

Preface, special issue of “20th Anniversary of Terra Science”

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The Terra satellite, launched in December 1999 as the flagship mission of the Earth Observing System, is an international mission carrying instruments developed by the United States, Japan, and Canada. These instruments, the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER), Clouds and Earth’s Radiant Energy System (CERES), Multi-angle Imaging SpectroRadiometer (MISR), Moderate-resolution Imaging Spectroradiometer (MODIS), and Measurements of Pollution in the Troposphere (MOPITT), provide valuable observations to investigate the interconnections between Earth's land, atmosphere, ocean, snow and ice, and energy balance, and have yielded the first global and seasonal measurements of the Earth system for long-term monitoring of climate and environmental change. Over the past 20 years and with more than 100,000 orbits, Terra’s observations have greatly enhanced our understanding of the Earth's climate and the effects of human activity and natural disasters on communities and ecosystems.

This special issue, published at the *20th Anniversary of Terra* highlights two decades of scientific research utilizing a combination of Terra products as well as other space-based and airborne missions. Differing from regular review articles, the papers in this special issue offer a more comprehensive overview of the types of scientific investigations that have been undertaken over the course of two decades, since the launch of the Terra satellite and the free dissemination of its products. These papers emphasize the unique opportunity that 20 years of high-quality data from the multiple instruments on the same platform has provided for multi-sensor applications.

Thanks to the active involvement of the international scientific community over the past two years and after a rigorous review process, we have assembled 23 papers for this special issue. Some of these papers utilize multiple Terra instruments, for example, studies of air pollution and aerosols

that utilize MODIS along with ASTER (Meng et al., 2021; Wang et al., 2020a), MOPITT (Buchholz et al., 2021), MISR (Kuttippurath and Raj., 2021; Mhawish et al., 2021), and both MISR and CERES (Hu et al., 2021). Other papers focus solely on the use of the MODIS instrument (Bilal et al., 2021, Wei et al., 2021) combined with data produced from other space-based and airborne missions and reanalysis data. The topics of these papers ranged from studies in snow cover (Hall et al., 2021; Kuter, 2021; Rittger et al., 2021), forest (Los et al., 2021; Nandy et al., 2021), data fusion methods (Duveiller et al., 2021; Wang et al., 2021; Wang et al., 2020b), vegetation (DiMiceli et al., 2021; Miura et al., 2021; Yan et al., 2021), water reservoir spatio-temporal variability (Klein et al., 2021), and water temperature (Luo et al., 2021; Zhao et al., 2020). One paper provides a comprehensive summary and review regarding the application and benefits of multi-sensor remote sensing for regional to global drought studies (Jiao et al., 2021).

Although studies utilizing all five Terra instruments are included in the special issue, most submissions focus on the use of Terra MODIS in combination with non-Terra data focusing on estimations and assessments of air pollution and aerosols making other earth science-related topics less represented. *Remote Sensing of Environment* strives to increase publications on all topics, and therefore regular review papers are welcome even though this Terra's 20th anniversary special issue is now completed in its final form.

Overall, the special issue covers a wide range of use of Terra's products and addresses several Earth system scientific questions and is a true reflection of the long-term climate-quality data record that Terra provides.

Finally, we would like to thank the large number of authors who spent their valuable time to share their science and the associate editors and reviewers who ensured the quality of the selected papers.

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