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Near-Space Remote Sensing

Potential and Challenges

Springer

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Preface

Near-Space Remote Sensing: Potential and Challenges deals with the role of near-space vehicles in supplying a gap between satellites and airplanes for microwave remote sensing applications from a top-level system description, with an aim for further research.

Near-space is defined as the atmospheric region from about 20 to 100 km altitude above the Earth's surface. Very few sensors are currently operating in near-space, because the atmosphere is too thin to support flying for most aircrafts and yet too thick to sustain orbit for satellites. Nevertheless, potential benefits for vehicles operating in near-space may include possible persistent monitoring and high revisiting frequency (revisit the same site in a short time interval) that are critical to some specific radar and navigation applications, but not accessible for current satellites and airplanes.

There is a region in near-space where the average wind is <10 m/s; hence, persistent coverage and high flying speed can be obtained for the vehicles operating in this region. Moreover, near-space vehicles are relatively low cost when compared to satellites and airplanes. Additionally, as near-space is below ionosphere, therefore, there are no ionospheric scintillations that will significantly degrade microwave communication and navigation performance which explains why near-space has received much attention in recent years and why several types of near-space vehicles are being studied, developed, or employed.

Near-space vehicles offer the long-term persistence traditionally provided by satellites while providing the fast responsiveness of airplanes. Near-space thus offers an opportunity for developing new synthetic aperture radar (SAR) remote sensing techniques. Several potential applications such as passive surveillance, reconnaissance, high-resolution wide-swath remote sensing, and ground moving targets indication (GMTI) are described in this book.

Near-space vehicle-borne SARs cannot replace spaceborne and airborne radars, but they could provide more efficiently remote sensing functionality than spaceborne SARs. Although near-space vehicles have much smaller coverage area than satellites due to their lower altitude, they can still offer a regional coverage of hundreds of kilometers and provide cost-effective remote sensing services.

Near-space vehicle-borne SARs could also extend remote sensing services into areas with limited or no access to spaceborne and airborne SARs. Therefore, given their operational flexibility, near-space vehicle-borne SARs may supply a gap between spaceborne and airborne SARs which is the reason why we appeal to the system engineering community for more publication and support on the research and development of near-space vehicle-borne SARs.

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