PERSONAL INFORMATION

Sara Modanesi

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Date of birth 19/10/1985 | Nationality Italian

Current Position Researcher (III Level) at National Research Council (CNR) – Research Institute for Geo-Hydrological Protection (IRPI), Italy

RESEARCH INTERESTS

Summary

My main research interests include: (i) land surface modelling and hydrological modelling; (ii) data assimilation of high resolution remote sensing observations in land surface and hydrological models to improve the water cycle description and track the effects of the human impacts on it (i.e., detection and quantification of irrigation); (iii) drought monitoring through the use of land surface/hydrological models and remote sensing observations; (iv) validation and application of innovative satellite products to improve hydrological/land surface modelling. I have been involved in numerous national and international projects aiming at developing and producing tools for monitoring drought events, quantifying irrigation and improving the water cycle description. I have published 20+ scientific papers in peer reviewed international journals and one manuscript is currently under review in an international journal. Finally, I produced 40+ conference contributions.

Bibliometric Indicators

SCOPUS (25/06/2024): h-index 10, citations 590 by 474 documents
Web of Science (25/06/2024): h-index 10, citations 500 by 409 documents
Scholar (25/06/2024): h-index 9, citations 722

WORK EXPERIENCE

Apr. 2023 – to date

Researcher (Ricercatore III Livello)

Non-permanent position as Researcher (III level) at Consiglio Nazionale delle Ricerche (CNR) - Istituto di Ricerca per la Protezione Idrogeologica (IRPI)

- Scientific research activities in the development of hydrological applications (floods, droughts) at regional and global scales using satellite observations and advanced modelling, as part of the project called Open Earth Monitor Cyberinsfrastructure, OEMC code DTA.AD004.459.

May 2019 – Apr. 2023

Research Fellowship at CNR – IRPI

Consiglio Nazionale delle Ricerche (CNR) - Istituto di Ricerca per la Protezione Idrogeologica (IRPI)

- Analysis and use of hydrometeorological data from ground stations and satellite sensors, hydrological modelling, flooding, hazard and hydraulic risk analysis.
- Development of codes for applications in the field of hydrology and hydraulics.
- Monitoring (forecasting) drought events and irrigation water uses through advanced

modelling and data assimilation of ground and satellite observations into land surface/hydrological models.

Tutor: Dr. Christian Massari

May 2018 – May 2019 **Scholarship at CNR – IRPI**

Consiglio Nazionale delle Ricerche (CNR) - Istituto di Ricerca per la Protezione Idrogeologica (IRPI)

- Use and validation of satellite soil moisture and rainfall data to improve hydrological modelling and drought monitoring.
- Developments of codes for applications in drought monitoring.

Tutor: Dr. Stefania Camici

Oct. 2017 – Mar. 2018 **Internships at CNR-IRPI**

Work experience within the project "Torno Subito 2017", programme of interventions aimed at students/graduates Axis III- Education and Training - Investment Priority 10.ii- Specific Objective 10.5 - POR FSE Lazio 2014-2020. Determinazione Dirigenziale Laziodisu 1234 del 19/04/2017 carried out at CNR-IRPI on the topic:

- New technologies for monitoring hydrogeological instability

EDUCATION AND TRAINING

Oct. 2018 – Jun. 2022 **PhD degree Civil and Environmental Engineering**
PhD degree in Bioscience Engineering
Joint PhD Title

University of Perugia (UNIPG) – Dipartimento di Ingegneria Civile e Ambientale (DICA)
University of Florence (UNIFI) – Dipartimento di Ingegneria Civile e Ambientale (DICEA)
Katholieke Universiteit Leuven (KU Leuven) – Faculty of Bioscience Engineering

- Thesis: Innovative Use of Earth Observation and Land Surface Modeling for Tracking the Effects of Irrigation on the Terrestrial Water Cycle
- Tutors: Prof. Dr. Eng. Renato Morbidelli
  Prof. Dr. Eng. Gabrielle De Lannoy
  Dr. Eng. Christian Massari
  Dr. Michel Bechtold

Feb. 2015 – Jul. 2016 **Master's degree in Analysis and Mitigation of Hydro-Geological Risks**

Sapienza University of Rome - CERI

Thesis: Susceptibility to blocks' detachment from rock walls assessed through stability analysis and kinematic compatibility verification methods based on geo-structural surveys with direct and remote techniques applied to an experimental site (Suscettibilità al distacco di blocchi da pareti in roccia valutata attraverso analisi di stabilità e metodi di verifica della compatibilità cinematica basata su rilievi geostrutturali con tecniche dirette e da remoto applicata ad un sito sperimentale).

Tutors: Prof. Dr. Salvatore Martino
Dr. Andrea Fantini

Mark: 110/110 cum laude

Nov. 2013 **State Examination – Profession of Geologist**

Sapienza University of Rome

Successfully passed examination

Jan. 2010 – Jun. 2010 **ERASMUS Project**

University of Birmingham (UK)

Modules: Sedimentary petrology and diagenesis; Earth History; Neotectonic and Sedimentation.

Oct. 2008 – Mar. 2012 **MSc Degree in Geologia Applicata all'Ingegneria e alla Pianificazione Territoriale (DM 509/99 - 86/S)**

Sapienza University of Rome – Faculty of Mathematical, Physical and Natural Sciences

- Thesis: Reactivation scenarios of earthquake-induced landslides in the coastal area of the southern-tyrrhenian Calabria (Scenari di riattivazione sismoindotta di frane nell'area costiera della Calabria sud-tirrenica)
- Tutors: Prof. Dr. Salvatore Martino
  Dr. Carlo Esposito
  Dr. Guido Martini
- Mark: 110/110 cum laude

Sep. 2004 – Oct. 2008 **BSc Degree in Geology – Scienze Geologiche**

University of Perugia – Faculty of Mathematical, Physical and Natural Sciences

Thesis: The Stones of Perugia: an Example of Urban Geology (Le Pietre di Perugia: un Esempio di Geologia Urbana)

Tutors: Prof. Dr. Lucilia Gregori

- Mark 110/110 cum laude

HIGHER EDUCATION COURSES

January 2021 **GEOframe Winter School**

University of Trento (Italy)

- Language: English
- Duration: 64 hours
- Course objectives: The Winter School aims at the installation of the GEOframe-OMS system tools and to provide theoretical and practical lectures on: catchment and Hydrologic Response Unit (HRU) delineation; meteorological variables interpolation; simple evapotranspiration methods; snow modules; radiation and rainfall-runoff modeling.

2020 **PGR Catchment Summer School**

University of Birmingham

- Language: English
- Duration: 40 hours
- Course objectives: The Catchment Science Summer School is a 5-day short course that is intended for post-graduate students and post-docs interested in a hands-on catchment science curriculum, focusing on northern catchments, runoff processes and combined hydrometric, isotope/chemical tracer and modeling techniques in catchment hydrology.

2020 **Use of Python for calculation and application development in science**

University of Perugia - DICA

- Language: Italian
- Duration: 30 hours

- Course objectives: Understanding fundamental programming concepts and python syntax; use of third-party libraries (i.e., Numpy, Scipy, SPandas, Matplotlib); work with common file formats (ASCII, Binary, Excel, GeoTIFF, NetCDF).

2020 LINUX for HPC

KU Leuven (Belgium)

- Language: English
- Duration: 4 hours
- Course objectives: Getting familiar with shells (mainly bash); working with i/o files; customizing the shell for particular needs; being able to get the necessary account/job information; getting familiar with NX GUI software; writing sample PBS scripts; installing applications as a user.

2020 HPC-Introduction

KU Leuven (Belgium)

- Language: English
- Duration: 4 hours
- Course objectives: Understanding basic HPC terms; using software; install applications on the cluster; submitting jobs, deleting unwanted jobs; understanding output files; perform parameter studies on the cluster.

2019 Python as a second language

KU Leuven (Belgium)

- Language: English
- Duration: 4 hours
- Course objectives: The course introduces the programming language to participants who have programming experience with other programming languages such as R, MATLAB, C/C++ or Fortran. Subjects are control flow statements, functions, data types and file I/O

2019 Earth Observations

KU Leuven (Belgium)

- Language: English
- Duration: 52 hours
- Course objectives: After completion of the course, students are able to understand the various types of Earth observation techniques and how they are used in different applications. Additionally, students gain insight in: which sensors can be used for various types of remotely sensed Earth observations; which platforms carry Earth observing sensors; basic image characteristics required for various Earth applications; principles and operational missions in the field of optical, thermal, microwave remote sensing; processing and distribution of Earth observation data.

PERSONAL SKILLS

Mother tongue(s) Italian

Other language(s)

	Listening	Reading	Writing	Speaking	OVERALL BAND
English	6.0	7.0	6.0	7.0	6.5

IELTS TEST (09/02/2019) B2

Level: A1 and A2: Base user - B1 and B2: Autonomous user - C1 and C2: Advanced User

Common European Framework of Reference for Languages

Technical skills and competences

SELF EVALUATION				
Information processing	Communication	Creation of Contents	Security	Problem Solving
Advanced User	Advanced User	Advanced user	Advanced User	Advanced user

Digital skills - self-evaluation

- Excellent knowledge of Windows operating systems.
- Excellent knowledge of the LINUX operating systems.
- Excellent knowledge of the MATLAB environment.
- Excellent knowledge of FORTRAN programming.
- Excellent knowledge of Python environment.
- Good command of Google Earth Engine (GEE) environment.
- Excellent knowledge of basic Office programs (Word, Excel, Power Point), Adobe Acrobat, WinZip, WinRaR
- Basic knowledge of softwares for 3D modelling: Agisoft Photoscan, Meshlab and CloudCompare

Driving Licenses Car license category B

NATIONAL AND INTERNATIONAL PROJECT PARTECIPATION

2023-2025 (participation) **CCI-AWU**
Funded by European Space Agency
Total budget: 500,000€ (CNR-IRPI: 160,000 €)
link: https://climate.esa.int/en/projects/anthropogenic-water-use/
N partner: 5
Protocol: ESA Contract No. 4000142449/23/I-NB.
Role in the project: Responsible of WP340 Data Assimilation and co-point of contact for technical matters.

2024 (participation) **“Mazdi Ndi Moyo” L’Acqua è Vita**
Protocollo Intesa con ITTS A. Volta Perugia Progetto "L'Acqua è Vita" Programma #iosonoAmbiente"
Total budget: not applicable
N partner: 4
Protocol: 119643/2024
Role in the project: Reference person for IRPI-CNR.

2022-2024 (participation) **ACQUACENTRO**
Funded by Autorità di Bacino Distrettuale dell’Appennino Centrale

Total budget: € 150,000 (CNR-IRPI: 70,000€)
link: /
N partner: 2
Protocol: Ordini di servizio 0003415/2022, 0016154/2023 and 201832/2024
Role in the project: Estimation of water needs in relation to climate change, with particular focus on irrigation needs.

2022-2023 (participation) **DTE Alps**
Funded by European Space Agency
Total CNR-IRPI budget: €80,000
link: https://devext.sinergise.com/sentinel/dta/
N partner: 5
Protocol: Subcontract between Sentinel Hub and IRPI-CNR within the ESA contract 4000139281/22/I-DT
Role in the project: Implementation of tools and algorithm for drought monitoring

2022-2025 (participation) **WATERSTEM**
Funded by "Progetti di Ricerca di Rilevante Interesse Nazionale - Bando 2020 MUR Prot. 20202WF53Z
Total budget: 477,304€ (CNR-IRPI: 190,113.0 €)
N partner: 5
Protocol: Ordine di servizio 0002702/2022
Role in the project: Modelling and data assimilation

2022-2027 (participation) **EUMETSAT Satellite Application Facility on Support to Operational Hydrology and Water Management, H SAF**
Funded by European Organization for the Exploitation of Meteorological Satellites– EUMETSAT
Total budget: 7,325,000.00 € (CNR-IRPI: 178,749.00 €)
Link: http://hydrology.irpi.cnr.it/projects/h-saf/
N partner: 19
Protocol: Ordine di servizio 0002665/2022 and Ordine di servizio 202073/2024
Role in the project: takes part in WP 8300 (application tools) and WP 8400 (training program).

2022-2023 (participation) **DTE-Hydrology evolution**
Funded by European Space Agency – ESA
Total budget: 399,967.00 € (CNR-IRPI: 135,000.00 €)
Link: http://hydrology.irpi.cnr.it/projects/dte-hydrology/
N partner: 6
Protocol: Ordine di servizio 0002664/2022
Role in the project: takes part in WP 150 (Irrigation) and WP 700 (User Community engagement and roadmap).

2021-2023 (participation) **4DMED-Hydrology**
Funded by European Space Agency – ESA
Total budget: 999,956.00 € (CNR-IRPI: 220,000.00 €)
Link: https://www.4dmed-hydrology.org/
N partner: 10
Protocol: Ordine di servizio 0000362/2022
Role in the project: takes part in WP 110 (scientific requirements consolidation) and WP 340 (Irrigation)

2020-2022 (participation) **IRRIGATION+**
Funded by European Space Agency – ESA
Total budget: 449,936.00 € (CNR-IRPI: 114,444.00 €)
Link: http://hydrology.irpi.cnr.it/projects/irrigation+/
N partner: 7

Protocol: IRPI 0012611/2020

Role in the project: Data Collection. WP400: Irrigation products development; WP600: Impact Assessment.

2020 (PI) **Assimilation of innovative Earth observations into a land surface model for tracking human-induced changes to the terrestrial water cycle, Short Term Mobility, STM**

Short term mobility funded by Consiglio Nazionale delle Ricerche – CNR

Link: https://www.cnr.it/en/short-term-mobility

N partner: 2

Protocol: CNR 0054417/2020

Role in the project: To test the joint use of a Land Surface Model (LSM) and remote sensing backscatter observations, integrated via data assimilation (DA), for improving the water cycle description and track the effects of the human impacts on it, over a study area within the Po river Valley (Italy).

2019-2021 (participation) **Resolving the Daily Water Cycle over Land with Radar Satellites, DWC Radar**

Funded by FFG Cooperative R&D project (Austria)

Total budget: 299,964.00 € (CNR-IRPI: 22,808.00 €)

Link: http://hydrology.irpi.cnr.it/projects/dwc-radar/

N partner: 3

Protocol: IRPI 0002621/2019

Role in the project: Collection of modelled soil moisture and remote sensing soil moisture time series for quantifying the water resource used for irrigation.

2018-2019 (participation) **Rapporto di collaborazione e partnership, nell'ambito delle rispettive finalità istituzionali, per la realizzazione di studi e ricerche finalizzati a supportare le attività della rete dei Centri Funzionali, seguendo i principi di maggiore efficacia, efficienza e funzionalità della Pubblica Amministrazione**

Funded by: Accordo tra la Presidenza del Consiglio dei Ministri -Dipartimento di Protezione Civile e l'Istituto di Ricerca per la Protezione Idrogeologica del Consiglio Nazionale delle Ricerche

Total budget: 257,070.00 € (CNR-IRPI: 257,070.00 €)

N partner: 1

Protocol: DPC n. 0067693/2018

Role in the project: Satellite soil moisture products validation and satellite applications for hydrology.

2017 (participation) **Innovative Risk Management Solutions for Floods and Droughts to support national strategies for Disaster Risk Reduction in South Asia**

Funded by International Water Management Institute – IWMI

Total budget: 11,000.00 € (CNR-IRPI: 11,000.00 €)

N partner: 1

Protocol: 0002163/2017

Role in the project: Collection of satellite soil moisture, precipitation products and modelled soil moisture estimates. Implementation and validation of algorithms and tools for agricultural drought monitoring.

TEACHING-SCIENTIFIC DISSEMINATION

2023 **Monitoring soil moisture from space, a key variable for hydrological and agricultural applications: background and real-world practical exercises**

Role: Teacher

International Advanced School in Agricultural Meteorology – 3rd Edition

Period: 11-15/12/2023

Link: https://climateservices.it/wp-content/uploads/2023/07/brochure_2023_04_07.pdf

2022 **Modellazione Idraulica & GIS: "Utilizzo di dati satellitari per il monitoraggio di siccità e pratiche irrigue.**

Role: Presenter
Professional course
Period: 25/02/2022
Link: https://www.youtube.com/watch?v=o_eSDYZfbmI&t=345s

2021 **LOGYTalks – Irrigation estimates from remote sensing and land surface modeling.**
Role: Presenter
Dissemination
Period: 15/12/2021
Link: https://www.linkedin.com/events/irrigationestimatesfromremotese6861223991344959488/

2020 **Sharper Night 2020: "Observing the Earth".**
Role: Presenter
Dissemination
Period: November 2020
Link: https://ing1.unipg.it/home/notizie-ed-eventi/archivio-notizie/1249-il-dipartimento-ingegneria-civile-e-ambientale-partecipa-a-sharper-2020

2019 **EUMeTrain: Event week on Soil Moisture products of H-SAF 4 - 8 Novembre 2019.**
Role: Teacher
Course within the framework of the HSAF-Cdop3 (DTA.AD004.155)
Period: 4-8/11/2019

FURTHER INFORMATION

Memberships

- Società Idrologica Italiana (SII) since 2019
- European Geoscience Union (EGU) from 2019 to 2023
- Gruppo Italiano di Idraulica (GII) from 2020 to 2021

Evaluation of research results

- Reviewer for several peer-reviewed international journals including Hydrology of Earth Systems Sciences (HESS), Remote sensing (MDPI), International Journal of Remote Sensing (IJRS), Agricultural Water Management (Elsevier)
  https://www.webofscience.com/wos/author/record/AFX-9576-2022)

Personal data

According to law 679/2016 of the Regulation of the European Parliament of 27th April 2016, I hereby express my consent to process and use my data provided in this CV

Date: Perugia, 25/06/2024

Signature: Sara Modanesi

Editorial Board

1. **Article collection**
   Journal: **Frontiers in Water**
   Role: Topic Editors
   Research Topic: Monitoring Irrigation Dynamics from Satellite Data

link: https://www.frontiersin.org/research-topics/51699/monitoring-irrigation-dynamics-from-satellite-data
Publication year: December 2022 – June 2023
Description: novel studies on: (i) Irrigation detection (timing and/or mapping) through remote sensing observations; (ii) irrigation estimates on satellite data; (iii) monitoring irrigation dynamics across scales; (iv) coupling remotely-sensed observations with hydrological or land surface modeling for irrigation management purposes; (v) assessing the impacts of irrigation practices on the hydrological cycle and climate; (vi) innovative data assimilation systems to merge EO and land surface models to improve irrigation; (vii) assessing irrigation efficiency through satellite data; (viii) assessing irrigation water needs under future climate scenarios.

2. **Special Issue**
Journal**: Remote Sensing (MDPI)**
Role: Guest Editor
Title: "Irrigation Estimates and Management from EO data"
link: https://www.mdpi.com/journal/remotesensing/special_issues/Irrigation_EO
Period: January 2022 – December 2022
Description: novel studies aimed at monitoring irrigation dynamics at different spatial scales through Earth Observation (EO) data, as well as works proposing managing strategies based on remote sensing observations. Review papers are also welcome.

List of ISI publications

1. Zappa, L., Dari, J., **Modanesi, S.**, Quast, R., Brocca, L., Lannoy, G.D., Massari, C., Seguí, P.Q., Ortiz, A.B., Dorigo, W. Benefits and pitfalls of irrigation timing and water amounts derived from satellite soil moisture. Agric. Water Manag., 295, 108773, https://doi.org/10.1016/j.agwat.2024.108773, 2024.
2. Brocca, L., Barbetta, S., Camici, S., Ciabatta, L., Dari, J., Filippucci, P., Massari, C., **Modanesi, S.**, Tarpanelli, A., Bonaccorsi, B., Mosaffa, H., Wagner, W., Vreugdenhil, M., Quast, R., Alfieri, L, Gabellani, S., Avanzi, F., Rains, D., Miralles, D.G., Mantovani, S., Briese, C., Domeneghetti, A., Jacob, A., Castelli, M., Camps-Valls, G., Volden, E., Fernandez, D. A Digital Twin of the terrestrial water cycle: a glimpse into the future through high-resolution Earth observations Front. Sci., 1, 10.3389/fsci.2023.1190191, 2024
3. Girotto, M., Formetta, G., Azimi, S., Bachand, C., Cowherd, M., De Lannoy, G., Lievens, H., **Modanesi, S.**, Raleigh, M.S., Rigon, R., Massari, C. Identifying snowfall elevation patterns by assimilating satellite-based snow depth retrievals, Science of The Total Environment, Volume 906,167312, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2023.167312, 2024.
4. Azimi, S., Massari, C., Formetta, G., Barbetta, S., Tazioli, A., Fronzi, D., **Modanesi, S.**, Tarpanelli, A., and Rigon, R.: On understanding mountainous carbonate basins of the Mediterranean using parsimonious modeling solutions, Hydrol. Earth Syst. Sci., 27, 4485–4503, https://doi.org/10.5194/hess-27-4485-2023, 2023.
5. Bechtold, M., **Modanesi, S.**, Lievens, H., Baguis, P., Brangers, I., Carrassi, A., ... & De Lannoy, G. Assimilation of Sentinel-1 backscatter into a land surface model with river routing and its impact on streamflow simulations in two Belgian catchments. Journal of Hydrometeorology, 24(12), 2389-2408, https://doi.org/10.1175/JHM-D-22-0198.1, 2023.
6. Natali, M., **Modanesi, S.**, Massari, C., Brocca, L., De Lannoy, G., J. M. Maino, A., Mantovan, F. A simple framework to calibrate a soil water balance model with Sentinel-1 and Sentinel-2 observations over irrigated fields. IEEE International Workshop on Metrology for Agriculture and Forestry, 2023.
7. Massari, C., Pellet, V., Tramblay, Y., Crow, W. T., Gründemann, G. J., Hascoetf, T., Penna, D., **Modanesi, S.**, Brocca, L., Camici, S., & Marra, F. On the relation between antecedent basin conditions and runoff coefficient for European floods. Journal of Hydrology, 625, 130012. https://doi.org/10.1016/j.jhydrol.2023.130012, 2024
8. Kragh, S. J., Dari, J., **Modanesi, S**., Massari, C., Brocca, L., Fensholt, R., Stisen, S., and Koch, J. An inter-comparison of approaches and frameworks to quantify irrigation from satellite data, Hydrol. Earth Syst. Sci., 28, 441–457, https://doi.org/10.5194/hess-28-441-2024 , 2024.
9. Dari, J., Brocca, L., **Modanesi, S**., Massari, C., Tarpanelli, A., Barbetta, S., Quast, R., Vreugdenhil, M., Freeman, V., Barella-Ortiz, A., Quintana-Seguí, P., Bretreger, D., and Volden, E.: Regional data sets of high-resolution (1 and 6 km) irrigation estimates from space, Earth Syst. Sci. Data, 15, 1555–1575, https://doi.org/10.5194/essd-15-1555-2023 , 2023.
10. Le Page M, Nguyen T, Zribi M, Boone A, Dari J, **Modanesi S**, Zappa L, Ouaadi N, Jarlan L. Irrigation Timing Retrieval at the Plot Scale Using Surface Soil Moisture Derived from Sentinel Time Series in Europe. Remote Sensing., 15(5):1449. https://doi.org/10.3390/rs15051449, 2023.
11. Baguis, P., Carrassi, A., Roulin, E., Vannitsem, S., **Modanesi, S.**, Lievens, H., Bechtold, M., De Lannoy, G. Assimilation of Backscatter Observations into a Hydrological Model: A Case Study in Belgium Using ASCAT Data. Remote Sens., 14, 5740. https://doi.org/10.3390/rs14225740, 2022.

12. **Modanesi, S.,** Massari, C., Bechtold, M., Lievens, H., Tarpanelli, A., Brocca, L., Zappa, L., De Lannoy, G.J.M. Challenges and benefits of quantifying irrigation through the assimilation of Sentinel-1 backscatter observations into Noah-MP. Hydrol. Earth Syst. Sci., 26, 4685-4706. https://doi.org/10.5194/hess-26-4685-2022, 2022.
13. Elwan, E., Le Page, M., Jarlan L., Baghdadi, N., Brocca, L., Modanesi, S., Dari, J., Quintana-Seguí, P., Zribi, M. Irrigation Mapping on Two Contrasted Climatic Contexts Using Sentinel-1 and Sentinel-2 Data. Water, 14(5), 804. DOI: https://doi.org/10.3390/w14050804, 2022.
14. **Modanesi, S.,** Massari, C., Gruber, A., Lievens, H., Tarpanelli, A., Morbidelli, R., and De Lannoy, G. J. M. Optimizing a backscatter forward operator using Sentinel-1 data over irrigated land, Hydrol. Earth Syst. Sci., 25, 6283–6307, https://doi.org/10.5194/hess-25-6283-2021 , 2021
15. **Modanesi, S.,** Dari, J., Massari, C., Tarpanelli, A., Barbetta, S., De Lannoy, G., Gruber, A., Lievens, H., Bechtold, M., Quast, R., Vreugdenhil, M.; Zribi, M., Le Page, M., Brocca, L. A comparison between satellite- and model-based approaches developed in the ESA Irrigation+ project framework to estimate irrigation quantities. 2021 IEEE International Workshop on Metrology for Agriculture and Forestry (MetroAgriFor), 268-272. doi: 10.1109/MetroAgriFor52389.2021.9628453
16. Massari, C., **Modanesi, S.**, Dari, J., Gruber, A., De Lannoy, G.J.M., Girotto, M., Quintana-Seguí, P., Le Page, M., Jarlan, L., Zribi, M., Ouaadi, N., Vreugdenhil, M., Zappa, L., Dorigo, W., Wagner, W., Brombacher, J., Pelgrum, H., Jaquot, P., Freeman, V., Volden, E., Fernandez Prieto, D., Tarpanelli, A., Barbetta, S., Brocca, L. A review of irrigation information retrievals from space and their utility for users. Remote Sens., 13(20), 4112. DOI: https://doi.org/10.3390/rs13204112, 2021.
17. De Santis, D., Biondi, D., Crow, W.T., Camici, S., **Modanesi, S.**, Brocca, L., Massari, C. Assimilation of Satellite Soil Moisture Products for River Flow Prediction: An Extensive Experiment in over 700 Catchments throughout Europe. Water Resources Research, 57, 6. https://doi.org/10.1029/2021WR029643, 2021.
18. **Modanesi, S.**, Massari, C., Camici, S., Brocca, L., Amarnath, G. Do Satellite Surface Soil Moisture Observations Better Retain Information About Crop-Yield Variability in Drought Conditions? Water Resources Research, 56 ,2. https://doi.org/10.1029/2019WR025855, 2020.
19. Azimi, S., Dariane, AB., **Modanesi, S.**, Bauer-Marschallinger, B., Bindlish, R., Wagner, W., Massari, C. Assimilation of Sentinel 1 and SMAP - based satellite soil moisture retrievals into SWAT hydrological model: the impact of satellite revisit time and product spatial resolution on flood simulations in small basins. J Hydrol (Amst). 2020, 581:124367. Epub 2019 Nov 22. PMID: 33154604; PMCID: PMC7608049. https://doi.org/10.1016/j.jhydrol.2019.124367
20. Bauer-Marschallinger, B., Naeimi, V., Cao, S., Paulik, C., Schaufler, S., Stachl, T., **Modanesi, S.**, Massari, C., Ciabatta, L., Brocca, L., Wagner, W. Towards Global Soil Moisture Monitoring with Sentinel-1: Harnessing Assets and Overcoming Obstacles. IEEE Trans. Geosci. Remote Sens., DOI: 10.1109/TGRS.2018.2858004, 2018.
21. Bauer-Marschallinger, B., Paulik, C., Hochstöger, S., Mistelbauer, T., **Modanesi, S.**, Ciabatta, L., Massari, C., Brocca, L., Wagner, W. Soil Moisture from Fusion of Scatterometer and SAR: Closing the Scale Gap with Temporal Filtering. Remote Sens., 10(7), 1030, https://doi.org/10.3390/rs10071030, 2018.

List of ISI submitted publications

1. De Lannoy, G. et al. Contributions of irrigation modeling, soil moisture and snow data assimilation to the skill of high-resolution digital replicas of the Po basin water budget. *ESS Open Archive,* 10.22541/essoar.171535793.33881670/v1. May 10, 2024.

List of conference contributions

1. Natali, M., **Modanesi, S.**, De Lannoy, G.J.M., De Santis, D., Domeneghetti, A. and Massari, C. Detecting and Quantifying irrigation at the Field Scale by using Soil Water Balance and the Water Cloud Model with Sentinel-1 and Sentinel-2 observations. Giornate dell'Idrologia 2024, 24-26/06/2024, Udine (Italia).
2. **Modanesi, S.**, De Santis, D., Dalmonech, D., Collalti, A., Avanzi, F., De Lannoy, G.J.M., Grasso, F.M. and Massari, C. Challenges in the representation of hydrological droughts by land surface models in the Mediterranean region. Giornate dell'Idrologia 2024, 24-26/06/2024, Udine (Italia).
3. Natali, M., **Modanesi, S.**, De Santis, D., Brocca, L., Mantovani, F., Maino, A., De Lannoy, G., and Massari, C. Irrigation Estimation from Soil Water Balance and the Water Cloud Model by leveraging Sentinel-1 and Sentinel-2 observations. EGU General Assembly 2024, 15-19/04/2024, Vienna (Austria).
4. Malet, J.P., Lamare, M., Guardamino, L., Viehweger, J., Camici, S., Brocca, L., Barbetta, S., Bonaccorsi, B., **Modanesi, S.**, Tarpanelli, A., Dall'Amico, M., Di Paolo, F., Franceschetti, N., Michoud, C., Oppikoffer, T., Michéa, D., Provost, F., Déprez, A., Foumelis, M., and Bally, P.. Towards a Digital Twin for the Alps to simulate water-related processes and geohazards for climate change adaptation strategies. EGU General Assembly 2024, 15-19/04/2024, Vienna (Austria).

5. De Lannoy, G.J.M., Busschaert, L., **Modanesi, S.,** Dunmire, D., Brangers, I., Lievens, H., Heyvaert, Z., Massari, C., Getirana, A, Bechtold, M. Relative contribution of high-resolution Sentinel-1 data assimilation and modeling choices to improve regional water budget estimates. Invited Lecture at EGU General Assembly 2024, 15-19/04/2024, Vienna (Austria).
6. Busschaert, L., Bechtold, M., **Modanesi, S.**, Massari, C., Brocca, L., De Lannoy, G.J.M.. Irrigation estimation through backscatter data assimilation with a buddy check approach. American Meteorological Society - 104th Annual Meeting. 28/01/– 01/02/2024, Baltimore (USA)
7. **Modanesi, S.**, De Lannoy, G.J.M., Bechtold, M., Brocca, L., Busschaert, L., Dari, J., Natali, M., Massari, C. Can Earth observations improve land surface model simulations through the calibration of a simple irrigation scheme? HYDROSPACE, 27/11-01/12/2023, Lisbon (Portugal).
8. Brocca, L., Gabellani, S., Alfieri, L., Avanzi, F, Wagner, W., Vreugdenhil, M., Miralles, D., Nielsen, K., Aires, F., Dalmonech, D., Collalti, A., Quintana-Segui, P., Mantovani, S., De Lannoy, G.J.M., Orth, R., Samaniego, L., Rakovec, O., Brombacher, J., Camps-Valls, G., Trigo, I., Camici, S., Tarpanelli, A., Massari, C., Ciabatta, L., Barbetta, S., **Modanesi, S.**, Filippucci, P., Mosaffa, H., Dari, J. Towards a Digital Twin for the Water and Energy cycle over Land. HYDROSPACE, 27/11-01/12 2023, Lisbon (Portugal).
9. De Lannoy, G.J.M., Busschaert, L., Bechtold, M., **Modanesi, S**., Brangers, I.; Lievens, Hans, Heyvaert, Z., Massari, C. Assimilation of Sentinel-1 data to improve estimates of snow, soil moisture, irrigation and discharge in the Po River basin. HYDROSPACE, 27/11-01/12 2023, Lisbon (Portugal).
10. Natali, M., **Modanesi, S.**, Massari, C., Brocca, L., De Lannoy, G.J.M., Mantovani, F. A simple framework to calibrate a soil water balance model with Sentinel-1 and Sentinel 2 observations over irrigated fields. Metroagrifor Conference, 06-08 Nov 2023, Pisa (Italy).
11. **Modanesi, S**., De Lannoy, G.J.M., Bechtold, M., Busschaert, L., Massari, C. Towards an optimization of irrigation parameters to improve land surface model simulations. Giornate dell'Idrologia, 13-15/09/2023, Matera (Italia).
12. **Modanesi, S**., De Lannoy, G.J.M., Bechtold, M., Brocca, L., Dari, J., Busschaert, L., Natali, M., Massari, C. Optimising Irrigation Simulations through Integration of Land Surface Models and Remote Sensing Data. Workshop CNR IRPI.03-05/07/2023, Rome (Italia).
13. **Modanesi, S.**, De Lannoy, G.J.M., Bechtold, M., Busschaert, L., Massari, C. Optimizing irrigation parameters to improve land surface model irrigation simulations: an example over the Po Valley, Italy. 8th EGU Galileo Conference: European Vision for Hydrological Observations and Experimentation. 12-15/06/ 2023, Napoli (Italia).
14. **Modanesi, S.**, De Lannoy, G.J.M., Bechtold, M., Brocca, L., Dari, J., Busschaert, L., Natali, M., and Massari, C. Combining land surface modelling and Earth observations: the key role of soil moisture data to improve estimates of agricultural water uses, EGU General Assembly 2023, 23–28/04/2023, Vienna (Austria); EGU23-2784, https://doi.org/10.5194/egusphere-egu23-2784, 2023.
15. Dari, J, Brocca, L., **Modanesi, S.**, Massari, C., Tarpanelli, A., Barbetta, S., Quast, R., Vreugdenhil, M., Freeman, V., Barella-Ortiz, A., Quintana-Seguí, P., Bretreger, D., Flammini, A., Volden, E. First regional-scale and high-resolution (1 and 6 km) irrigation water data sets obtained from satellite observations. EGU General Assembly 2023, 23–28/04/2023, Vienna, (Austria).
16. Busschaert, L., Bechtold, M., **Modanesi, S.**, Massari, C., Brocca, L., De Lannoy, G.J.M. Irrigation quantification through backscatter data assimilation with a buddy check approach. EGU General Assembly 2023, 23–28/04/2023, Vienna (Austria).
17. Bechtold, M., **Modanesi, S**., Lievens, H., Baguis, P., Brangers, I., Carrassi, A., Getirana, A., Gruber, A., Heyvaert, Z., Massari, C., Scherrer, S., Vannitsem, S., De Lannoy, G.J.M. Improving streamflow simulation by assimilating Sentinel-1 backscatter into a land surface model with river routing. ISDA-online conference, Land Surface and Data Assimilation session, 02/12/2022.
18. **Modanesi, S**., Massari, C., Bechtold, M., Tarpanelli, A., Brocca, L., Lievens, H., Zappa, L., Morbidelli, R., De Lannoy, G.J.M. Investigating the potential of Sentinel-1 observations to improve irrigation simulations into a land surface model. Giornate dell'Idrologia, 09-11/11/2022, Genova (Italia).
19. **Modanesi, S**., Massari, C., Bechtold, M., Tarpanelli, A., Brocca, L., Lievens, H., Dorigo, W., Zappa, L., De Lannoy, G.J.M. On the potential of Sentinel-1 backscatter to improve land surface model irrigation estimates. Soil Moisture Workshop, 7-9/06/ 2022, Perugia (Italia).
20. Dari, J., **Modanesi, S**., Massari, C., Tarpanelli, A., BARBETTA, S., De Lannoy, G., Bechtold, M., Lievens, H., Quast, R., Vreugdenhil, M., Zribi, M., Le Page, M., Quintana Seguí, P., Brocca, L. Comparing irrigation quantification approaches developed within the Irrigation+ project. ESA Living Planet Symposium 2022, 25/05/2022, Bonn (Germany).
21. Massari, C., Marra, F., Tramblay, Y., Crow, W., Camici, S., **Modanesi, S**., Brocca, L., Gruendemann, G. J. Prestorm root zone soil moisture conditions critical for flood forecasting in Europe. Oral presentation at EGU 2022, 23-27/05/2022, Vienna (Austria).
22. **Modanesi, S**., Massari, C., Bechtold, M., Tarpanelli, A., Brocca, L., Lievens, H., Dorigo, W., Zappa, L., De Lannoy, G.J.M. Benefits of Sentinel-1 backscatter assimilation to improve land surface model irrigation estimates in Europe. Oral presentation at EGU 2022, 23-27/05/2022, Vienna (Austria).

23. Bechtold, M., **Modanesi, S**., Lievens, H., Brangers, I., Getirana, A., Gruber, A., Massari, C., Gabrielle, G.J.M. Assimilation of Sentinel-1 backscatter into a land surface model for soil moisture and leaf area index updating: Impact on streamflow simulations. Oral presentation at EGU 2022, 23-27/05/2022, Vienna (Austria).
24. Azimi, S., Massari, C., Formetta, G., Barbetta, S., Tazioli, A., Fronzi, D., **Modanesi, S.**, Tarpanelli, A., Rigon, R. Assessing the ability GEOframe modeling system for water budget analysis of a challenging karst basin in the Apennines chains, Central Italy. Oral presentation at EGU 2022, 23-27/05/2022, Vienna (Austria).
25. Elwan, E., Le page, M., Jarlan, L., Baghdadi, N., Brocca, L., **Modanesi, S.**, Dari, J., Quintana Segui, P., Zribi, M. Irrigation mapping using Sentinel-1 and Sentinel-2 data. Oral presentation at EGU 2022, 23-27/05/2022, Vienna (Austria).
26. Bechtold, M., **Modanesi, S.**, Lievens, H., Brangers, I., Getirana, A., Gruber, A., Massari, C., De Lannoy, G. Updating Soil Moisture and Vegetation by Assimilating Sentinel-1 Backscatter: Impact on Streamflow Simulations. AGU Fall Meeting 2021, 13-17/12/2021. New Orleans, LA (USA).
27. De Lannoy, G.J.M, Bechtold, M., Brangers, I., de Roos, S., Felsberg, A., Heyvaert, Z., Kumar, S., Lievens, H., Massari, C., **Modanesi, S.** et al. Earth observations and their integration into land surface modeling. Invited Lecture at the 6th Conference on Modelling Hydrology, Climate, and Land Surface Processes. 26/09/2021
28. Bechtold, M., **Modanesi, S.**, Lievens, H., Brangers, I., Getirana, A., Gruber, A., Massari, C., De Lannoy, G. Updating soil moisture and vegetation by assimilating Sentinel-1 backscatter: Impact on streamflow simulations. ECMWF workshop - Connecting global to local hydrological modelling and forecasting: scientific advances and challenges. Online session, 29/06 – 1/07/2021
29. De Lannoy, G.J.M, Bechtold, M., Brangers, I., Felsberg, A., Heyvaert, Z., Lievens, H., **Modanesi, S.**, Reichle, R.. Satellite-based microwave data assimilation to estimate soil moisture, vegetation and snow. Invited Lecture by WMO S2S Prediction Project Monthly Webinar, 26/05/2021
30. **Modanesi, S.**, Massari, C., Gruber, A., Brocca, L., Lievens, H., Morbidelli, R., De Lannoy, G. J., M. On the ability of Sentinel-1 backscatter to detect soil moisture and vegetation changes caused by irrigation fluxes over the Po River Valley (Italy). vEGU General Assembly 2021. Online Session, 19 -30/04/2021
31. **Modanesi, S.**, Massari, C., Gruber, A., Brocca, L., Lievens, H., Morbidelli, R., De Lannoy, G. J., M. Irrigation detection over the Po River Valley (Italy) using Sentinel-1 radar backscatter observations. Earth Observation for Water Cycle Science 2020. Online Session. 16-19/11/2020
32. **Modanesi, S.**, De Lannoy, G. J. M., Gruber, A., Massari, C., Brocca, L., Lievens, H., Morbidelli, R. Irrigation detection with Sentinel-1 radar backscatter observations over an agricultural area in the Po River Valley (Italy). EGU General Assembly 2020. Online session.
33. De Santis, D., Massari, C., Camici, S., **Modanesi, S.**, Brocca, L., Biondi, D. Added value of satellite soil moisture assimilation in hydrological modelling: an evaluation through a large experiment over Europe. EGU General Assembly 2020. Online session.
34. **Modanesi, S.**, Massari, C., Camici, S., Brocca, L., Amarnath, G. On the relation between satellite soil moisture and crop production during drought events in India. AGU Fall Meeting 9 – 13/12/2019, San Francisco (USA)
35. **Modanesi, S.**, Massari, C., Azimi, S., Brocca, L, Filippucci, P., Ciabatta, L., Bauer- Marshallinger, B., Wagner, W. Effects of spatial resolution and revisit time of different satellite soil moisture products for flood forecasting into a Rainfall-Runoff Model. H SAF and HEPEX joint workshop on Satellite inspired hydrology for an uncertain future, 25-28/11/2019, Reading (UK).
36. **Modanesi, S.**, Massari, C., Camici, S., Brocca, L., Amarnath, G. Performance of a Standardized Soil Moisture Index based on the ESA-CCI soil moisture product for assessing agricultural drought in India. H SAF and HEPEX joint workshop on Satellite inspired hydrology for an uncertain future, 25-28/11/2019, Reading (UK).
37. Brocca, L., Camici, S., **Modanesi, S.**, Filippucci, P., Ciabatta, L., Massari, C., Hahn, S., Wagner, W., Campione, E., Puca, S., Cacciamani, C. Operational services of satellite soil moisture products for flood, landslide, drought and precipitation. EMS Annual Meeting 2019, 9-13/09/2019, Copenhagen (Denmark).
38. **Modanesi, S.**, Massari, C., Camici, S., Brocca, L., Amarnath, G. Utility of a Standardized Soil Moisture Index based on satellite data in estimating crop yield during drought events. Giornate dell'Idrologia, 16-18/09/2019, Bologna (Italia).
39. Brocca, L., Camici, S., Ciabatta, L., Tarpanelli, A., **Modanesi, S.**, Filippucci P., Massari C., Brunetti M. T., Peruccacci S., Gariano S. L., Melillo M.- Recent advances in using satellite soil moisture and precipitation for flood and landslide prediction in the Mediterranean basin. EGU General Assembly 2019. 7-12/04/2019, Vienna (Austria)
40. **Modanesi, S.**, Massari, C., Camici, S., Brocca, L., Amarnath, G. Performance of a drought Standardized Soil Moisture Index based on ESA CCI Soil Moisture product: validation in India using crop data. EGU General Assembly 2019. 7-12/04/2019, Vienna (Austria).
41. Azimi, S., Massari, C., Darian, A. B., **Modanesi, S.**, Filippucci, P., De Santis, D., Maschallinger, B. B., Wagner, W. Benefit of coarse- and medium-scale satellite soil moisture products for flood modelling in small basins: temporal versus spatial resolution. EGU General Assembly 2019. 7-12/04/2019, Vienna (Austria).
42. **Modanesi, S.**, Massari, C., Camici, S., Brocca, L., Amarnath, G. ESA-CCI soil moisture for agricultural drought: validation by using crop data. 16th Plinius Conference on Mediterranean Risks. 9–11/10/2018, Montpellier (France).

43. **Modanesi, S.**, Massari, C., Camici, S., Brocca, L., Amarnath, G. ESA-CCI soil moisture for agricultural drought in India: validation by using crop data. Giornate dell'Idrologia, 18-20/06/2018, Roma (Italia).

List of submitted conference contributions

1. Dari, J., Brocca, L., **Modanesi, S.**, Massari, C., Quintana-Seguí, P., Vreugdenhil, M., Quast, R., Saltalippi, C., Flammini, A. and Renato Morbidelli. Monitoring irrigation from space for water management: achieved results and next steps forward. Convegno Nazionale di Idraulica e Costruzioni Idrauliche IDRA24, 15-18 Sep. 2024, Parma (Italia).
2. Massari, C., Dionigi, M. Penna, D., Avanzi, F., Argenti, G., Barbetta, S., Battipaglia, G., Brilli, L., Chiesi, M., Collalti, A., Dibari, C., Dalmonech, D., De Santis, D., di Prima, S., Donnini, M., Formetta, G., Fronzi, D., Giadrossich, F.,Kabala, J.P., **Modanesi, S.**, Moriondo, M., Niccoli, F.,Preziosi, E., Rigon, R., Tazioli, A. Impact from changes in snow accumulation for two hydrological years in a Mediterranean mountainous catchment in Central Italy. ERB2024, 17-20 Sept. 2024. Inca, Mallorca (Spain).

Invited talks

1. **Modanesi, S.**, De Lannoy, G. J. M., Bechtold, M., Brocca, L., Dari, J., Busschaert, L., Natali, M., Massari, C. Combining land surface modelling and Earth observations: the key role of soil moisture data to improve estimates of agricultural water uses. Solicited Author at EGU 2023, 23-28/04/2023, Vienna (Austria).

List of Technical Reports

1. **CCI AWU – Report Explaining the Criteria for Selecting Test Regions Deliverable 2**
   Authors: Brocca, L., Massari, C., **Modanesi, S.**, Dari, J., Saltalippi, C., Morbidelli, R., De Lannoy, G., Bechtold, M., Busschaert, L., Heyvert, Z., Dorigo, W., Laulet, P., Langhans, P., Rulli, M.C., Chiarelli, D.D., Galli, N.
   Role: Coauthor
   Description: The document aims at describing the criteria defined for selecting the study areas, data collection of in situ benchmark data and satellite data. More specifically, the data collection involved the following variables: in-situ irrigation benchmark data, actual and potential evaporation (ET), forcing datasets to drive AWU algorithms, satellite soil moisture datasets.
   Publication year: 2024
   Additional Information: Report prepared within the CCI AWU project, ESA Contract No. 4000142449/23/I-NB.
2. **CCI AWU – User Requirement Document (URD) Deliverable 1 (V1)**
   Authors: Brocca, L., Massari, C., **Modanesi, S.**, Dari, J., Saltalippi, C., Morbidelli, R., De Lannoy, G., Bechtold, M., Busschaert, L., Heyvert, Z., Dorigo, W., Laulet, P., Langhans, P., Rulli, M.C., Chiarelli, D.D., Galli, N.
   Role: Coauthor
   Description: The document aims at describing the efforts of the Consortium in order to create a strong network and connection with climate research and climate service user communities. In this context, a questionnaire was spread within climate scientists and climate communities to gather their needs and feedback regarding a CCI AWU ECV (Essential Climate variable). In the report (version 1 - V.1) results based on the first set of answers provided by scientists are reported.
   Publication year: 2024
   Additional Information: Report prepared within the CCI AWU project, ESA Contract No. 4000142449/23/I-NB.
3. **DTE Alps – Prototype Performance and Validation Report (V1) Deliverable 4**
   Authors: Brocca, L., Camici, S., Dall'Amico, M., Di Paolo, F., Guardamino, L., Viehweger, J., Jean-Baptiste, J., Lamare, M., Malet, J.P., Michoud, C., **Modanesi, S.,** Oppikofer, T., Tasin, S.
   Role: Coauthor
   Description: The V1 of this document provides a preliminary analysis of the operation of the DTA demonstration platform, reporting on the utilization and performance of the services available within a demonstrator, as well as the validation of the products offered.
   Publication year: 2023
   Additional Information: Report prepared within the DTA Alps project, ESA Contract No. 4000139281/22/I-DT.
4. **DTE Alps – Demonstration Exercise Output Dataset Description (V1) Deliverable 3**
   Authors: Brocca, L., Camici, S., Dall'Amico, M., Di Paolo, F., Guardamino, L., Jean-Baptiste, J., Lamare, M., Malet, J.P., Michoud, C., **Modanesi, S.**, Oppikofer, T., Tasin, S.
   Role: Coauthor
   Description: The document presents a comprehensive description of the datasets generated during the first iteration of the DTE (V1), aiming to provide all users with the information needed to have a complete understanding of the data, enabling appropriate use and assessment. In addition to the dataset description, the document includes a validation of the datasets, ensuring a complete and clear understanding of the data to enable appropriate use and assessment.

Publication year: 2023
Additional Information: Report prepared within the DTA Alps project, ESA Contract No. 4000139281/22/I-DT.

5. **4DMED Hydrology – Impact Assessment Report: Society. Deliverable 6.1**
   Authors: Tarpanelli, A., Massari, C., **Modanesi, S.**, Aires, F., Alfieri, L., Avanzi, F., Barbetta, S., Bartkowiak, P., Bechtold, M., Brocca, L., Camici, S., Castelli, M., Ciabatta, L., Claus, M., Dari, J., De Jeu, R., De Lannoy, G., Delogu, F., Dorigo, W., Filippucci, P., Gabellani, S., Hulsman, P., Jacob, A., Koppa, A., Lievens, H, Massart, S., Miralles, D., Barella Ortiz, A., Gispert, R. C., Peiro, Y., Pellet, V., Petrova, I., Quast, R., Quintana Seguí, P., Rains, D., Schellekens, J., Schlaffer, S., Tramblay, Y., van der Schalie, R., Vreugdenhil, M., Wagner, W., Zappa, L.
   Role: Coauthor
   Description: The scope of the document is to describe the use of 4DMED-Hydrology data developed within Task 2 for Advancing the Earth system science. Various case studies have been meticulously developed, each one poised for publication as independent scientific papers.
   Publication year: 2024
   Additional Information: Report prepared within the 4DMED project, ESA Contract No. 4000136272/21/I-EF.
6. **4DMED Hydrology – Impact Assessment Report: Science. Deliverable 5.1**
   Authors: Christian Massari and the 4DMed Hydrology Team
   Role: Coauthor for the WP520: Human Impact on the water cycle
   Description: The main objective of the "Human impact on the water cycle" is to quantify and account for human water use in a reconstruction of the water budget for the Po river basin. More specifically, Sentinel-1 snow depth retrievals (Alps, Apennines), Sentinel-1 backscatter observations (Po valley), and irrigation modelling (Po valley) are used to improve the skill of high-resolution estimates of water cycle state variables (snow, soil moisture, vegetation) and fluxes (streamflow, evapotranspiration, irrigation) over the entire Po river basin.
   Publication year: 2024
   Additional Information: Report prepared within the 4DMED project, ESA Contract No. 4000136272/21/I-EF.
7. **4DMED Hydrology – Product Validation Report (PVR) Deliverable 3.2**
   Authors: Tarpanelli, A., Massari, C., **Modanesi, S.**, Aires, F., Alfieri, L., Avanzi, F., Barbetta, S., Bartkowiak, P., Bechtold, M., Brocca, L., Camici, S., Castelli, M., Ciabatta, L., Claus, M., Dari, J., De Jeu, R., De Lannoy, G., Delogu, F., Dorigo, W., Filippucci, P., Gabellani, S., Hulsman, P., Jacob, A., Koppa, A., Lievens, H, Massart, S., Miralles, D., Barella Ortiz, A., Pellet, V., Petrova, I., Quast, R., Quintana Seguí, P., Rains, D., Schellekens, J., Schlaffer, S., Tramblay, Y., van der Schalie, R., Vreugdenhil, M., Wagner, W., Zappa, L.
   Role: Coauthor
   Description: The report prepared within the 4DMED project intends to describe all the experimental error analysis and validation activities carried out. The methods and algorithms selected on the basis of the experimental analysis are validated in terms of statistical analysis and against ground measurements.
   Publication year: 2023
   Additional Information: Report prepared within the 4DMED project, ESA Contract No. 4000136272/21/I-EF.
8. **4DMED Hydrology – Algorithm Theoretical Basis Document (ATBD) Deliverable 3.1**
   Authors: Tarpanelli, A., Massari, C., **Modanesi, S.**, Aires, F., Alfieri, L., Avanzi, F., Barbetta, S., Bartkowiak, P., Bechtold, M., Brocca, L., Camici, S., Castelli, M., Ciabatta, L., Claus, M., Dari, J., De Jeu, R., De Lannoy, G., Delogu, F., Dorigo, W., Filippucci, P., Mosaffa, H., Gabellani, S., Hulsman, P., Jacob, A., Koppa, A., Lievens, H, Miralles, D., Barella Ortiz, A., Pellet, V., Petrova, I., Greimeister-Pfeil, I., Quast, R., Quintana Seguí, P., Rains, D., Schellekens, J., Schlaffer, S., Tramblay, Y., van der Schalie, R., Vreugdenhil, M., Wagner, W., Zappa, L.
   Role: Coauthor
   Description: The report prepared within the 4DMED project intends to describe in detail all the algorithms, methods and models implemented in the project. The report also includes all related input data and its sources, processing steps and output data. In addition, the document reports a scientific analysis of the drivers of specific development choices and trade-offs for all the algorithms implemented to generate the whole suite of target products. Technical considerations justifying the selected methodologies is also provided.
   Publication year: 2023
   Additional Information: Report prepared within the 4DMED project, ESA Contract No. 4000136272/21/I-EF.
9. **4DMED Hydrology– Requirement baseline report**
   Authors: Camici, S., Massari, C., **Modanesi, S.**, Tarpanelli, A., Aires, F., Alfieri, L., Avanzi, F., Barbetta, S., Bechtold, M., Brocca, L., Castelli, M., Ciabatta, L., Claus, M., Dari, J., De Jeu, R., De Lannoy, G., Delogu, F., Dorigo, W., Filippucci, P., Gabellani, S., Hulsman, P., Jacob, A., Koppa, A., Lievens, H., Miralles , D., Barella Ortiz, A., Pellet, V., Petrova, I., Greimeister-Pfeil, I., Quast, R., Quintana

Seguí, P., Rains, D., Schellekens, D., Schlaffer, S., Tramblay, Y., van der Schalie, R., Vreugdenhil, M., Wagner, W., Zappa, L.
Role: Coauthor
Description: The report provides: 1) a review of the state-of-the-art research on the Mediterranean water cycle; 2) the identification of the main European and international projects and initiatives that are relevant for 4DMED activities, and of the potential areas for collaboration; 3) consolidation of the technical specifications of the target products and methods to be included in the Experimental Dataset to be generated during the project; 4) a consolidated risk analysis conducted assessing which risk areas could affect the final success of the project and the relative possible solutions.
Publication year: 2022
Additional Information: Report prepared within the 4DMED project, ESA Contract No. 4000136272/21/I-EF.

10. **Irrigation+ – Scientific Roadmap D6.1**
Authors: Brocca, L., Massari, C., Barbetta, S., Quintana Seguì, P., Brombacher, J., Dari, J., Dorigo, W., Freeman, V., Le Page, M., **Modanesi, S.**, De Lannoy, G., Bechtold, M., Busschaert, L., Tarpanelli, A., Zappa, L., Zribi, M.
Role: Coauthor
Description: This document summarizes the main achievements obtained during the Irrigation+ project and outlines the future steps that should be carried out in this activity
Publication year: 2023
Additional Information: Report prepared within the Irrigation+ project, ESA Contract 4000129870/20/I-NB
11. **Irrigation+ - Collection of Papers Report D5.2**
Authors: Brocca, L., Massari, C., Barbetta, S., Quintana Seguì, P., Brombacher, J., Dari, J., Dorigo, W., Freeman, V., Le Page, M., **Modanesi, S.**, De Lannoy, G., Bechtold, M., Busschaert, L., Tarpanelli, A., Zappa, L., Zribi, M.
Role: Coauthor
Description This document describes the list of publications of Irrigation+ projects and the outreach (media and conferences).
Publication year: 2023
Additional Information: Report prepared within the Irrigation+ project, ESA Contract 4000129870/20/I-NB
12. **Irrigation+ – Impact Assessment Report Report D5.1**
Authors: Brocca, L., Massari, C., Barbetta, S., Quintana Seguì, P., Brombacher, J., Dari, J., Dorigo, W., Freeman, V., Le Page, M., **Modanesi, S.**, De Lannoy, G., Bechtold, M., Busschaert, L., Tarpanelli, A., Zappa, L., Zribi, M.
Role: Coauthor
Description: This document describes the validation of the datasets generated during the Phase 1 of the project, addressing: i) irrigation water amounts, ii) irrigation mapping, and iii) irrigation timing. For each dataset we provide a short description of how it has been derived and the results of the validation over the IRRIGATION+ pilot areas. Additionally, a cross validation between the irrigation quantification datasets was obtained, when possible, based on the spatial and temporal extent of each product.
Publication year: 2023
Additional Information: Report prepared within the Irrigation+ project, ESA Contract 4000129870/20/I-NB
13. **Irrigation+ – Experimental Dataset Validation Report D4.3**
Authors: **Modanesi, S.**, Dari, J., Brocca, L., Barbetta, S., Bechtold, M.; Brombacher, J., De Lannoy, G., Dorigo, W., Le Page, M., Massari, C., Tarpanelli, A., Zappa, L., Zribi, M.
Role: Coauthor
Description: This document describes the evaluation of the irrigation datasets generated during Phase 1 of the project. It performs the evaluation of each product singularly (i.e., irrigation water amounts through different methodology; irrigation mapping and timing products) as well as a cross comparison between the irrigation quantification products.
Publication year: 2022
Additional Information: Report prepared within the Irrigation+ project, ESA Contract 4000129870/20/I-NB
14. **Irrigation+ – Experimental Dataset Description D4.2**
Authors: Zappa, L., Brocca, L., Brombacher, J., De Lannoy, G., Dari, J., Dorigo, W., Massari, C., M., **Modanesi, S.**, Zribi, M.
Role: Coauthor
Description: This document describes the experimental datasets generated during Phase 1 of the project, addressing i) irrigation water amounts, ii) irrigation mapping, and iii) irrigation timing.
Publication year: 2022
Additional Information: Report prepared within the Irrigation+ project, ESA Contract 4000129870/20/I-NB
15. **Irrigation+ – Updated Proposal for Phase 2 Deliverable D3.4**
Authors: Brocca, L., Massari, C., Barbetta, S., Quintana Seguí, P., Brombacher, J., Dari, J., Dorigo, W., Freeman, V., Le Page, M., **Modanesi, S.**, De Lannoy, G., Bechtold, M., Lievens, H., Jaquot, P., Tarpanelli, A., Zappa, L., Zribi, M.

Role: Coauthor
Description: This document provides the updated proposal for the Phase 2 of the project that considers the shift of the activities due to COVID-19 and the remodulation of the activities based on the scientific results obtained in Phase 1.
Publication year: 2021
Additional Information: Report prepared within the Irrigation+ project, ESA Contract 4000129870/20/I-NB

16. **Irrigation+ – Algorithm Theoretical Basis Document (ATBD) Deliverable D3.2**
Authors: Brocca, L., Massari, C., Barbetta, S., Quintana Seguí, P., Brombacher, J., Dari, J., Dorigo, W., Freeman, V., Le Page, M., **Modanesi, S**., De Lannoy, G., Bechtold, M., Lievens, H., Jaquot, P., Tarpanelli, A., Zappa, L., Zribi, M.
Role: Coauthor
Description: This document provides the Algorithm Theoretical Basis Document (ATBD) description of the methods developed within the Irrigation+ project for irrigation quantification (SM-based inversion, SM-based delta, ET-based, data assimilation) and mapping.
Publication year: 2021
Additional Information: Report prepared within the Irrigation+ project, ESA Contract 4000129870/20/I-NB

17. **DWC Radar – Use Cases**
Authors: Vreugdenhil, M., Quast, R., Filippucci, P., Zappa, L., Reuss, F., Bauer-Marschallinger, B., Brocca, L., Massari, C., **Modanesi, S.**, Ciabatta, L., Chatzikyriakou, C., Reimond, S., Hoyal, S., Wagner, W., Dorigo, W.
Role: Coauthor
Description: The report prepared within the DWC Radar project describes the results of the use cases applications tested in the framework of the project. Specifically, the selected use cases are irrigation monitoring, flood forecasting and landslide monitoring.
Publication year: 2021
Additional Information: Report prepared within the DWC Radar project, CNR-IRPI Contract Directory 24840/2019.

18. **Irrigation+ – Mid-Term Technical Note Deliverable D3.1**
Authors: Brocca, L., Massari, C., Barbetta, S., Quintana Seguí, P., Brombacher, J., Dari, J., Dorigo, W., Freeman, V., Le Page, M., **Modanesi, S**., De Lannoy, G., Jaquot, P., Tarpanelli, A., Zappa, L., Zribi, M.
Role: Coauthor
Description: The document provides a detailed description of the experimental development carried out and the results obtained in Task 3 (WP400) 'Irrigation products development.
Publication year: 2020
Additional Information: Report prepared within the Irrigation+ project, ESA Contract 4000129870/20/I-NB

19. **Irrigation+ – Dataset description Deliverable D2.2**
Quintana Seguí, P., Massari, C., Barbetta, S., Brocca, L., Brombacher, J., Dari, J., Dorigo, W., Freeman, V., Le Page, M., **Modanesi, S**., Jaquot, P., Tarpanelli, A., Zappa, L., Zribi, M.
Role: Coauthor
Description: The document describes the data collected in the IRRIGATION+ project, including in situ and satellite data, and describes the specification of the common file format used for the database.
Publication year: 2020
Additional Information: Report prepared within the Irrigation+ project, ESA Contract 4000129870/20/I-NB

20. **Irrigation+ – Requirement Baseline Report Deliverable D1.1**
Massari, C., Dari, J., **Modanesi, S**., Brocca., L., Tarpanelli, A., Quintana Seguí, P.
Role: Coauthor
Description: The document provides an update of the state of research on irrigation and identifies the requirements and competencies acquired through a survey/interview of different stakeholders and organizations working in the field of agriculture.
Publication year: 2020
Additional Information: Report prepared within the Irrigation+ project, ESA Contract 4000129870/20/I-NB

21. **STM - Assimilation of innovative Earth observations into a land surface model for tracking human-induced changes to the terrestrial water cycle report**
Authors: **Modanesi, S.**
Role: Author
Description: The report described the results obtained during the short-term mobility project.
Publication year: 2020
Additional Information: Report prepared within the Short Term Mobility CNR project, CNR-IRPI protocol 0054991/2020.

22. **DPC Agreement - Satellite Applications for Hydrology**
Authors: **Modanesi, S.**, Massari, C., Camici, S., Ciabatta, L., Filippucci, P., Brocca, L.
Role: Coauthor
Description: The report was prepared for the Department of National Civil Protection. It contains material to demonstrate the potential of satellite soil moisture data for hydrological applications. Experiments in data assimilation of soil moisture observations within hydrological models are shown for some basins in central Italy.
Publication year: 2019
Additional Information: Report prepared within the project "Rapporto di collaborazione e partnership, nell'ambito delle rispettive finalità istituzionali, per la realizzazione di studi e ricerche finalizzati a supportare le attività della rete dei Centri Funzionali, seguendo i principi di maggiore efficacia, efficienza e funzionalità della Pubblica Amministrazione". Prot. U. of the Department of Civil Protection No. 67693 of November 23, 2018.

Perugia,
25/06/2024

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