JMMC: A SERVICE FOR CURRENT & FUTURE OPTICAL INTERFEROMETERS

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Abstract.   The Jean-Marie Mariotti Center (JMMC[*]) is the "Pôle Thématique National" for optical interferometric data. It develops software to facilitate the use of optical interferometers open to the comunity and thus helps maximize the exploitation of their current instruments (*e.g.* PIONIER, MATISSE and GRAVITY on the VLTI or SPICA, MIRCX-MYSTIC on CHARA) and prepare for the arrival of future instruments or instrumental modes (*e.g.* GRAVITY+, ASGARD). Alongside the delivery of the tools, it provides a "face to face" user support. It coordinates therefore the activities of two "Services Nationaux d'Observation": the AANO5-MOIO "Méthodes et Outils pour l'Interférométrie Optique" and the AANO3-SUV "Support pour les Utilisateurs du VLTI".

The poster, accessible from the JMMC document database[†], presents the main software tools needed to prepare observations, analyse the reduced interferometric data and finally archive them on a database. All tools take advantage of interoperability using the Virtual Observatory standards and protocols, which is an important feature and strength of JMMC developments. Alongside these developments, the JMMC participates in promoting optical interferometry in general. It also manages an interactive database of refereed publications in the field referenced in ADS.

Keywords: optical interferometry, database, virtual observatory

1   JMMC in brief

Optical interferometers have become essential means of advancing our knowledge in many astrophysical fields, from stellar physics to planet formation or galactic centers, by enabling high-angular resolution imaging and modelling that exceeds the capabilities of current single telescopes. However they do imply a conceptual and observational complexity that needs to be overcome. Since its inception in 2000, the JMMC focused its activities on helping astronomers handle these difficulties.

It aims to coordinate the efforts of the French Observatories involved in optical interferometry (OI), namely Grenoble, Lyon, Paris-Meudon and Côte d'Azur Observatories, to offer the best operational environment for the community using the VLTI/ESO and CHARA/GSU instruments. Its mission is multi-faceted: it develops and maintains software needed to operate the OI instruments (Sec. 2); it offers "face to face" user support throughout all the steps involved; it plays an active role in training, co-organizing interferometry schools and producing teaching materials such as video tutorials and finally, it can support the prospective development of new OI instruments, providing simulated data to facilitate their design and estimate future performances.

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[†] https://www.jmmc.fr/doc/approved/JMMC-POS-2100-0003.pdf

2 Software Suite and Key Services

JMMC 's software suite is designed to meet the diverse needs of OI users. The user-friendly tools cover the entire lifecycle of observational data, from preparation to archiving, visualization and analysis. Key tools include:

- **Aspro2**: a scheduling and observation preparation tool that simulates observations considering instrumental and atmospheric parameters. It supports adaptive optics (AO) and fringe tracking (FT) for the GRAVITY+ instrument.
- **SearchCal** (Chelli et al. 2016): a tool for calibrator star selection, using data from the JSDC2 catalog, and soon integrating the JSDC3, which includes GAIA DR3 data.
- **SearchFTT**: specifically designed for GRAVITY-wide and GRAVITY+ instruments, this tool helps users select stars for fringe tracking and adaptive optics systems, optimizing the observation process.
- **AMHRA** (https://amhra.oca.eu/): a website offering a library of astrophysical models, and allowing users to simulate interferometric data at the spatial frequencies of the real data.
- **OIFits Explorer**: a visualization tool that enables dynamic data exploration and filtering across multiple dimensions, such as wavelength and spatial frequency.
- **LITpro** (Tallon-Bosc et al. 2008): a model-fitting tool, requiring no coding. Building combinable analytical models and exploring parameter space are offered through a graphical interface.
- **OImaging** (Soulez et al. 2022): a tool for image reconstruction, requiring no coding and offering four different reconstruction algorithms through a graphical interface. Visualizing the "beam" on the reconstructed image and comparing reconstructed images using proven metrics are offered as part of open developments on github.
- **OiDB** (Haubois et al. 2014): an archive for calibrated OI data. This service allows users to query and store their own observational data. Future enhancements aim to ingest more data, improve the user interface and provide permanent DOI referencing for published datasets.

3 Visibility

JMMC 's impact on the OI community is evidenced by the widespread use of its tools and the large number of publications that reference them. Around 70% of refereed OI articles published annually over the past decade cite JMMC tools. Impact is also measured by counting distinct IP accesses to the various software tools, with Aspro2 being the leading one, a number that increases sharply during specialist training schools, highlighting the synergy between JMMC 's educational efforts and the development of its software tools.

JMMC also actively maintains the OLBIN database, which brings together all OI articles published in ADS, ensuring that researchers have access to complete, up-to-date literature.

To carry out all its activities, the JMMC has an average of 3.5 FTE per year, including 1.6 FTE engineers, and a dozen of researchers, all people working at part-time. It also benefits from constructive exchanges and collaborations within the OI community.

If the JMMC provides indubitable services to the users community, it reciprocally needs user feedbacks, not only to improve its software tools by fixing reported bugs or taking into account requests for new features, but also to be able to measure the usefulness of its efforts and ensure its continuation. Users of JMMC tools and services are therefore warmly invited to mention them explicitly in their publications, *e.g.* in the acknowledgements section and in the bibliographic section if published references exist.

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