

# The Extensive Database of Astrophysical Maser Sources (eDAMS): the First Release on Circumstellar Maser Sources

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## Abstract

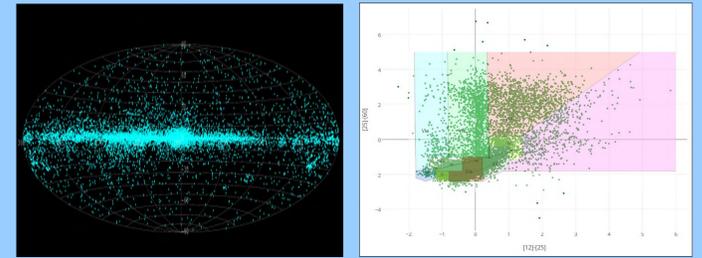
We introduce the newly developed database of circumstellar maser sources. Until now, the compilations comprehensively including the three major maser species in evolved stars (i.e., SiO, H<sub>2</sub>O, OH) has been practically limited only to the Benson's catalog, which was published more than a quarter of a century ago. For OH masers alone, there exists the University of Hamburg (UH) database, but there is no updated compilation work for H<sub>2</sub>O and SiO masers. In order to utilize the information of masers in actual studies, it is highly desirable to have a database containing all the three masers.

We are currently constructing a database covering SiO, H<sub>2</sub>O and OH masers. This database consists of a web-service, which accesses compiled maser observations in available archives and combines them with the data we newly collected and IR databases. The archives currently used are the OH maser archive from Engels & Bunzel (2015, A&A, 582, A68), and H<sub>2</sub>O and SiO archives, which are currently under construction. So far, the information of about 27,000 observations (about 9,800 objects) has been implemented. We also have a plan to extend the database by including higher transitions and other types of objects, such as YSOs, in future. In this poster, we briefly summarize, (1) outline of the data collected, (2) overview of the graphic user interface of eDAMS, and (3) future development plans of the eDAMS system.

The URL of the database is as follows: <http://maserdb.ins.urfu.ru/>

## Summary of the Collected Data

The initial release of eDAMS is dedicated to the circumstellar maser sources of evolved stars mainly in the following maser lines: **SiO J=1-0, v=1 & 2 (43 GHz), H<sub>2</sub>O 22 GHz, OH 1612, 1665, 1667 MHz**. The data are taken mainly from 5 published/unpublished compilation catalogs (see, the eDAMS web for the details of the used catalogs). The OH data are based on the OH maser archive from Engels & Bunzel (2015). The H<sub>2</sub>O data are based on an ongoing compilation work (PI: Engels, D.). A significant amount of additional data of other maser transitions (for example, **SiO J=1-0 v=0&3, SiO J=2-1, v=1&2, <sup>29</sup>SiO J=1-0 v=0**, etc.) are also included in the database, but the data survey for these lines are still not completed (the data will keep updating). We note that **a non-negligible number of unpublished data of the Nobeyama SiO maser survey project are released to the public for the first time** (the number of unpublished Nobeyama observations is about 400). In addition to the basic line parameters (such as intensity, velocity, line-profile, etc.), for a part of the observations, spectral data in ascii format are available, so that users could cook the spectral data for their own purposes. In total, at this moment, **9746 objects are included in the database**. The number of detections of SiO, H<sub>2</sub>O and OH (either of transitions) are 6812, 3212, and 5767 respectively. Non-detections are also included in the database: 4171, 4605, and 8754, respectively, for SiO, H<sub>2</sub>O and OH masers.



Left: Distribution of all cataloged 9746 objects on the l-b coordinates. Right: Distribution of all cataloged objects on the IRAS 2-color diagram. The format of the diagram follows that of Figure 5b in van der Veen, W. E. C. J., & Habing, H. J. 1988, A&Ap, 194, 125.

## Overview of the User Interface (1)

(a) Top page. The user interface of eDAMS consists of 4 parts (functions): (1) **Search**, (2) **Tables**, (3) **Objects**, and (4) **Download**. The links to these functions can be easily found at the top page (in the top and side bars). (b) Search page. The data of maser sources can be searched with object name and coordinate values. List search is also available. Various options available. (c) Tables page. (d) Objects page. Organized/Cross-checked data-sets of maser sources can be downloaded from here. (e) Ascii and csv form of the data can be downloaded from here. (f) Example of the search result.

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## Overview of the User Interface (2)

(a) Example of the basic information page. In this page, source distributions on the l-b coordinate and IRAS 2-color diagram are given for each paper and table. (b) Example of the source information page. Maser information, archival infrared images, photometric data, and related papers found in SIMBAD are summarized in this page. Infrared images can be displayed in many other pages/functions in eDAMS. (c) Example of a table given in Table page. The parameters given in the table flexibly can be modified. Infrared photometric data can be downloaded from this page. (d) Example of spectra. A majority of Nobeyama SiO maser data has spectral data entry. We intend to increase the number of spectral data, which can be downloaded in ascii format.

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## Project Structure

The eDAMS project is an international project, of which the work consists mainly two aspects: the web system construction and construct/maintain the database. The role sharing of the work is illustrated as follows.

### Role Sharing

#### Ural Federal University

**Member:**  
Nakashima, J. (P.I.)  
Ladeyschikov, D. A.  
Sobolev, A. M.

**Main role:**  
• Development of the Web system  
• Collection and maintaining SiO data

#### University of Hamburg

**Member:**  
Engels, D.,  
(+ Other UH staff members)

**Main role:**  
• Collection and maintaining OH and H<sub>2</sub>O data  
• Sharing the experiences of the database construction

#### Other Contributors

**Member:** Zhang, Y., Hsia, C. -H., Yung, B. H. K., Imai, H.  
**Main role:** Development of analysis tools, collecting new maser data, sharing experiences of IR archives

## Future Development Plans

The eDAMS project has following future development plans:

- Add the data of the **higher-J transition lines** of circumstellar maser sources, so that the system would be useful for potential users of latest sub-mm telescopes, such as ALMA and SOFIA.
- Increase the number of **ascii spectral data**, so that the users could process the data for their purposes.
- Add the data of other kinds of astrophysical objects. For the moment, we have a plan to add the data of **methanol masers of young stellar objects (YSO)**, of which the data collection has been basically already finished.
- Add the reduced **FITS images of the KaVA ESTEMA project**, which is a VLBI imaging survey of circumstellar masers of mira-type variables.
- Additionally, we will keep adding new data whenever the new data are published/released. We would very much appreciate if you could inform us when you publish new papers, which include maser observations.