Ministry of Innovation, Science & Technology

Israel Space Agency
Ministry of Science & Technology

CALL FOR RESEACH PROPOSALS TO BE CONDUCTED IN COOPERATION WITH ITALIAN RESEARCHERS

For the Years 2025-2027

Deadline for Submissions: 31/7/2025

INDEX

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Italy-Israel Scientific Research

CALL FOR JOINT PROJECT PROPOSALS

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Within the framework of the Italy-Israel agreement on scientific cooperation, the ASI (The Italian Space Agency) and the Ministry of Innovation, Science and Technology of the State of Israel (hereinafter refered to as "the Ministry" or "MOST") have decided to fund cooperative research. Accordingly, MOST invites researchers and scientists to submit proposals for research to be carried out jointly by researchers from both countries. For the avoidance of doubt, please note that this Call is for proposals from Israeli research teams only but the research will be conducted in cooperation with Italian research teams. The research teams on the Italian side have already been chosen by ASI and will conduct the research with the Israeli research teams whose proposals will be chosen for funding within the framework of this Call.

The aim of this Call is to support the development of scientific and technological cooperation between Italian and Israeli researchers and to strengthen the scientific partnership between research groups from both countries, by establishing bilateral research networks, enhancing research cooperation and promoting the exchange of knowledge between Italian and Israeli scientists.

The joint research shall focus on one of the main areas of cooperation and its subtopics as detailed in Section A, and concentrate on applied research which could lead to technological applicability and the development of new products.

Qualifying scientific applicants in this framework may receive research grants from MOST, according to the applicable national funding procedures, regulations, and the requirements as detailed in this Call.

A. MAIN AREA OF COOPERATION – Irrigation Needs

Israeli research teams are hereby invited to submit proposals for applied research study on **Irrigation Needs** in accordance with the full requirements that are specified in appendix A.

B. MODE OF COOPERATION

Cooperation will take the form of planning and performing joint research as well as conducting mutual visits between laboratories for the purpose of facilitating the research. Each research team may submit only one project within this program.

Cooperation may also take the form of:

a) Joint research activities in which interdependent subprojects of a single project are conducted in Italian and Israeli laboratories;
b) Complementary methodological approaches to a common problem;
c) Joint use of research facilities, materials, equipment and/or services by cooperating scientists;
d) Mutual visits between laboratories for the purpose of facilitating the research.

C. LEVEL OF FUNDING AND DURATION OF RESEARCH

It is the intention of the Parties to fund research proposals selected hereunder for a term of **two years** and contracts will be signed accordingly. However, funding shall be approved annually, with the funding for each consecutive year to be approved in accordance with the provisions of the research contract.

The Ministry intends to support one research proposal. The research to be funded will be determined based on such factors as merits of the proposals upon scientific evaluation, and budgetary considerations.

The total maximum funding for the research proposal approved under this Call is 100,000$ (380,000 ILS based on the conversion rate of 3.8 ILS/ 1 USD for the Israeli said) for a two-year period.

In accordance, research proposals should be planned on a two-year basis beginning approximately during the final quarter of 2025. A contract will be signed accordingly.

Funding for the approved research proposal depends on the availability of funds and the approval of the State budget.

D. ELIGIBILITY

Proposals must meet the following preconditions. Proposals not meeting the preconditions will be automatically rejected and will not be passed on to the scientific committee for review and evaluation.

1. Proposals must be for research to be conducted by collaborating Italian and Israeli scientific research teams.
2. Proposals must be for research study on the area of cooperation and its subtopics as detailed in Section A and appendix A.
3. The Israeli research team for each proposal must be led by a Principal Investigator (PI).
4. The PI must be affiliated with an academic institution or a research institute ("Affiliated Institution") as defined below, and is a permanent employee of the affiliated institution or on track for tenure in the affiliated institution or be a professor emeritus who continues working on research in affiliation with the Affiliated Institution. An Affiliated Institution is determined as follows:

a) An accredited Institution of Higher Education, according to the Council for Higher Education Law, 5718-1958; or

b) A Research Institute which is a nonprofit organization, a government company or a governmental unit.

For the purposes of this Call, a "Research Institute" in Israel is a research institute whose main activity is the advancement of cutting-edge scientific knowledge, which possesses appropriate infrastructure and equipment, which employs researchers who, inter alia, publish articles related to their research in leading scientific journals, and who present their research at international symposia.

5. In compliance with MOST's Procedures Regarding Scientific Projects Funded by MOST ("MOST Regulations"), an Israeli PI that has or will have an active grant from any of MOST's international cooperation programs, whose funding will be concurrent to the funding of this program, is not eligible to apply. No parallel funding is allowed in the international cooperation program. A researcher who is not eligible to submit a proposal as PI due to an active grant may submit one additional proposal in the international cooperation program as Associated -PI, if he does not have an active grant in the international program in which he acts as Associated-PI.

a. A researcher who has submitted a proposal for any MOST international cooperation call for proposals in the 2025 calendar year **may not submit another proposal for any other MOST international cooperation call for proposals in 2025**.

b. Researchers should be advised that after a proposal has been submitted, the status of the members of the research team as Principal Investigator-PI and/ or Associated-PI may not be changed for the purpose of compliance with the eligibility requirements listed above, It will be clarified that, the aforementioned limitations regarding changing the status of the members of the research team include the addition of a PI and/ or Associated-PI who, at the time of submission, was defined as an external consultant or were not listed in the proposal and/or research group.

E. SUBMISSION OF PROPOSALS

Research proposals must be prepared and submitted by the Israeli research team and must be carried out jointly by the Israeli and the Italian teams. Research proposals must be submitted by Israeli PIs to MOST through the Science Forefront system. Each proposal should be written in English.

Deadline for applications: July 31, 2025 at 15:00. Proposals will not be accepted under any circumstances after the said date and hour.

Further submission instructions for Israeli research teams:

a) The Israeli PI shall submit the proposal through the Science Forefront system, at https://kf.most.gov.il.

In order to apply for the first time, the applicant needs to fill an "account request" at the Science Forefront system. The request should be approved by the Research Authority of the Affiliated Institution. Once approved, the applicant will be notified by email that the account is active. The approval process may take time and therefore should be done well in advance of the application deadline.

b) **Deadline for researchers' submission**: The PI must submit the proposal in English via the Science Forefront system by **24/7/2025 at 15:00 local time (Israel). The online system will be closed for submissions after the said date and hour and no researchers' submissions will be accepted after that time. Israeli**

researchers who have not submitted their proposals by 24/7/2025 at 15:00 local time (Israel) will not be allowed to submit their proposal.

c) A proposal that has been submitted can be edited by the PI, in coordination with the Affiliated Institution, until the final joint submission deadline.

d) The Affiliated Institution must submit the proposal not later than by the final deadline on, **31/7/2025 at 15:00 local time (Israel time)**. Proposals that are not submitted by the Affiliated Institution through the Science Forefront system by this time, **will not be accepted**.

e) Please be advised that as technical problems are possible, and the submission process may take a significant amount of time.

Therefore, it is strongly recommended to fulfil the above steps well in advance of the applications deadlines.

f) A valid project application consists of the appropriated application form **duly filled in and signed**, together with all the necessary application documents required from the research team as detailed above, submittedto MOST in Israel. **If the application is not duly received by the date and hour indicated above and in accordance with all the submission instructions, the proposal will be rejected.**

F. FUNDED EXPENSES

Funding provided by this Call is intended to enhance joint collaboration between Italian and Israeli researchers. Therefore, funding may be assigned to costs related to support of the collaboration vectors, such as costs related to the bilateral nature of the project (travel expenses of the researchers, scientific meetings, etc.) as well as to defray costs incurred by the approved research projects (disposables, publication costs, etc.).
In any case, each budget item or expenditure for which reimbursement is requested must conform to MOST regulations in this regard.

Participating researchers are encouraged to plan visits to their counterparts' institutions and labs, given that such visits are an integral part of the research collaboration. International travel costs and in-country living expenses of visiting scientists, including accommodation, per diem and any other relevant expenses for each visiting scientist, should be included in their project's budget. In this regard when preparing the budget ,

please note that each side funds their own travel expenses and should budget accordingly. Funding provided under this Call may only be used for visits taking place in Italy or Israel; visits to third countries are not eligible for financing by project funds.

Further funding provisions for the Israeli side:

- The applicant should reserve a budget for the invitation of the partner, including accommodation, to attend one of the annual international Collaborators meetings, organized by the Ministry of Innovation, Science and Technology, during the period of the grant
- Please see full funding provisions on MOST Procedures Regarding Scientific Projects Funded by MOST ("MOST Regulations"). All activities and funding pursuant to this Call must be in accordance with MOST Regulations unless otherwise specified.

G. RENEWAL OF FUNDING

Renewal of project funding for a subsequent year is subject to the submission of the relevant documents and reports, separately by the Italian and Israeli PIs. Israeli PIs must submit these documents to MOST two months before the end of the previous year's contract and according to MOST regulations.

In Israel, An application for the continuation of research funding for the second and third year must be submitted to MOST by the Research Institution of Israeli Principal Investigator on the appropriate forms through the Science Forefront system at https://kf.most.gov.il, at least two months prior to the end of the first year and the second year of the project together with the annual scientific report.

H. INSTRUCTIONS FOR WRITING PROPOSALS

Please note that upon submission, the submitting researcher takes full responsibility for all content included in the proposal and the attached documents, even if technological means and/or artificial intelligence tools were used in preparing the proposal. If it is found that a submitted proposal includes information, facts, or data that are not accurate, reliable, or trustworthy, the proposal may be rejected.

Each proposal should be written in **English**. The proposal should be submitted in accordance with the following guidelines:

Font: Times New Roman 11; line spacing: 1.5.

a. **Full proposal** should be up to 10 pages, including figures (not including bibliography) and should include the following sections:
   1) Abstract (max 1500 characters including spaces)
   2) Scientific background and state of the art: Scientific background, including an overview of the field of research around the world, noting the relative advantage of the proposed research;
   3) Research objectives and specific aims: The purpose of the research
   4) Detailed description of the proposed research: Working hypothesis, research program and methods, and preliminary results;
   5) Significance, importance, innovation, and potential benefits of the proposed research;
   6) Applicability: Expected uses and future technological development;
   7) Cooperation vectors between the research groups: Proposed modes of cooperation, their benefits and how they contribute to the research;
   8) Work plan and Gantt: The work plan will be summarized in a schedule diagram. A verbal description of the work steps must be included. Each stage will be defined by a start time and an end time.

b. **Bibliography**: A complete bibliographic list should be attached to the proposed research. The five most relevant items for the proposed research should be marked with an asterisk.

c. **CV**: A short CV for each researcher involved in the research of up to 2 pages each, including: personal statement (brief description of why the investigator is well-suited for the role on the proposed project); list of ongoing and completed research projects from the last three years that the investigator wishes to highlight; citation of up to five publications or research products that highlight the investigator's experience and qualifications for the proposed project; positions, scientific appointments, and honors.

d. **Letter of intent** from the research PIs in both countries affirming their intent to collaborate on the proposed research.

e. **Additional authorizations needed depending on the type of research** (e.g. Helsinki Committee, animal experiments) shall be submitted along with the proposal. In case the required authorization is still not available at the time of submission, a statement in free text should be attached including the researcher's commitment that

if their proposal is approved, the required authorization will be submitted as soon as possible.

f. <u>Additional data for the Science Forefront system:</u>

1) Short abstract (up to 1500 characters in Hebrew and English).
2) Applicability (up to 1000 characters in Hebrew).
3) Adapting the research to the sub-themes defined in the call (up to 500 characters in Hebrew/English)
4) Principal Investigator Abroad- Regarding the Principal Investigator Abroad ,the Israeli PI should write TBD in the following fields first and last name, email, specialty, and other institution name. **Budget request** - enter the requested budget in ILS.

The budget of the researcher from abroad must be entered in a general way in the section designated for this purpose.

5) Do not add any additional documents beyond what is specified above and in the attached guidelines for submission to the Science Forefront system.

I. PROPOSALS REVIEW

MOST will establish a Scientific Committee, composed of 3-7 expert scientists from the academia ("The Committee"). The Committee will review the proposals, and in appropriate cases may pre-select proposals to be sent to external reviewers for evaluation. The Committee will evaluate the proposals and formulate recommendations as to which proposal will be funded. The Committee may confirm with the relevant personnel at ASI that a proposal is eligible for cooperation, specifically, in regard to the research topic, before making their final recommendations for funding. Only recommended projects and only projects that will be eligible for cooperation will be considered for funding.

The proposals will be evaluated based on the following criteria:

1. <u>Scientific level (20%)</u>: scientific and technological excellence, the scientific basis of research;
2. <u>Innovation (20%)</u>: the degree of innovation and originality of the proposed research in comparison to the state of the art;
3. <u>Methodology (20%)</u>: the extent to which the proposed method of conducting the research is qualitative, feasible and consistent with the proposed objectives;

4. Applicability potential (20%): the research contribution to the development of new applied scientific and technological advancement in the field;
5. Capability of the researcher and potential for bi-national cooperation (20%): based on the experience, previous achievements and skills of the researchers and level of collaboration and compatible skills of partners.

J. CONTRACTS, PAYMENTS AND REPORTS

1. **Contracts**:
   Upon approval of a particular project proposal, a contract will be signed in Israel, between MOST and the Affiliated Institution of the Israeli PI.
2. **Payments**:
   Payments will be made by MOST to the Affiliated Institution of the Principal Investigator, in keeping with the provisions of the contract referred to above, and according to MOST's regulations.
3. **Final reports**:
   Within three months of the conclusion of the project, Israeli PIs must submit a final report in English to MOST through the Science Forefront system at https://kf.most.gov.il. It should include a final scientific and financial report covering the work and cooperation carried out during the entire two-year project period, in accordance with the contract's requirements.
   The PI and Affiliated Institution are accountable to for the execution of the project.

K. MISCELLANEOUS PROVISIONS

1. It is strongly recommended that the Italian and Israeli research teams and their Institutions enter into an agreement regarding Intellectual Property rights from the output of the financed project prior to the commencement of the collaborative activities.
2. All procedures and activities under this Call or the projects approved hereinafter, including the eligibility of Affiliated Institutions via which applications must be filed and the eligibility of PI's and Associated-PI's, are subject to MOST Regulations and to MOST Standard Contract for Scientific Projects ("Standard Terms"). Additionally,

MOST reserves the right to take into account national security considerations when considering applications.

3. Applicants are required to familiarize themselves with the Standard Terms before filing an application under this Call. Filing an application constitutes a declaration that the applicant has done so and agrees to be bound by the Standard Terms' provisions thereof. Please note any updates made to the standard terms made before the final submission date will apply to proposals submitted to this Call.

L. ADDITIONAL INFORMATION

Additional information can be obtained as follows:

On administrative matters:

Israeli researchers should consult administrative matters directly with the Research Authority at their Affiliated Institution. The Institution will contact the Ministry in case of necessity.

On scientific matters:

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Appendix A

The central theme of the "EarTH Observation for the Early forecasT of Irrigation needS" (TETI) project established since November 2023 between ASI and the National Research Council of Italy - Institute for Electromagnetic Sensing of the Environment (CNR-IREA), has been supporting the sustainable use of water resources in agriculture while addressing weather-related challenges and the impacts of climate change.
TETI addressed a case study in a semi-arid area of the Puglia region (i.e. Tavoliere Pugliese, Foggia province, southern Italy; centre coordinates: LAT 41.464182°, LON 15.531827°), vulnerable to prolonged and severe droughts due to climate change. This trend poses significant risks to freshwater resources and agricultural productivity, especially in areas, such as the Mediterranean basin, known for its hot, dry climate and unpredictable rainfall patterns.

After 18 months of projects (November 2023-May 2025), TETI achieved full demonstration of the following satellite-based products:

- Crop rotations from optical data (e.g., Sentinel-2)
- Cumulative tillage change (ploughed or rolled) from Synthetic Aperture Radar (SAR) and optical data (e.g., Sentinel-1 and Sentinel-2) and parcel identification system (LPIS) (@~0.1 km)
- Soil surface moisture (SSM) from SAR Sentinel-1 / SAOCOM data (@~0.1 km)
- Irrigated area from high-resolution SSM SAR (@~0.1 km)
- NDVI from multi- or hyper-spectral optical data (Sentinel-2, PRISMA)
- LAI from optical data: Copernicus Land Monitoring Service (CLMS) product

By exploiting Hydrological (SWB) and crop (CM) modelling, as well as Artificial Intelligence (AI) models for the spatialization of weather and climate data, TETI proved that it is technically feasible to forecast irrigation needs:

- I: at an early stage (before crop seeding)
- II: at the beginning of the crop season

- III: during the crop season

For further reading about the TETI outcomes (and from previous ASI – CNR-IREA projects), as well as algorithms and models developed by CNR-IREA and partners, please refer to the following papers:

Balenzano, A., G. Satalino, F. P. Lovergine, A. D'Addabbo, D. Palmisano, R. Grassi, O. Ozalp, F. Mattia, D. Nafría García, V. Paredes Gómez, 2022, "Sentinel-1 and Sentinel-2 Data to Detect Irrigation Events: Riaza Irrigation District (Spain) Case Study", Water, 14 (19), art. no. 3046, DOI: https://doi.org/10.3390/w14193046.

G. Satalino, D. Palmisano, A. Balenzano, F. Lovergine, F. Mattia, F. Nutini, M. Boschetti, G. Verza, M. Rinaldi, S. Ruggieri, F. Ciavarella, C. Manganiello, V. P. Gómez, D. A. Nafría García, "Copernicus Sentinels for tillage change detection", Proc. of the 2024 IEEE International Geoscience and Remote Sensing Symposium, IGARSS 2024, July 7–12, 2024, Athens, Greece, pp. 1249-1252, DOI: https://doi.org/10.1109/IGARSS53475.2024.10641126.

Lovergine F.P., G. Satalino, D. Palmisano, A. Balenzano, F. Mattia, "Exploiting big geodata in the context of soil moisture retrieval on large areas: the case of the SMOSAR system and SMTools", 2nd Italian Conference on Big Data and Data Science, 11-13 September 2023, Naples, https://doi.org/10.1016/j.envsoft.2017.12.022.

F. Mattia, A. Balenzano, G. Satalino, F. P. Lovergine, A. D'Addabbo, D. Palmisano, R. Grassi, F. Nutini, M. Boschetti, G. Verza, M. Rinaldi, S. Ruggieri, A. P. De Santis, V. Paredes Gómez, D. A. Nafría García, D. Tapete, "Multi-Frequency Sar Data For Agriculture", Proc. of the IEEE 2022 Int. Geoscience and Remote Sensing Symposium, IGARSS 2022, July, 17-22, 2022, Kuala Lumpur, Malaysia, 2022, pp. 5176-5179, ISBN: 978-1-6654-2792-0, DOI: https://doi.org/10.1109/IGARSS46834.2022.9884627.

Palmisano, D., F. Mattia, A. Balenzano, G. Satalino, N. Pierdicca, A. Monti Guarnieri, "Sentinel-1 Sensitivity to Soil Moisture at High Incidence Angle and the Impact on Retrieval Over Seasonal Crops", IEEE Trans. on Geoscience and Remote Sensing, Vol. 59, Issue 9, pp. 7308-7321, Sept. 2021, Print ISSN: 0196-2892, Online ISSN: 1558-0644, DOI: https://doi.org/10.1109/TGRS.2020.3033887.

G. Satalino, A. Balenzano, F. Lovergine, C. Albertini, D. Palmisano, F. Mattia, S. Ruggieri, P. Garofalo, M. Rinaldi, V. Iacobellis, A. Gioia, D. Impedovo, L. Nardella, M. Di Cataldo, N. Noviello, R. Guarini, P. Sacco, M. Virelli, D. Tapete. "Earth observation for the early forecast of irrigation needs", Proc. of the 2024 IEEE International Geoscience and Remote Sensing Symposium, IGARSS 2024, July 7–12, 2024, in Athens, Greece, pp. 4912- 4915, ISBN: 979-8-3503-6032-5, DOI: https://doi.org/10.1109/IGARSS53475.2024.10642240.

M. Rinaldi, S. Ruggieri, F. Ciavarella, G. Satalino, D. Palmisano, A. Balenzano, C. Albertini, F. Lovergine, F. Mattia, V. Iacobellis, A. Gioia, D. Impedovo, L. Nardella, M. Di Cataldo, N. Noviello, R. Guarini, P. Sacco, M. Virelli, D. Tapete, P. Garofalo, "A crop model for large scale and early irrigation requirements estimation", Proc. of the 2024 IEEE International Geoscience and Remote Sensing Symposium, IGARSS 2024, July 7–12, 2024, Athens, Greece, pp. 2807- 2810, ISBN: 979-8-3503-6032-5, DOI: https://doi.org/10.1109/IGARSS53475.2024.10640683.

Vito Iacobellis and the THETIS team (Vito Iacobellis, Andrea Gioia, Vincenzo Totaro, Margherita Lombardo, Salvatore Manfreda, Ruodan Zhuang, Giuseppe Satalino, Anna Balenzano, Cinzia Albertini, Francesco Mattia, Francesco Lovergine, Davide Palmisano, Michele Rinaldi, Sergio Ruggieri, Pasquale Garofalo, Donato Impedovo, Nicoletta Noviello, Luigi Nardella, Michele Di Cataldo, Rocchina Guarini, Maria Virelli, Patrizia Sacco, Deodato Tapete). "Advancing Water Management in Water-Scarce Regions: A Collaborative Approach for Early Assessment of Irrigation Needs in the Capitanata Consortium (Apulia region)", EGU, Vienna - 14-19 April 2024, https://doi.org/10.5194/egusphere-egu24-18407.

V. Iacobellis, A. Gioia, V. Totaro, M. Lombardo, A. B. Izzaddin, S. Manfreda, R. Zhuang, G. Satalino, A. Balenzano, C. Albertini, F. Mattia, F. Lovergine, D. Palmisano, M. Rinaldi, S. Ruggieri, P. Garofalo, D. Impedovo, N. Noviello, L. Nardella, M. Di Cataldo, R. Guarini, M. Virelli, P. Sacco, D. Tapete. "*Advancing Sustainable Water Management in Southern Italy through Integrated Hydrological Modeling and Earth Observation*". Computational Science and Its Applications – ICCSA 2024 Workshops. Hanoi, Vietnam, July 1–4, 2024, Conference Proceedings, Part V (Paper), Part of the book series: Lecture Notes in Computer Science (LNCS,volume 14819), https://doi.org/10.1007/978-3-031-65282-0_14.

Vito Iacobellis, Andrea Gioia, Vincenzo Totaro, Margherita Lombardo, Aras Botan Izzaddin, Salvatore Manfreda, Ruodan Zhuang, Giuseppe Satalino, Anna Balenzano, Cinzia Albertini, Francesco Mattia, Francesco Lovergine, Davide Palmisano, Michele Rinaldi, Sergio Ruggieri, Pasquale Garofalo, Donato Impedovo, Nicoletta Noviello, Luigi Nardella, Michele Di Cataldo, Rocchina Guarini, Maria Virelli, Patrizia Sacco, Deodato Tapete. "*Sfide e opportunità nell'integrazione di modelli idrologici, colturali e dati satellitari per un efficace sistema di supporto alle decisioni in ambito irriguo*". Proceedings of the XXXIX Convegno Nazionale di Idraulica e Costruzioni Idrauliche (IDRA24), Parma September 2024, https://doi.org/10.1109/IHTC61819.2024.10855081.

D. Impedovo, V. Gattulli, L. Sarcinella, D. Veneto, G. Satalino, A. Balenzano, F. Lovergine, C. Albertini, D. Palmisano, F. Mattia, S. Ruggieri, P. Garofalo, M. Rinaldi, V. Iacobellis, A. Gioia, L. Nardella, M. Di Cataldo, N. Noviello, R. Guarini, P. Sacco, M. Virelli, D. Tapete. *A Novel Multi-Speed Dilated Convolutional Deep Neural Network Architecture for Meteorological Forecasting*. Submitted to the IHTC - IEEE International Conference on Humanitarian Technologies, 27-30 November 2024 – Bari – Italy, https://doi.org/10.1109/IHTC61819.2024.10855081.

Giuseppe Satalino and the THETIS team (G. Satalino, F. Mattia, A. Balenzano, F. Lovergine, C. Albertini, D. Palmisano, S. Ruggieri, P. Garofalo, L. Musti, M. Rinaldi, V. Iacobellis, A. Gioia, M. Lombardo, A. M. N. Martellotta, D. Impedovo, L. Sarcinella, D. Veneto, V. Gattulli, L. Nardella, M. Di Cataldo, N. Noviello, R. Guarini, P. Sacco, M. Virelli, D. Tapete). Leveraging Earth Observation for Accurate Early Forecasting of Irrigation Needs"; submitted to EGU, Vienna – 27-02 may 2025, https://doi.org/10.5194/egusphere-egu25-13700.

Michele Rinaldi and the THETIS team (Ruggieri, P. Garofalo, L. Musti, F. Ciavarella, G. Satalino, F. Mattia, A. Balenzano, F. Lovergine, C. Albertini, D. Palmisano, V. Iacobellis, A. Gioia, M. Lombardo, A.bM. N. Martellotta, D. Impedovo, L. Sarcineneto, V. Gattulli, L. Nardella, M. Di Cataldo, N. Novello, R. Guarini,, M. Virelli, D. Tapete). Estimation of Irrigation Needs by Monitoring Crop Rotations and Phenology of Tomato in Southern Italy, submitted to EGU, Vienna – 27-02 may 2025, https://doi.org/10.5194/egusphere-egu25-11983.

Vito Iacobellis and the THETIS (Vito Iacobellis, Andrea Gioia, Vincenzo Totaro, Margherita Lombardo, Salvatore Manfreda, Ruodan Zhuang, Giuseppe Satalino, Anna Balenzano, Cinzia Albertini, Francesco Mattia, Francesco Lovergine, Davide Palmisano, Michele Rinaldi, Sergio Ruggieri, Pasquale Garofalo, Donato Impedovo, Nicoletta Noviello, Luigi Nardella, Michele Di Cataldo, Rocchina Guarini, Maria Virelli, Patrizia Sacco, Deodato Tapete). Integrated soil moisture modelling in an agricultural river basin: preliminary results for the Fortore irrigation district pilot case study. Submitted to AGU, Washington – 9-13 December 2024, https://doi.org/10.5194/egusphere-egu24-18407.

Activities that ASI and CNR-IREA will run during TETI project extension (May 2025 – May 2027), also including a work package dedicated to Italo-Israeli scientific research cooperation

ASI and CNR-IREA will develop and demonstrate the feasibility and reliability of a multi-temporal monitoring of the geophysical parameters of agricultural areas through the generation of Earth Observation (EO) geospatial products according to the methodologies developed during the TETI project.
The activity will be undertaken in the Tavoliere Pugliese site. In addition, EO products will be generated by CNR-IREA and tested jointly with the Israeli academic/research body counterpart on a second Israeli Agricultural Site, as part of the bilateral cooperation between ASI and the Israel Space Agency (ISA).

The activities on the Italian side will be as follows:

- Continue the production of the geophysical variables retrieved from EO data using TETI methodologies over Tavoliere Pugliese, and extend them to the Israeli Agricultural Site.

  This activity will encompass:
  - Systematically pre-processing of time series of SAR (Sentinel-1, SAOCOM,) and optical (Sentinel-2) Level-1 data into stacks of co-registered products, ready for deriving Level-2 products of geophysical variables

- Use of in situ data to systematically assess Level-2 products (e.g., surface soil moisture)
- Production and systematic generation of Level-2 products

• Provide a quality analysis of Level-2 products derived over Tavoliere Pugliese and the Israeli Agricultural Site

• Consolidate and extend the systematic collection of in situ data over Tavoliere Pugliese:

- Upgrade the existing hydrologic network with new stations
- Continue the calibration activity, which involves periodic collection of soil samples around the stations using Kopecky rings and estimating their volumetric moisture content through the thermogravimetric method
- Automatically pre-process the data collected by the stations through quality checks following international standards
- Integrate the hydrologic network installed at Tavoliere Pugliese into the International Soil Moisture Network (ISMN) and adhere to the required standards.

- Complement the hydrologic network with survey activities to compile seasonal crop maps with land use information at Tavoliere Pugliese on:
  - Agriculture and irrigation management
  - Tillage activities

• Dissemination of in situ and EO data (both Level-1 and Level-2) by means of the TETI WEBGIS platform. This platform will also serve as a product/data inter-exchange and demonstration platform for the joint research activity on the Israeli Agricultural Site.

Pending ISA's communication of the Israeli academic/research body counterpart that will undertake the joint research activity with CNR-IREA, here below the activities that relate the joint research are reported:

- CNR-IREA will search and download EO SAR and optical data covering Tavoliere Pugliese and the Israeli Agricultural Site.

Important point:

Regarding the SAR data collected by SAOCOM, this activity will be managed under ASI's coordination, in compliance with the data policies in force of the SAOCOM mission, in relation to the envisaged project activities, the progress of the aforementioned activities and the availability guaranteed by the satellite mission.

ASI requests ISA that the Israeli Agricultural Site satisfies the below technical requirements and that the spatial extent will be sufficient enough to encompass a suitable number of fields. Particular care should be paid in the spatial extent and location of the chosen site. As soon as candidate sites are known from the proposals received in response to ISA tender, it would be really important that ISA could share this information with ASI in order to verify, **in advance of the final selection of the winning Israeli research proposal**, the feasibility of SAOCOM data collection over the proposed Israeli Agricultural Site candidate.

If in the framework of the ASI – ISA bilateral cooperation, ISA is able and wish to share any ISA or partner's EO data, there is ASI and CNR-IREA's availability to discuss and agree the conduction of experiments for TETI products generation using such EO data that will be accessed through the ASI – ISA cooperation.

In general, pending the finalization of the definition of the Israeli Agricultural Site and the related technical-scientific activities, at this stage the research activities are expected to include:

- Identification of the Israeli Agricultural Site, jointly between ASI, ISA, the Israeli academic/research body counterpart and CNR-IREA.

  In this respect, in order to ensure that the full portfolio of TETI products can be generated over the Israeli Agricultural Site with the best spatial resolution, the

Israeli Agricultural Site and the data covering it must comply with the requirements reported below.

Technical requirements that ASI suggest ISA to account for in the preparation of the tender, so the Israeli applicants know what is required in order to perform the joint activity with the Italian counterpart

The surface soil moisture (SSM) product, derived from dense time series of satellite SAR data with an approximate resolution of 100 meters, marks an advancement over the existing 1 km resolution product developed by CNR-IREA (Balenzano et al., 2021; https://doi.org/10.1016/j.rse.2021.112554). While the 1 km product has been extensively validated against in situ observations, the newer 100 m version remains under evaluation and may require further refinements. To effectively assess its performance, long-term time series of SAR and in situ data collected from well-documented sites are crucial.

Below is a summary of the key requirements for Earth Observation (EO) and in situ data necessary to produce and evaluate SSM maps at 100 m resolution for the Israeli and Italian Agricultural Sites. These requirements are divided into two categories: historical data (existing) and forthcoming data from May 2025 to May 2027.

Key Requirements

1. Site Extent, Field Size and hydrologic network

- The Israeli Agricultural Site should span approximately 150–200 km², with average agricultural field sizes of about 4-5 hectares.
- A hydrologic network of ground stations measuring SSM at various depths should be established at least two years prior to the project's start.
- The site should have coverage from Sentinel-1 and Sentinel-2 satellites, and potentially SAOCOM, with minimal radiometric interference expected.

2. Historical Data (Minimum of Two Preceding Years)

Seasonal Land Use

- Comprehensive information is required on winter and summer crops, including their phenological status and agronomic calendars (e.g., sowing and harvest dates) for 500–800 fields larger than 5 hectares.
- Data should be provided in georeferenced shapefiles with parcel boundaries and accompanying attribute tables.

Tillage and Irrigation Events

- A dataset documenting 200–300 tillage events should include details such as parcel locations, tillage types (e.g., ploughed or rolled), row direction and depth, and event dates.
- Another dataset on irrigation practices for 200–300 fields must specify crop types, irrigation methods, start and end dates, and water consumption.

Calibrated Soil Moisture Measurements

- Continuous soil moisture measurements over two years are required, collected by a network of ground stations with probes at depths of 5 cm, 10 cm, and 20 cm. Station density should be at least 5 stations per km², with a minimum of 10 stations.
- Monthly calibration should be performed using Kopecky rings (three 5 cm rings and three 10 cm rings per station) to estimate volumetric moisture content via the thermogravimetric method.

Ancillary Data

- High-resolution soil texture maps and meteorological data (e.g., precipitation and air temperature) with intervals of 15–30 minutes are essential.

3. Forthcoming Data (May 2025 to May 2027)

- Maintain the quality and detail of land use data at a level equal to or better than that of the previous two years.
- Improve the Soil Sensor Network by increasing the total number of monitoring stations to 20–30, achieving a density of 5-7 stations in areas of 300 m x 300 m. Sub-micro networks may be organized to meet these density targets.
- Calibration should continue systematically using Kopecky rings and the thermogravimetric method.

If the above technical requirements are satisfied, the SSM product at 100 m spatial resolution and the irrigated areas maps can be produced by CNR-IREA over Israeli Agricultural Site.

If the above technical requirements are not satisfied, CNR-IREA will generate 1 km SSM product only.

The provision of the maps of the tilled fields, either ploughed and/or rolled soils, is also subject to the availability of data for validation.

• Collection and provision of ground data on soil moisture, through the installation of measuring stations and/or use of data from existing networks – this activity over the Israeli Agricultural Site must be carried out by the Israeli counterpart;

• Conducting periodic surveys of the type, state and management of crops in relation to land use, soil tillage and irrigation management – this activity over the Israeli Agricultural Site must be carried out by the Israeli counterpart;

• Assessment of the nature and quality of the ground data provided by the Israeli counterpart for the Israeli Agricultural Site – this activity will be undertaken by CNR-IREA;

• Provision of thematic maps derived from EO data – this activity will be undertaken by CNR-IREA, with spatial resolution conditions depending on the nature and quality of the ground data provided by the Israeli counterpart – see above requirements;

• Integrated analysis of thematic maps derived from EO data and ground data – joint activity between ASI, CNR-IREA, ISA and the Israeli academic counterpart;

• Exchange of results within the bilateral cooperation ASI – ISA – joint activity between ASI, CNR-IREA, ISA and the Israeli academic counterpart;

• Dissemination and publication activities as input to WP 1600 – joint activity between ASI, CNR-IREA, ISA and the Israeli academic counterpart.

The description of the work package will be updated once the Israeli academic and research counterpart is known and once the Israeli Agricultural Site has been identified and its nature and quality of ground data are known.

This update will take into account any further methodological and/or analytical contributions not currently foreseeable that may be provided by the Israeli counterpart (e.g. hydraulic modelling).