

## Editorial\*

Geosynchronous synthetic aperture radar satellites (GEO SAR) orbiting at an altitude around 36000 km were firstly proposed in 1980s with an orbit inclination of 50 degrees to cover North and South America. Though the ultra-high orbit has overwhelming advantages of 1-day revisiting time and wide coverage, the strong requirements on antenna sizes and power budgets were difficult to satisfy with the contemporary technology. With the development of science and technology, GEO SAR has become feasible and hot topic worldwide again since 2000s. Related researches are focused on new GEO SAR concepts, developments of accurate focusing algorithms, compensation of atmospheric effects, GEO InSAR/D-InSAR techniques and applications, along with the corresponding GEO SAR verification experiments.

This special focus of SCIENCE CHINA Information Sciences is devoted to covering the recent advances in geosynchronous SAR system design and optimization, GEO InSAR/D-InSAR techniques and the temporal-spatial variant atmospheric influences. We accepted eight contributed papers with novel results and techniques which are developed by the research groups in the field as follows: In “Options for continuous radar Earth observations”, geosynchronous systems, from the one proposed in 1978 by Tomiyasu to telecom satellite compatible solutions, and Low, Medium or Geosynchronous Earth Orbit constellations are compared and discussed. Their benefits, problems, and sizes are briefly summarized, and a comparative table is presented.

“Interferometric orbit determination for geostationary satellites” proposes a multiple baseline ground-based interferometer for the accurate determination of the GEO SAR orbit. “Optimal 3D deformation measuring in inclined geosynchronous orbit SAR differential interferometry” proposes an optimal multi-angle data selection method to obtain a good 3D deformation retrieval accuracy of the order of centimeter-level or even millimeter-level. Finally, the retrieved 3D deformation performances under different orbit configurations and geolocations are compared. “Potential of geosynchronous SAR interferometric measurements in estimating three-dimensional surface displacements” exploits the potential of three-dimensional (3D) deformation measurement by using GEO D-InSAR measurements acquired from multiple imaging geometries.

“Laplace plane and low inclination geosynchronous radar mission design” presents an attractive mission implementation for GEO SAR whose potential use is for the long-term imaging. Then the imaging geometry, power demand and the cost of station-keeping are assessed and compared for the benefits of different orbit configurations. “Beam scan mode analysis and design for geosynchronous SAR” analyses the varying beam velocity of GEO SAR and proposes a beam scan mode considering the curved satellite track and the spherical Earth surfaces.

“Modelling of tropospheric delays in geosynchronous synthetic aperture radar” proposes a novel tropospheric model considering a deterministic background component and a random turbulent one, and then incorporates some of the most recent meteorological data for the characterization of the troposphere. “L-band geosynchronous SAR imaging degradations imposed by ionospheric irregularities” establishes the analytical model of the generalized ambiguity function (GAF) considering the moving ionospheric irregularities and the influences are analyzed. The theoretical derivation is validated by numerical analyses and signal-level simulations.

\*Citation Hu C, Ding Z G, Long T, et al. Special Focus on Geosynchronous Synthetic Aperture Radar—Editorial. *Sci China Inf Sci*, 2017, 60(6): 060300, doi: 10.1007/s11432-017-9098-2

Finally, we would like to express our sincere appreciation to all the authors for submitting their manuscripts. Moreover, we express our deepest gratitude to all the anonymous reviewers for delivering high-quality and timely review comments. We also thank SCIENCE CHINA Information Sciences editorial office for the scrupulous service and supports during the whole process of this special focus.

Guest Editors: Cheng HU

*Beijing Institute of Technology, China*

Zegang DING

*Beijing Institute of Technology, China*

Teng LONG

*Beijing Institute of Technology, China*

Stephen HOBBS

*Cranfield University, UK*

Andrea MONTI GUARNIERI

*Politecnico di Milano, Italy*

Antoni BROQUETAS

*Universitat Politècnica de Catalunya, Spain*