings significant impact on the Martian atmosphere: the thickened dust layer blocks sunlight from reaching the surface, and brings a decrease of the surface temperature. At the same time, the floated dust particles absorb the radiation and directly leads to heating the surrounding atmosphere. Such a drastic change in the thermal structure induces the modulation in the dynamics as well as in the compositions.
Starting from the middle of June 2018, a global dust storm has occurred for the first time in the past 11 years. ALMA observed the Martian submillimeter emission during that global dust storm. Observing with submillimeter wavelength has a good advantage compared to other optical and infrared wavelengths, since the dust opacity becomes transparent at the submillimeter wave and the emission from deep inside the global dust storm can be detected.
We present the analysis of the data taken with the Atacama Compact Array of the ALMA observatory. The data were taken for 14 days at intervals in the period from 21 June to 28 September. We derived the total flux density of the Martian submillimeter continuum emission at 220 GHz via fitting a theoretical visibility distribution model. We found that total flux density (disk-averaged surface brightness temperature) had decreased by 18% during the storm compared to the data taken when the storm settled. The results will be compared with other studies including infrared observations from orbiters and numerical experiments of Martian GCMs.

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