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Future GEO missions for cloud and precipitation measurements by microwave instruments

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Earth observing satellites fly in either a low Earth orbits (LEO) or the geostationary orbit (GEO). GEO satellites make temporally continuous observations at the expense of limitation in spatial resolution due to its great distance from the Earth. Only visible and infrared imagers are feasible for GEO instruments at present. On the other hand, LEO satellites, orbiting much closer to the Earth, have the advantage to accommodate technologically challenging remote sensors such as spaceborne radars.

While visible and infrared images are unable to directly detect rain drops below overlying cloud layers, microwave radiation penetrates the cloud layer to reach rainfall beneath. Extreme rainfall events, developing quickly within a half to one hour, are difficult to detect directly by the current GEO satellites because of the lack of microwave sensors. LEO microwave instruments, however, are not optimal for such purposes either since the revisit frequency of LEO satellites is no better than twice daily. Microwave remote sensing from the GEO orbit, if realized, would bring a breakthrough to the monitoring of extreme meteorological events from the space.

In this paper, major challenges and expected impacts of GEO microwave remote sensing on the social and research communities will be discussed.

Keywords: Satellite remote sensing, cloud and precipitation measurements, future satellite missions