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Lunar Exploration based on Ground-Based Radar: Current Research Progress and Future Prospects

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Abstract : Lunar exploration is of significant importance in the development and utilization of in-situ lunar resources, water ice exploration, space and astronomical science, as well as in political and military strategy. In recent years, ground-based radar (GBR) has gained increasing attention in the field of lunar exploration due to its flexibility, low cost, and penetrating capabilities. This paper reviews the scientific research on lunar exploration using GBR, outlining the basic principles of GBR and the progress made in lunar exploration studies. It introduces the fundamental principles of lunar imaging using GBR, and systematically reviews studies on lunar surface layer detection, inversion of lunar regolith dielectric properties, and polar water ice detection using GBR. In particular, the paper summarizes the current development status of Chinese GBR and forecasts future development trends in China. This review will enhance the understanding of lunar exploration results using GBR radar, systematically demonstrate the main applications and scientific achievements of GBR in lunar exploration, and provide a reference for future GBR radar lunar exploration missions.

Keywords : ground-based radar, lunar exploration, radar imaging, lunar surface/subsurface detection
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