Biography

Ryo Natsuaki (Student member 2011-2014, Regular member 2015-2020, Senior member 2021-present) received B. S., M. S. and Ph. D. degrees in electrical engineering from The University of Tokyo, Japan in 2009, 2011 and 2014, respectively. He was Aerospace Project Research Associate of Japan Aerospace Exploration Agency (JAXA), Tsukuba, Japan from 2014 to 2017. He was also a guest scientist with Microwaves and Radar Institute, German Aerospace Center (DLR), Oberpfaffenhofen, Germany from 2018 to 2020 under JSPS Overseas Research Fellowships. He is currently an Associate Professor with the Department of Electrical Engineering and Information Systems, The University of Tokyo, Japan. His research interests include active remote sensing with synthetic aperture radar (SAR). He is also a member of the Institute of Electronics, Information and Communication Engineers (IEICE), Japan and American Geophysical Union (AGU). He currently serves as an associate editor of IEEE Transactions on Geoscience and Remote Sensing (IEEE TGRS), a secretary of IEICE technical committee on Electromagnetic Theory (EMT). He is also a technical committee member of Frequency Allocations in Remote Sensing (FARS) and Remote sensing Environment, Analysis and Climate Technologies Technical Committee (REACT) in GRSS. He was a publicity chair of IEEE International Geoscience and Remote Sensing Symposium (IGARSS) 2019 and secretary of IEEE GRSS Japan chapter from 2014 to 2017 as well as a secretary of IEICE technical committee on Space, Aeronautical and Navigational Electronics (SANE) from 2017 to 2022.

Principles and Recent Progress in Synthetic Aperture Radar (SAR) and Interferometric SAR

Synthetic aperture radar (SAR) has become a major tool for disaster monitoring. Its all-weather capability enables us to monitor the affected area soon after the event happens. Since the first launch of spaceborne SAR, its amplitude images have been widely used for disaster observations. In present day, an accurate orbit control and scheduled frequent observations enable us to perform interferometric analysis of SAR (InSAR) and the use of interferometric coherence. Especially for L-band SAR, long-lasting temporal coherence is an advantage to perform precise interferometric coherence analysis. In addition, recent high resolution SAR images are found to be useful for observing relatively small targets, e.g., individual buildings and facilities. This lecture will describe synthetic aperture radar (SAR) techniques from electromagnetic theory to aperture synthesis and answer fundamental questions such as: Why do we need radar observations? Why do we have to synthesize the aperture instead of deploying a large antenna? How does SAR mathematically work?