European Journal of Remote Sensing

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/tejr20

Planet care from space

Maria Teresa Melis, Maria Antonietta Dessena, Mirco Boschetti, Gabriele Candiani, Giacomo Deiana & Laura Pioli

To cite this article: Maria Teresa Melis, Maria Antonietta Dessena, Mirco Boschetti, Gabriele Candiani, Giacomo Deiana & Laura Pioli (2023): Planet care from space, European Journal of Remote Sensing, DOI: 10.1080/22797254.2023.2201062

To link to this article: https://doi.org/10.1080/22797254.2023.2201062

Published online: 14 Apr 2023.

EUROPEAN JOURNAL OF REMOTE SENSING
https://doi.org/10.1080/22797254.2023.2201062

Taylor & Francis
Taylor & Francis Group

Planet care from space

Maria Teresa Melis[a], Maria Antonietta Dessena[b], Mirco Boschetti[c], Gabriele Candiani[c], Giacomo Deiana[a] and Laura Pioli[a]

[a]Department of Chemical and Geological Sciences, University of Cagliari, Monserrato, Italy; [b]Ente Acque della Sardegna, Cagliari, Italy; [c]CNR-IREA, Milano, Italy

Remote Sensing technologies play an important and well-recognized role in the sciences and in our society. The general topic of this Special Issue is focused on the role of satellite data on the knowledge of environmental dynamics and their impacts and interactions with human activities. The health of our planet requires a cross-disciplinary approach that unites efforts by bio- and physical-scientists and innovative monitoring specialists. The increasing interest in the economy on the space applications is confirmed by the rising literature. The fields of Remote Sensing in the last decades are expanding very fast, and the methods are constantly adapted to new subjects of application.

The complex set of systems made available by the Copernicus System, the EU's Earth Observation Program coordinated and managed by the European Commission, allows access to continuous series of radiometric data accompanied by services that are increasingly in demand and close to the needs of users. A great effort in these terms takes place with continuous communication of application services and dissemination of research results.

In the context of satellite products aimed at Earth monitoring, a particularly important role is played by the hyperspectral system PRISMA (Hyperspectral Precursor of the Application Mission) owned by the ASI (Italian Space Agency) and launched in 2019. This is equipped with electro-optical tools, which integrate a hyperspectral sensor with a medium-resolution panchromatic camera. The sensor operates in push broom scanning mode, recording the radiation reflected from the Earth's surface in 400 nm–2505 nm spectral window. The medium spatial resolution (30 m and 5 m of the panchromatic band) is strongly supported by the availability of 240 bands. A swath of 30 km completes its characteristics. These features make it an optimal tool for the characterization of the chemical-physical composition of the Earth's surface.

In this Special Issue, data coming mainly from these new ESA and ASI programs have been processed to study applications in the fields of agricultural and forest resources and for the study of coastal and marine systems. The Special Issue is completed by a reading on the geological hazard connected to landslides.

The study '*Detection and counting of meadow cuts by Copernicus Sentinel-2 imagery in the framework of the common agricultural policy (CAP)*', addresses the problem of monitoring agricultural practices subject to the European Common Agricultural Policy. Using time series of Sentinel-2 (S2) data, a procedure is proposed for detecting, mapping and quantifying the number of times mowing occurred. The results can be considered a useful tool for the national or regional paying agencies to monitor and verify compliance of farmers' declarations with the policy rules (Sarvia et al., 2022).

In the framework of the high interest of satellite applications in precision farming, the study '*Sentinel-2 estimation of CNC and LAI in rice cropping system through hybrid approach modelling*' is published in this Special Issue. This study was conducted to assess the performance of hybrid approaches, either standard or exploiting an active learning optimization strategy, to estimate the leaf area index (LAI) and canopy nitrogen content (CNC) from Sentinel–2 data, in rice crops. Sentinel 2 maps of LAI and CNC provided spatio-temporal information in agreement with crop growth, nutritional status and agro-practices applied to the study area, resulting in an important contribution to precision farming applications (Rossi et al., 2022).

The interest in the new PRISMA data and its potential application in precision farming and sustainable agriculture is demonstrated in the study '*Assessment of maize nitrogen uptake from PRISMA hyperspectral data through hybrid modelling*'. In this reading, the simulation of PRISMA data using the airborne sensor HyPlant is used to estimate the plant nitrogen uptake. The discussed results confirm the potential application of the system as the temporal trends are compatible with plant phenology stages (Ranghetti et al., 2022).

Furthermore, PRISMA has been recognized as an optimal sensor, providing the proper spectral resolution for non-photosynthetic vegetation mapping in

CONTACT Maria Teresa Melis titimelis@unica.it

the study: '*Mapping spatial distribution of crop residues using PRISMA satellite imaging spectroscopy*'. The results derived from the processing of 12 images over 2020 and 2021 analyzing field status and crop rotation trajectories through time proved that PRISMA data are suitable for mapping field conditions at parcel scale with high confidence level (Pepe et al., 2022).

The important role of the vegetation to mitigate the urban heat is discussed in the reading '*Integrating Copernicus land cover data into the i-Tree Cool Air model to evaluate and map urban heat mitigation by tree cover*'. The authors highlighted that a healthy vegetated landscape can abate heat wave severity and diminish the related urban heat island through the process of evapotranspiration. A methodology for cities to use Copernicus land cover maps to map air temperature and humidity in Naples, Italy, is shown. The results demonstrate that simulated land cover change, limited to a 10% increase or decrease in tree cover, generated an inverse change of 0.2°C in maximum hourly air temperature, with more trees obtaining cooler air (Pace et al., 2022).

The interactions of the changed environment with the human activities is analyzed in the study '*Shoreline erosion due to anthropogenic pressure in Calabria (Italy)*'. The process of coastal urbanization in the last decades is discussed in terms of alteration of the equilibrium conditions of several coastal ecosystems and triggering of shoreline erosion processes. The analysis emphasizes the interest of the multitemporal applied approach in the field of coastal area planning and management, and it is easily applicable and replicable as it is based on Open Data and free software (Foti et al., 2022).

The preservation of the sea resource and its health for the impact in the human activities is discussed in the study '*Microwave satellite remote sensing for a sustainable sea*'. The authors enhance the role of satellite microwave remote sensing to observe marine ecosystem and to assist a sustainable development of human activities. Three meaningful sectors are showcased: oil and gas, renewable energy and plastic pollution (Migliaccio et al., 2022).

This special issue, addressing anthropic interactions with the surrounding environment, welcomes the study of a geological phenomenon with a strong impact on the community, the deep landslides in urban environments. In the study '*Active lateral spreads monitoring system in East-Central Sardinia*' the authors underline the importance of the site monitoring for early warning and risk reduction. Data from different sources and direct measures in the field and from SAR data are integrated and identified downslope movement of up to 10 mm per year in the lateral spread (Demurtas et al., 2022).

These very important results support the high interest and attention from the local and regional protection agencies to define the threshold for a 24/7 early-warning system.

These research studies highlight the role of remote sensing technologies and how satellite data now constitute an indispensable tool for environmental monitoring. The risks associated with climate change and human pressure on the environment require monitoring systems and modern technologies in line with machine learning methods and Artificial Intelligence models. Studies also highlight the important role of field information validation.

We thank all the scholars and referees for their timely and useful contributions. We are thankful to the journal's Editor-in-Chief for permitting us to administer a special issue of this esteemed journal. We believe that the academic world would benefit much from this special issue.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Maria Teresa Melis http://orcid.org/0000-0003-0970-1244
Mirco Boschetti http://orcid.org/0000-0003-2156-4166
Gabriele Candiani http://orcid.org/0000-0001-5270-071X
Giacomo Deiana http://orcid.org/0000-0002-7019-9153
Laura Pioli http://orcid.org/0000-0003-1006-7703

References

Demurtas, V., Orru, P. E., & Deiana, G. (2022). Active lateral spreads monitoring system in East-Central Sardinia. *European Journal of Remote Sensing*, 1–21. https://doi.org/10.1080/22797254.2022.2161418

Foti, G., Barbaro, G., Barillà, G. C., Mancuso, P., & Puntorieri, P. (2022). Shoreline erosion due to anthropogenic pressure in Calabria (Italy). *European Journal of Remote Sensing*, 1–21. https://doi.org/10.1080/22797254.2022.2140076

Migliaccio, M., Buono, A., & Alparone, M. (2022). Microwave satellite remote sensing for a sustainable sea. *European Journal of Remote Sensing*, *55*(1), 507–519. https://doi.org/10.1080/22797254.2022.2126798

Pace, R., Chiocchini, F., Sarti, M., Endreny, T. A., Calfapietra, C., & Ciolfi, M. (2022). Integrating Copernicus land cover data into the i-Tree cool air model to evaluate and map urban heat mitigation by tree cover. *European Journal of Remote Sensing*. https://doi.org/10.1080/22797254.2022.2125833

Pepe, M., Pompilio, L., Ranghetti, L., Nutini, F., & Boschetti, M. (2022). Mapping spatial distribution of crop residues using PRISMA satellite imaging spectroscopy. *European Journal of Remote Sensing*, 1–16. https://doi.org/10.1080/22797254.2022.2122872

Ranghetti, M., Boschetti, M., Ranghetti, L., Tagliabue, G., Panigada, C., Gianinetto, M., Verrelstd, J., & Gabriele Candiani, G. (2022). Assessment of maize nitrogen

uptake from PRISMA hyperspectral data through hybrid modelling. *European Journal of Remote Sensing*, 1–17. https://doi.org/10.1080/22797254.2022.2117650

Rossi, M., Candiani, G., Nutini, F., Gianinetto, M., & Boschetti, M. (2022). Icon sentinel-2 estimation of CNC and LAI in rice cropping system through hybrid approach modelling. *European Journal of Remote Sensing*, 1–20. https://doi.org/10.1080/22797254.2022.2117651

Sarvia, F., De Petris, S., & Borgogno-Mondino, E. (2022). Detection and counting of meadow cuts by Copernicus Sentinel-2 imagery in the framework of the common agricultural policy (CAP). *European Journal of Remote Sensing*. https://doi.org/10.1080/22797254.2022.2129094