User Guide for Solar Orbiter / Metis Investigation
Data Products and Publication Policy
for the Metis Team

Version 1.2 — July 17, 2021

This document is developed and updated by the Metis team to provide a reference guide for users of Metis data. This is a “living document” that will be updated as necessary, such as when new data products are developed.

1 Introduction

1.1 Overview of Metis

The Metis instrument aboard Solar Orbiter spacecraft is an externally occulted coronagraph designed to take images of the solar corona in two channels: VL linearly polarized broadband (580-640 nm) and UV narrowband HI Ly-α (121.6 nm). The telescope FoV covers the full corona from 1.6^{o} to 2.9^{o} from disk center.
The primary data products are UV images, VL polarized brightness (pB) images, VL total brightness (tB) images, and VL fixed polarization (FP) images. Secondary data products are low latency UV and VL images, VL light curves and cosmic ray log matrices.
These data will provide direct and indirect estimates of electrons and Hydrogen coronal densities and their fluctuations, solar wind velocities, high cadence imaging of the evolution of coronal transients, and the F-corona. Additional targets observed for scientific and calibration purposes include planets, comets, and stars.
The current baseline for all RS Solar Orbiter instruments, including Metis, is to observe inside Remote-Sensing dedicated windows with the exception of specific targets of opportunities, such as UV stars, comets or special reciprocal positions with other spacecraft (conjunctions, quadratures, etc.).
Metis will also run a synoptic program (TBD) throughout most of Solar Orbiter orbit.
The data product availability will start during the Nominal Mission Phase (NMP).
The planning for the operations takes place with the following steps:

- Mission Level Planning (MLP): planning of a full orbit at science level, performed 6 months in advance during Science Working Team meetings (SWT)
- Long Term Planning (LTP): detailed science planning for three months intervals, performed three months in advance during Science Operation Working Group meetings (SOWG)
- Short Term Planning (STP): sequences to be uploaded (Instrument Observation Request – IOR), performed three weeks ahead of observations start
- Very Short Term Planning (VSTP): final adjustments with no impact on budgets, performed a few days before the observations start.

1.2 Data Providers and contact information

The PI coordinates the Metis Team, composed of the Co-PIs, Co-Is, associate scientists and key persons, with knowledge of the instrument and expertise in operations planning.
The Metis team develops the observing program and prepares the resulting commands; it meets weekly to discuss and develop the observing program for each orbit according to the scientific plan devised during the SWT.
Metis co-investigators lead topical teams (see Appendix A) to coordinate data analysis and suggest science planning relative to specific topics.

Questions regarding the use or interpretation of these data may be directed to the individuals listed below.

Marco Romoli (marco.romoli@unifi.it)	Principal Investigator (PI)
Giampiero Naletto (giampiero.naletto@unipd.it)	Experiment Manager
Silvano Fineschi (silvano.fineschi@inaf.it)	Experiment Scientist
Gianalfredo Nicolini (gianalfredo.nicolini@inaf.it)	Instrument Scientist
Vincenzo Andretta (vincenzo.andretta@inaf.it)	Operations Scientist
Daniele Spadaro (daniele.spadaro@inaf.it)	Scientific Team Coordinator
Ester Antonucci (ester.antonucci@inaf.it)	Retired Metis PI

1.3 Data Use Policy

The Metis data are made available freely and without restrictions to all parties and for all purposes after three months from the science telemetry download. This is fully consistent with ESA's open data policy.

As part of the development of collaboration with the broader solar and heliophysics community, however, Metis mission has defined some rules to govern how Metis instrument data should be used.

The rules will apply starting from the beginning of the Nominal Mission Phase (NMP).

First result publication and relevant «first» publications related, for example, to first minimum perihelion (4/2022 @0.32AU) and first high heliolatitude (2/2027 -25 deg) shall have the PI as a first author, the contributors, the Metis Core Team (see Appendix B) and Co-Is (see

Appendix C) as co-authors, and acknowledgments as given in Appendix D.
A provisional list of “first” and “relevant” publications with authorship policy is given in Appendix E.

It is requested that Metis team scientists adhere to the following guidelines:

1. First Publications of each topical team should include the Metis Core Team as co-authors and acknowledgments provided in Appendix C.

2. The PI requests that all publications using Metis data should:
   - be sent to the PI after submission to keep record of Metis publications
   - acknowledge the sources of data used in all publications, presentations, and reports by mentioning the correct DOI of the dataset used in the paper
   - add to the acknowledgments the text given in Appendix D
   - include for the first year of the NMP the PO and the operation team (as defined in Appendix C for each LTP) in the list of authors
   - cite the instrument paper (Antonucci et al., A&A, 2019)

3. In case of any doubt about the instrument, users are encouraged to consult with the PI to discuss the appropriate use of instrument data or model. Metis team should facilitate this process, serving as the contact point between PI and users in most cases.
4. Low latency data are not intended for science analysis or publication and should not be used for this purpose.

1.4 File naming conventions and FITS header definition

All Metis image data are in the FITS file format.
FITS naming convention is described in SOL-SGS-TN-0009 *Metadata Standard*.

The FITS image file contains an ASCII header followed by the binary image data. The header consists of keywords followed by the value. The content of the header is described in the document METIS-OATO-SPE-021 *Metis Data Product Description Document.*

1.5 Revision Management

The data product version number (VX in the FITS file name) indicates how many times the product has been generated. Modifications to processing software, changes to calibration or other input files, and header (metadata) changes are all examples that would cause the version number to increase. Data entry errors, transmission problems or other types of failures may also cause a product to be re-released and thus have the data product version number incremented. The data product version is tracked by the VERSION keyword in the FITS header and also indicated in the filename. Version zero (V0) in the filename indicates a quick-look data product; it’s VERSION number in the header may increment but the quick-look filename will not change.

2 Accessing the Data

2.1 Universal access from anywhere

Three months after the data from an orbit are downlinked to the ground, they are released to the public and are available through the Solar Orbiter SOAR (http://soar.esac.esa.int/soar).

2.2 Data Formats/Products

Metis is making several data products available:

Level 0: uncalibrated data (units of DN) obtained from telemetry packets, that are decompressed and formatted in standard FITS format. (The metadata contain only the information that is available from the telemetry packet headers.)
Level 1: uncalibrated data (units of DN). (The metadata contain extra engineering data from housekeeping telemetry packets and scientific coordinate systems (WCS) keywords.)
Level 2: calibrated data (physical units). (Corrections for bias, dark current, flat-field, and vignetting, exposure normalisation, pointing, and radiometric calibration are applied). They consist of primary science data: UV images; VL Stokes parameters, total/polarised-brightness images, polarisation angle/fraction and secondary science data: light curves and cosmic ray log matrix..
All the available orbital and attitude information is used and coordinates expressed in scientific coordinate systems (WCS).
Level 3: science data derived from L2 data, (Movies, Carrington maps; and data obtained after scientific analysis, i.e., electron-density maps, solar-wind outflow velocity maps.)

Level 2 data release is made public and will start within the beginning of the NMP (> Nov 2021). Level 0 and 1 data will be available upon request.

In most circumstances, we recommend use of the Level-2 or Level-3 data products for essentially all scientific analyses, both qualitative and quantitative.

2.3 Computer setup

The FITS image files conform to the CCSDS standard, and so are readable through many different systems. The traditional system for us has been the Interactive Data Language (IDL). If using IDL, make sure to compile the appropriate Solarsoft libraries. Information on solarsoft is available at https://sohowww.nascom.nasa.gov/solarsoft/. Python is also a capability that can be used. There are also two stand-alone applications that are very useful for viewing FITS images, DS9 and Jhelioviewer.

2.3.1 IDL

To read and process Metis images, use the IDL procedures in the Metis tree in the Solarsoft directory.

2.3.2 Python

The Astropy Python library contains a suite of procedures that can be used to read, analyze, and visualize Metis images. Numerous tutorials, documentation, and code examples can be found on the Learn.Astropy website, located at https://learn.astropy.org.
In addition to that, SunPy is the community-developed, free and open-source solar data

analysis environment for Python (https://sunpy.org).
A Metis package will be made available to be included in the SunPy library.

2.3.3 JHelioviewer

A useful tool for visualizing solar images of various types is JHelioviewer. It also a free, standalone application. For more information visit their website http://www.jhelioviewer.org. It is particularly useful for combining images of different spatial coverage such as EUV or magnetogram images of the solar disk with coronal imagery.

2.3.4 SAO Image DS9

Another useful tool to view the FITS files in a standalone mode, SAO Image DS9 is a very useful tool. Download instructions and the user manual are available at https://sites.google.com/cfa.harvard.edu/saoimageds9. It is a general astronomical imaging and data visualization application. DS9 is a free, stand-alone application supporting FITS images and binary tables, multiple frame buffers, etc. You can manipulate the images by zooming and changing the color table and see the FITS header.

3 List of acronyms

ASI	Italian Space Agency
AU	Astronomical Unit – the mean distance of the Earth from the Sun
ESA	European Space Agency
ESAC	European Space Astronomy Centre
ESOC	European Space Operations Centre
F-corona	Fraunhofer Corona – scattering of photospheric light by dust
FITS	Flexible Image Transport System
FOV	Field of View
FSW	Flight SoftWare
HGA	High Gain Antenna
IDL	Interactive Data Language
INAF	National Institute for Astrophysics, Italy
IOR	Instrument Observation Request
JH	JHelioviewer
K-corona	Kontinuerlich Corona – scattering of photospheric light by electrons
L1, L2, L3	Data Processing Levels
LTP	Long Term Planning
MLP	Mission Level Planning
MOC	Mission Operations Center (at ESOC)
MPPU	Metis Power and Processing Unit
NMP	Nominal Mission Phase
NASA	National Aeronautics and Space Administration
OBSW	On board Software
OBT	On Board Time
OS	Operative System
PI	Principal Investigator
PO	Project Office
RS	Remote Sensing
RSW	Remote Sensing Window
S/C	Spacecraft
SOC	Spacecraft Operations Center (at ESAC)
STP	Short Term Planning
VO	Virtual Observatory
VSO	Virtual Solar Observatory
VSTP	Very Short Term Planning
WCS	World Coordinate System

Appendix A – Metis Topical Teams

- TT1 - Wind diagnostics (R. Susino, INAF-OATO, Italy)
  - Electron density #(and electron temperature) (S. Fineschi, INAF-OATO, Italy)
  - Hydrogen density (J.C. Vial, IAS, France)
  - Wind velocity #with Doppler dimming (R. Susino, INAF-OATO, Italy)
- TT2 - F-corona (F. Landini, INAF-OATO, Italy)
- TT3 - Combined synoptics (L. Teriaca, MPS, Germany)
- TT4 - Helium Diagnostics (V. Andretta, INAF-OACn, Naples, Italy)
- TT5 - Image enhancements (F. Frassetto, CNR/IFN, Padua, Italy)
- TT6 - Solar Wind (D. Telloni, INAF-OATO, Italy)
- TT7 - Large scale magnetic configuration and evolution, Streamers and pseudo-streamers (L. Strachan, NRL, USA)
- TT8 - CMEs, prominence eruptions and blobs (P. Heinzel, AIAS, Czech Republic)
- TT9 - Coronal shocks, particle acceleration (G. Zimbardo, UniCal, Italy)
- TT10 - Plasma density fluctuations and waves (G. Nisticò, UniCal, Italy)
- TT11 - Flux emergence, magnetic field reconnection, coronal heating, flares (F. Reale, UniPa, Italy)
- TT12 - Modelling of CME propagation/evolution in corona and solar wind in connection with space weather (A. Bemporad, INAF-OATO, Italy)
- TT13 - Cosmic Rays (C. Grimani, UniUrb, Italy)
- TT14 - Sun grazing comets and other solar system bodies (V. Da Deppo, CNR/IFN, Padua, Italy)

Appendix B – Metis Core Team and Operations Team

Project Office (PO), Co-PIs

Marco Romoli	PI	Dip. di Fisica e Astronomia, Università di Firenze Via Sansone 1, 50019, Sesto Fiorentino (FI), Italy
Vincenzo Andretta	Operations Scientist	INAF – Osservatorio Astronomico di Capodimonte Salita Moiarello 16, 80131, Napoli, Italy
Ester Antonucci	Former PI	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Vania Da Deppo	Optics Scientist	CNR – IFN Via Trasea 7, 35131 Padova, Italy
Silvano Fineschi	Experiment Scientist	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Petr Heinzel	Co-PI	Academy of Science of the Czech Republic Fričova 298, 251 65 Ondřejov
Daniel Moses	Co-I	NASA Headquarters, Washington DC 20546-0001, USA
Giampiero Naletto	Experiment Manager	Dip. di Fisica e Astronomia, Università di Padova, Via F. Marzolo, 8 - 35131 Padova, Italy
Gianalfredo Nicolini	Instrument Scientist	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Daniele Spadaro	Scientific Team Coordinator	INAF – Osservatorio Astrofisico di Catania, Via Santa Sofia 78, 95123 Catania, Italy
Marco Stangalini	ASI Project Manager	ASI Via del Politecnico, 00133 Roma, Italy
Luca Teriaca	Co-PI	Max Planck Institute for Solar System Research, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany

Co-Is, Associate Scientists, and Key Persons

Alessandro Bemporad	Co-I	alessandro.bemporad@inaf.it INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Gerardo Capobianco	Associated Scientist	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Giuseppe Capuano	Associated Scientist	Dip. di Fisica e Astronomia, Università di Catania, Via S. Sofia 64, 95123 Catania, Italy
Chiara Casini	Associated Scientist	CNR – IFN Via Trasea 7, 35131 Padova, Italy
Marta Casti	Associated Scientist	Catholic University @ NASA – GSFC, Maryland, USA
Paolo Chioetto	Associated Scientist	CNR – IFN Via Trasea 7, 35131 Padova, Italy
Alain Jody Corso	Associated Scientist	CNR – IFN Via Trasea 7, 35131 Padova, Italy
Yara De Leo	Associated Scientist	Max Planck Institute for Solar System Research, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany and Dip. di Fisica e Astronomia, Università di Catania
Michele Fabi	Key Person	Dip. di Scienze Pure e Applicate, Università di Urbino, Via Santa Chiara, 27, 61029 Urbino, Italy
Federica Frassati	Associated Scientist	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Fabio Frassetto	Co-I	CNR – IFN Via Trasea 7, 35131 Padova, Italy
Silvio Giordano	Associated	INAF – Osservatorio Astrofisico di Torino

	Scientist	Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Catia Grimani	Co-I	Dip. di Scienze Pure e Applicate, Università di Urbino, Via Santa Chiara, 27, 61029 Urbino, Italy
Salvo Guglielmino	Associated Scientist	INAF – Osservatorio Astrofisico di Catania, Via Santa Sofia 78, 95123 Catania, Italy
Giovanna Jerse	Associated Scientist	INAF – Osservatorio Astronomico di Trieste, Via G.B. Tiepolo 11, 34143 Trieste, Italy
Federico Landini	Co-I	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Alessandro Liberatore	Associated Scientist	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Enrico Magli	Co-I	Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129 Torino, Italy
Giuseppe Massone	Co-I	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Mauro Messerotti	Co-I	INAF – Osservatorio Astronomico di Trieste, Via G.B. Tiepolo 11, 34143 Trieste, Italy
Maurizio Pancrazzi	Co-I	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Maria G. Pelizzo	Co-I	CNR-IEIIT via Gradenigo 6/B - 35131 Padova, Italy
Paolo Romano	Associated Scientist	INAF – Osservatorio Astrofisico di Catania, Via Santa Sofia 78, 95123 Catania, Italy
Clementina Sasso	Co-I	INAF – Osservatorio Astronomico di Capodimonte Salita Moiarello 16, 80131, Napoli, Italy
Udo Schühle	Co-I	Max Planck Institute for Solar System Research, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany
Thomas Straus	Co-I	INAF – Osservatorio Astronomico di Capodimonte Salita Moiarello 16, 80131, Napoli, Italy
Roberto Susino	Co-I	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Daniele Telloni	Co-I	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Michela Uslenghi	Co-I	INAF – IASF Milano, Via Alfonso Corti 12, 20133 Milano, Italy
Cosimo A. Volpicelli	Key Person	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Luca Zangrilli	Associated Scientist	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Paola Zuppella	Co-I	CNR – IFN Via Trasea 7, 35131 Padova, Italy

Operations Team:
The operations team includes, for each RSW, the planners and the data validators, and are listed below:

LTP period	Long term planning	Short term planning / IOR writing	IOR validation	Data verification and validation
LTP01 (June 2020)	Andretta Spadaro	Sasso Susino	Nicolini Pancrazzi	(Andretta Sasso Susino)
LTP02 (July-December 2020)	Andretta Spadaro	Sasso Susino Landini (in training)	Nicolini Pancrazzi	(Andretta Sasso Susino)
LTP03 (January-June 2021)	Andretta Spadaro	Landini Sasso Susino Jerse (in training) Slemer (in training)	Nicolini Pancrazzi	(Andretta Landini Sasso Susino Jerse)
LTP04 (July-September 2021)	Andretta Spadaro	Landini Jerse Frassati (in training)	Nicolini Pancrazzi	To be assigned
LTP05 (October-December 2021)	Andretta Spadaro			

Appendix C – Metis Co-Is

Lucia Abbo	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Vincenzo Andretta	INAF – Osservatorio Astronomico di Capodimonte Salita Moiarello 16, 80131, Napoli, Italy
Ester Antonucci	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Frédéric Auchère	Institut d'Astrophysique Spatiale, Centre universitaire d'Orsay, 91405 Orsay, France
Regina Aznar Cuadrado	Max Planck Institute for Solar System Research, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany
Alessandro Bemporad	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Arcadiusz Berlicki	University of Wroclaw, Astronomical Institute Kopernika 11, 51-622 Wroclaw, Poland
Roberto Bruno	INAF-IFSI Roma Via Fosso del Cavaliere 133, 00133 Roma, Italy
Angela Ciaravella	INAF - Osservatorio Astronomico di Palermo Piazza del Parlamento 1, 90134 Palermo, Italy
Vania Da Deppo	CNR – IFN Via Trasea 7, 35131 Padova, Italy
Raffaella D'Amicis	INAF-IFSI Roma Via Fosso del Cavaliere 133, 00133 Roma, Italy
Silvano Fineschi	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Fabio Frassetto	CNR – IFN Via Trasea 7, 35131 Padova, Italy
Catia Grimani	Dip. di Scienze Pure e Applicate, Università di Urbino, Via Santa Chiara, 27, 61029 Urbino, Italy
Philippe Lamy	LATMOS, CNRS & UVSQ, 11 Bd d'Alembert, 78280 Guyancourt, France
Federico Landini	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Alessandro Lanzafame	INAF – Osservatorio Astrofisico di Catania, Via Santa Sofia 78, 95123 Catania, Italy
Marco Malvezzi	Dipartimento di Fisica, Università degli Studi di Pavia Via Bassi, 6 - 27100 Pavia - Italy
Giuseppe Massone	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Mauro Messerotti	INAF – Osservatorio Astronomico di Trieste, Via G.B. Tiepolo 11, 34143 Trieste, Italy
Daniel Moses	NASA Headquarters, Washington DC 20546-0001, USA
Giampiero Naletto	Dip. di Fisica e Astronomia, Università di Padova, Via F. Marzolo, 8 - 35131 Padova, Italy
Gianalfredo Nicolini	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Piergiorgio Nicolosi	Dip. di Fisica e Astronomia, Università di Padova, Via F. Marzolo, 8 - 35131 Padova, Italy
Giuseppe Nisticò	Dip. di Fisica, Università della Calabria via Pietro Bucci, 87036 Arcavacata di Rende (CS), Italy
Maurizio Pancrazzi	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Maria G. Pelizzo	CNR-IEIIT via Gradenigo 6/B - 35131 Padova, Italy

Hardi Peter	Max Planck Institute for Solar System Research, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany
Fabio Reale	Dip. di Fisica e Chimica, Università di Palermo Piazza del Parlamento 1, 90134 Palermo, Italy
Clementina Sasso	INAF – Osservatorio Astronomico di Capodimonte Salita Moiarello 16, 80131, Napoli, Italy
Udo Schühle	Max Planck Institute for Solar System Research, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany
Sami Solanki	Max Planck Institute for Solar System Research, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany
Daniele Spadaro	INAF – Osservatorio Astrofisico di Catania, Via Santa Sofia 78, 95123 Catania, Italy
Marco Stangalini	ASI Via del Politecnico, 00133 Roma, Italy
Leonard Strachan	U.S. Naval Research Laboratory, 4555 Overlook Ave., SW Washington, DC 20375, USA
Thomas Straus	INAF – Osservatorio Astronomico di Capodimonte Salita Moiarello 16, 80131, Napoli, Italy
Roberto Susino	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Daniele Telloni	INAF – Osservatorio Astrofisico di Torino Via Osservatorio 20, 10025 Pino Torinese (TO), Italy
Giuseppe Tondello	Dip. di Fisica e Astronomia, Università di Padova, Via F. Marzolo, 8 - 35131 Padova, Italy
Kanaris Tsinganos	Department of Physics, University of Athens Panepistimiopolis, Zografos, 157 84 Athens, Greece
Michela Uslenghi	INAF – IASF Milano, Via Alfonso Corti 12, 20133 Milano, Italy
Marco Velli	UCLA 6697 Geology, Los Angeles, CA 90095, USA
Rita Ventura	INAF – Osservatorio Astrofisico di Catania, Via Santa Sofia 78, 95123 Catania, Italy
Jean-Claude Vial	CNRS-Université Paris-Sud, Université Paris-Saclay Rue Jean-Dominique Cassini, 91405 Orsay, France
Joachim Woch	Max Planck Institute for Solar System Research, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany
Gaetano Zimbardo	Dip. di Fisica, Università della Calabria via Pietro Bucci, 87036 Arcavacata di Rende (CS), Italy
Paola Zuppella	CNR – IFN Via Trasea 7, 35131 Padova, Italy

Appendix D - Acknowledgments

Long form for Acknowledgements:
Solar Orbiter is a space mission of international collaboration between ESA and NASA, operated by ESA. The Metis program is supported by the Italian Space Agency (ASI) under the contracts to the National Institute of Astrophysics (INAF): Accordi ASI-INAF N. I-043-10-0 and Addendum N. I-013-12-0/1, Accordo ASI-INAF N.2018-30-HH.0 and under the contracts to the industrial partners OHB Italia SpA, Thales Alenia Space Italia SpA and ALTEC: ASI-TASI N. I-037-11-0 and ASI-ATI N. 2013-057-I.0. Metis was built with hardware contributions from Germany (Bundesministerium für Wirtschaft und Energie (BMWi) through the Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)), from the Czech Republic (PRODEX) and from ESA.

In case Ester Antonucci is not in the list of authors add:
Metis team thanks the former PI, Ester Antonucci, for leading the development of Metis until the final delivery to ESA.

Short version for Science papers:
Solar Orbiter is a space mission of international collaboration between ESA and NASA, operated by ESA. Metis was built and operated with funding from the Italian Space Agency, under contracts to the National Institute of Astrophysics (INAF) and industrial partners. Metis was built with hardware contributions from Germany (Bundesministerium für Wirtschaft und Energie through DLR), from the Czech Republic (PRODEX) and from ESA.

Appendix E – Temptative list of most relevant publications

“First” Metis papers include all names (Co-Is included)
First light (Solar Orbiter First results Issue 1)
First result (end of 2021)
First perihelion (25/3/22 0.32, mid 2022)
First out-of-ecliptic (2025)

Author list: PI, paper authors, Metis Core Team + full list of Co-Is
Long form for acknowledgments (Appendix D)

Instrument calibration papers (lead by a Team member)
On-ground calibrations
In-flight calibrations

Author list: paper authors, Metis Core Team
Long form for acknowledgments (Appendix D)

Relevant first Proceedings (lead by a Team member)

Author list: paper authors, Metis Core Team
Short form for acknowledgments (Appendix D)

First TT papers

Author list: TT Leader, paper authors, Metis Core Team
Long form for acknowledgments (Appendix D)

Science papers

Author list: Paper authors, (Metis Operations Team – see Appendix C)
Short form for acknowledgments (Appendix D)

Instrument papers

Author list: Paper authors
Short form for acknowledgments (Appendix D)