AARHUS UNIVERSITY

IDA User Survey

Overview of key results

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Abstract

This report is based on the user survey conducted by the Instrument Centre for Danish Astrophysics (IDA) in March/April 2020. A total of 127 researchers and students took part in the survey, which was distributed by email. The key findings are as follows:

- ESO and NOT are vital for observational astronomy in Denmark.
- The ESO telescopes are very important for the future research. Another key instrument will be JWST.
- The most used and important infrastructure facility is NASA – both for research and (international) collaborations.
- People have stronger international collaborations on infrastructure than they do on a national Danish level.
- The user survey has a high response rate and is representative of the astronomical/astrophysical community in Denmark governed by IDA.
- IDA does currently not have a firm grasp on the HPC community.

Introduction

The background for conducting this survey was to give a detailed picture of the current use of Research infrastructure within Danish Astrophysics and take a deep look at the user environment of the research infrastructure facilities used by Danish astronomers around the world.

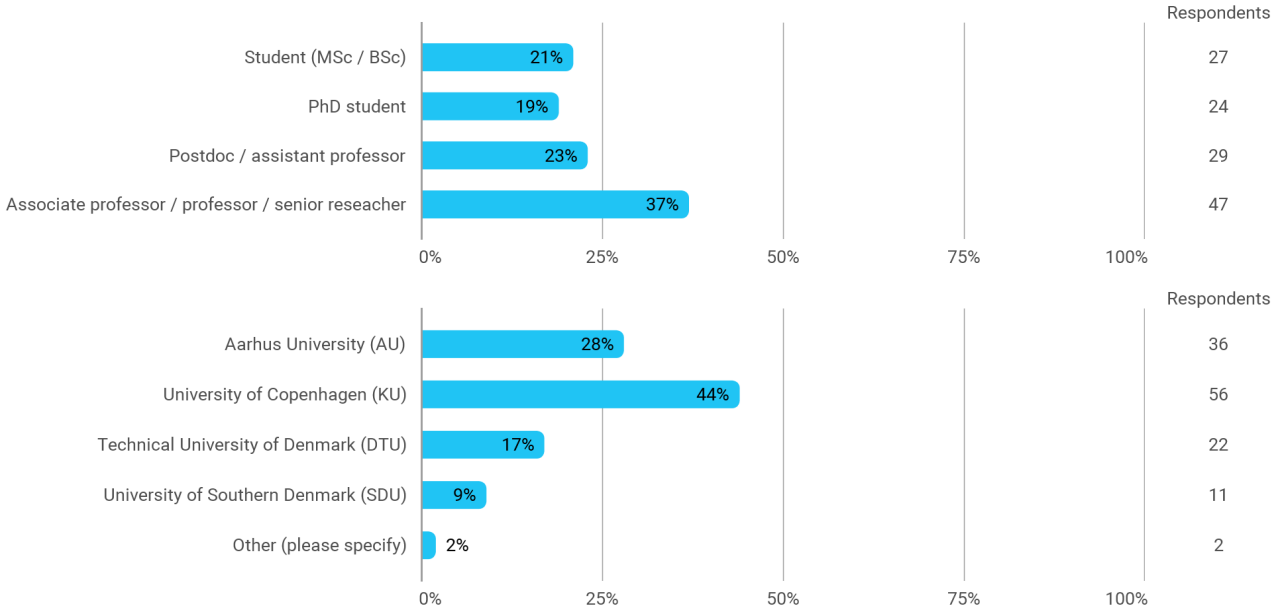
In the last decade Danish astrophysics has undergone a significant development in terms of research activities, number of researchers and students and access to research infrastructure. In parallel with the development in Danish research in general we have within astrophysics experienced the importance of continuing our collaboration with the international research organizations providing state-of-the-art research infrastructure. Alongside this collaboration Danish universities and individual research groups in astronomy have seen an increased interest in developing independent research activities as well as establishing a specific research infrastructure.

Danish astronomers have access to a large number of instruments and telescopes via the Danish memberships of international research organizations. This enables Danish based astronomers to study all types of objects in the universe from the Solar System, stars and exoplanets to galaxies, black holes and other compact objects, cosmology and the Big Bang. The Danish research environments for astrophysics are internationally considered extremely attractive exactly because of our involvement in international collaborations.

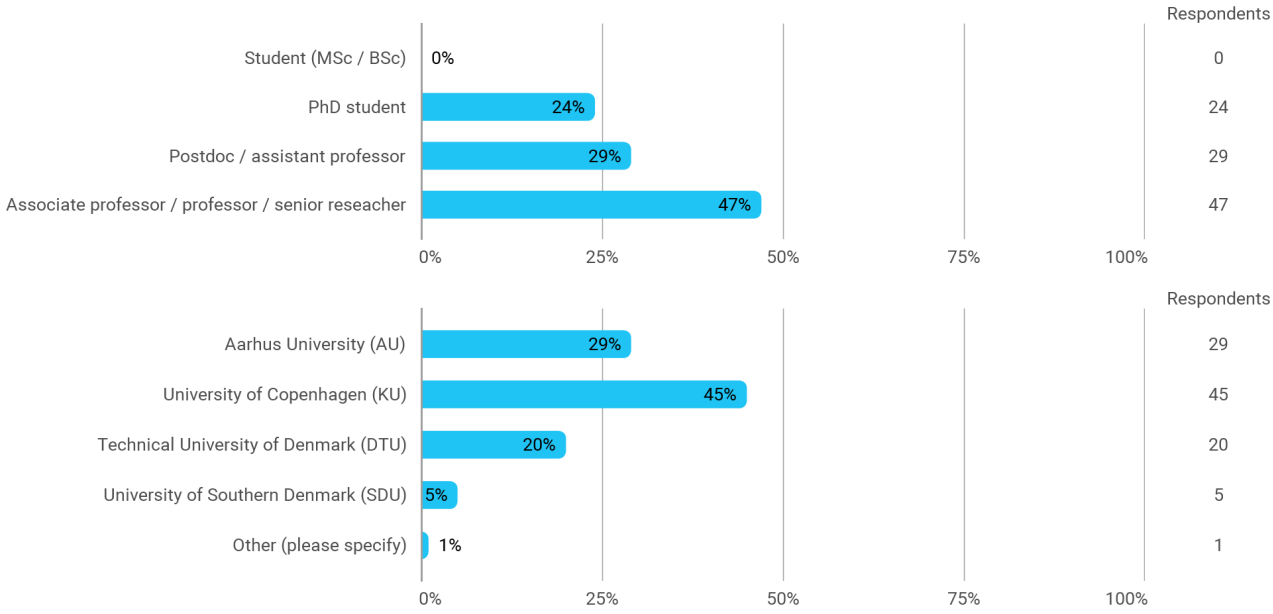
The data we have now collected through this survey will enable us to evaluate the use of the facilities and take strategic decisions about their use for Danish astronomy. The idea is that this is an approach that will be reproduced in 2-3-years to follow the development within Danish Astrophysics.

Survey data

An overview of the position and affiliation of all 127 respondents is given below:



The following analysis will not be based on all respondents, but on the respondents on PhD level or above. These amounts to 100 respondents (75 complete and 25 partially complete) distributed as follows:

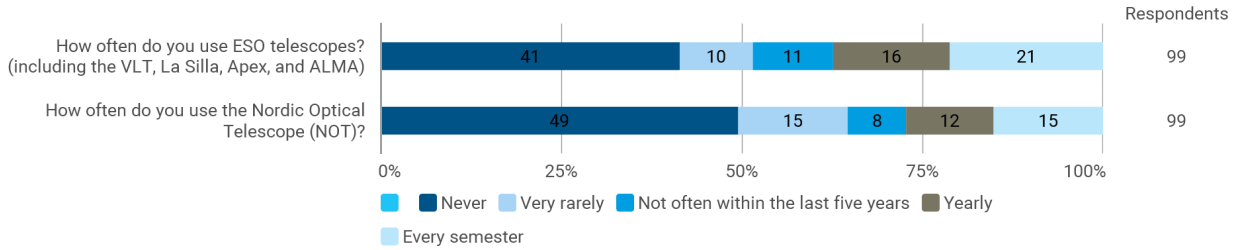


Later in the report, different filters will be applied (e.g. people using ESO telescopes often) and these results are shown and analysed as well.

From the figures, it is clear that the survey nicely covers the community and that we have a connection to all the different branches of our users.

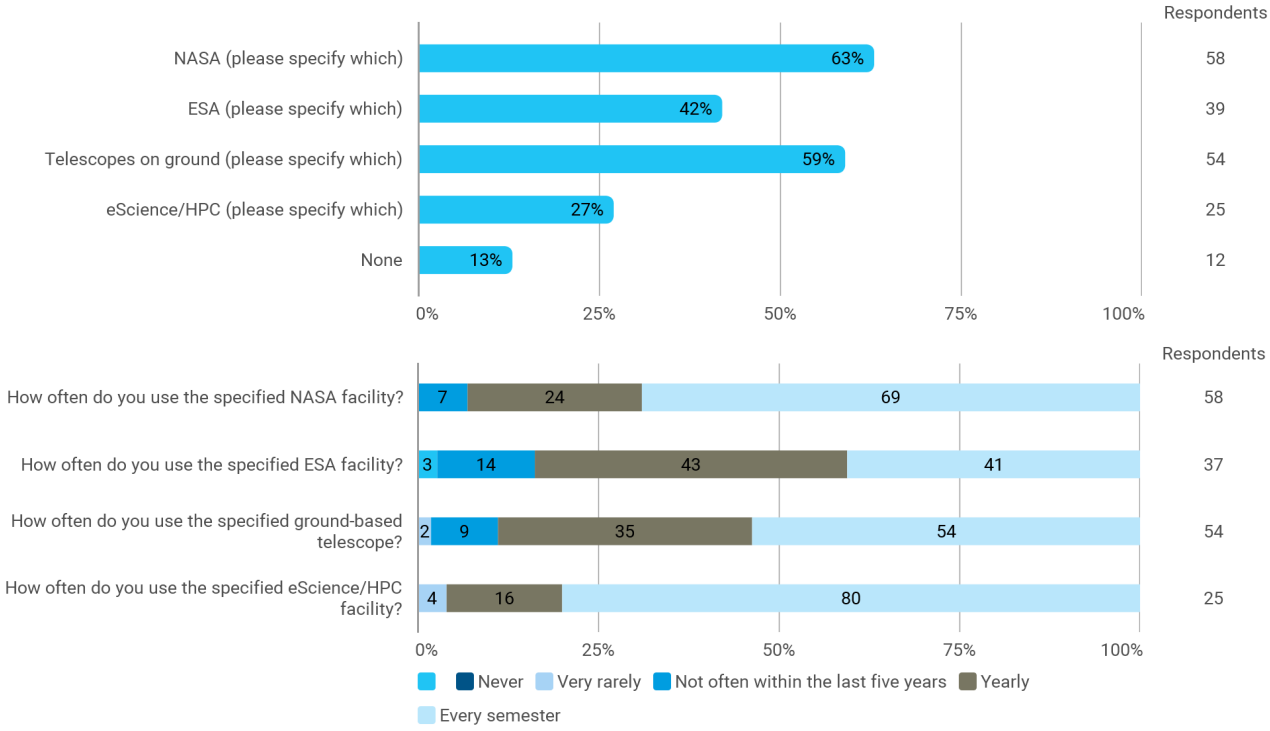
Use of infrastructure

The first part of the survey was related to the direct and indirect use of research infrastructure. Two of IDA's key interest are the European Southern Observatory (ESO) and the Nordic Optical Telescope (NOT). The replies of usage of those facilities are distributed as shown here:



We see that more than 1/3 of all Danish astronomers are using ESO facilities every year or more often. The same number is more than 1/4 for the Nordic Optical Telescope. We can conclude that those facilities are vital for observational astronomy in Denmark.

Of course, other facilities play an important role for the researches, as can be seen from the following two figures:

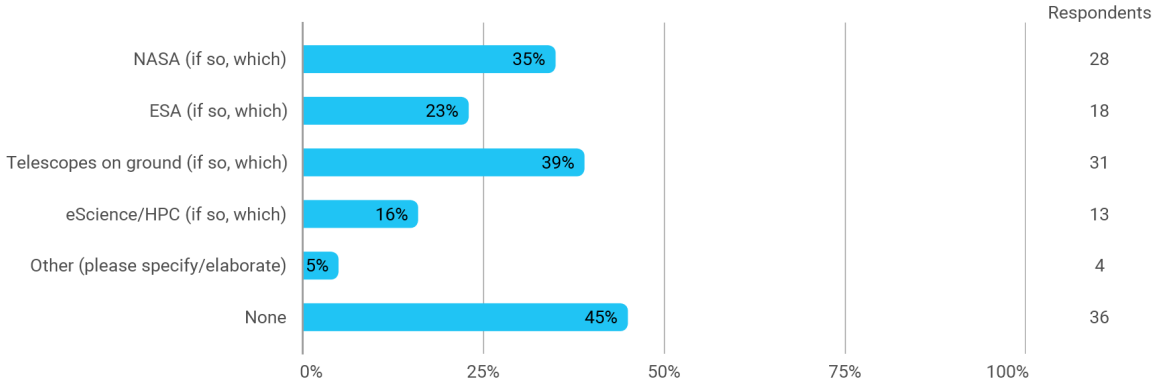


It is quite clear that NASA is the most important facility. Moreover, ESA and ESO are almost equivalent in usage. Finally, we can conclude that the users of scientific computing facilities (HPC) are not very well represented in the present user survey.

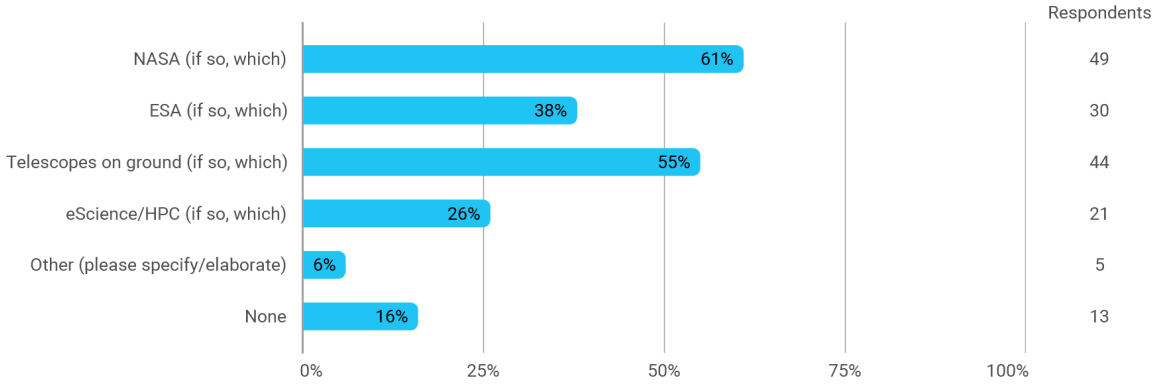
Collaboration on infrastructure

Continuing on the use of infrastructure, we asked about collaborative efforts with infrastructure in mind. Specifically, answers to the following questions: "*Which research infrastructure is important for your research activities done in collaboration with other [Danish/international] research groups?*" are distributed as follows:

Danish



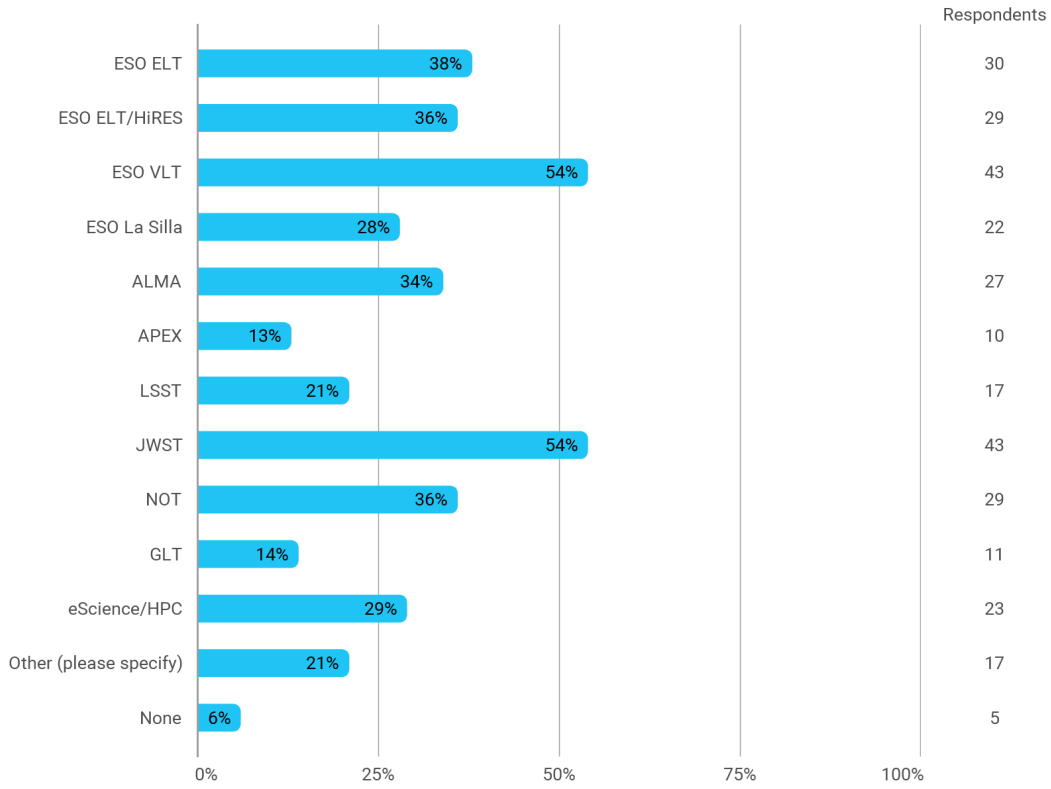
International



We see that international collaborations (using research infrastructure) clearly outscores Danish initiatives. For the international collaborations, NASA is the most important facility; for the national work, it is overtaken by ground-based telescopes (many of the respondents specifies SONG, NOT, ESO and ALMA).

The future

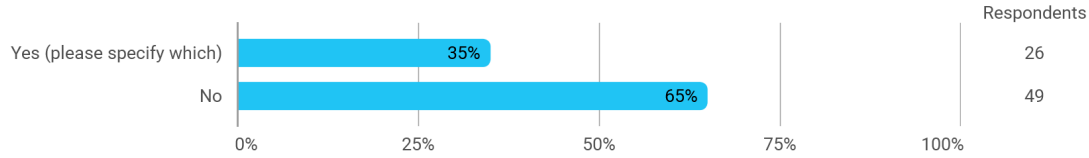
In the next part of the survey, we asked the community which instruments or facilities they predict will be important for their future research. The responses were as follows:



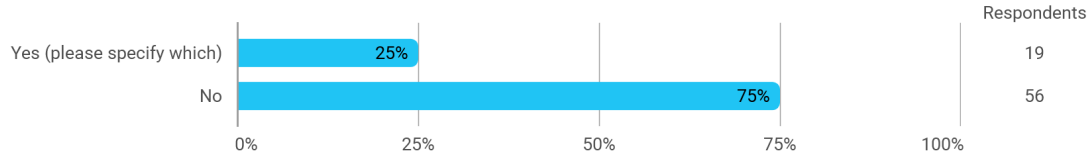
We see that the ESO telescopes – both the existing Very Large Telescope (VLT) and the European Extremely Large Telescope (ELT) currently under construction – are predicted to be very important for future research. It is also clear that people are planning for ELT. Another key instrument for the future will be the James Webb Space Telescope (JWST).

Grants

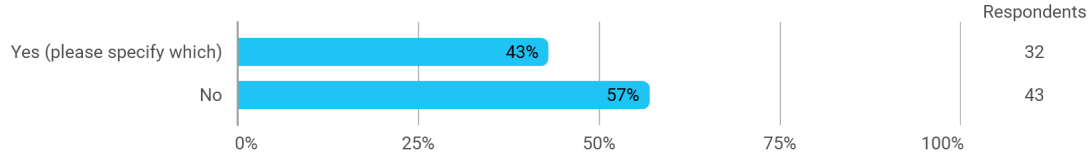
In the final part of the survey, we asked if the respondents had submitted applications for access to research infrastructure and received the following in return:



Of the 26 which applied, 19 was successful as evident from this figure:



Finally, we posed he question "*Are you working on establishing new research infrastructure or extending the current research infrastructures?"* and the responses was distributed like this:



We can conclude that a significant fraction of IDA's user base is working on creating better infrastructure

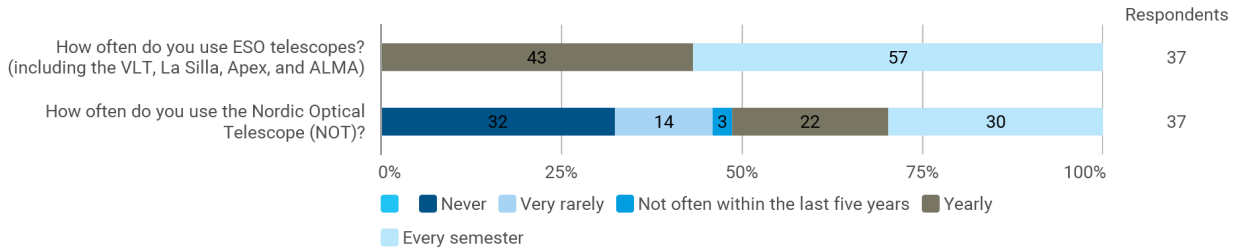
In the following two parts, the data have been filtered according the response on the question about the use of ESO and NOT (see page 4). The applied filter will be noted in the section title.

Filtered results – heavy ESO users

Applied filter: *Using ESO yearly or more often.*

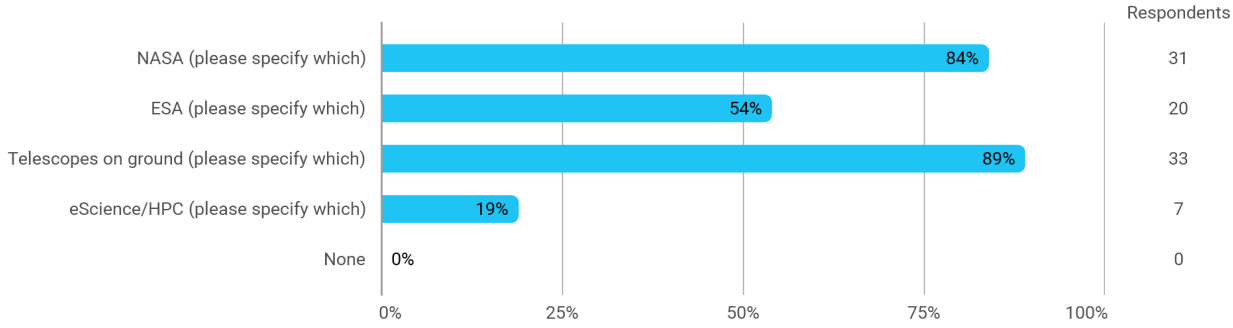
Use of infrastructure

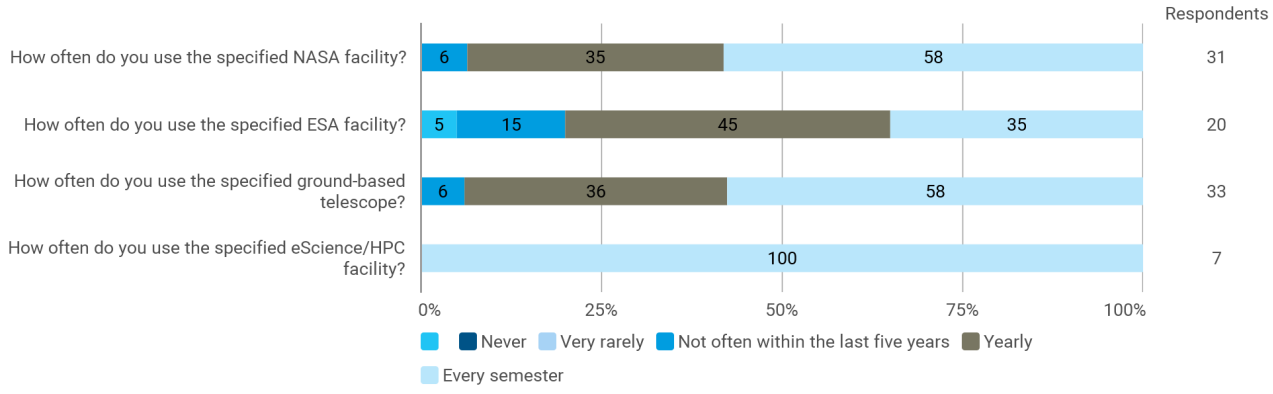
The usage of ESO and NOT of the respondent group are as follows:



We see that 37 of the total 100 respondents are keen users of the ESO facilities.

The usage statistics of other facilities is given below:





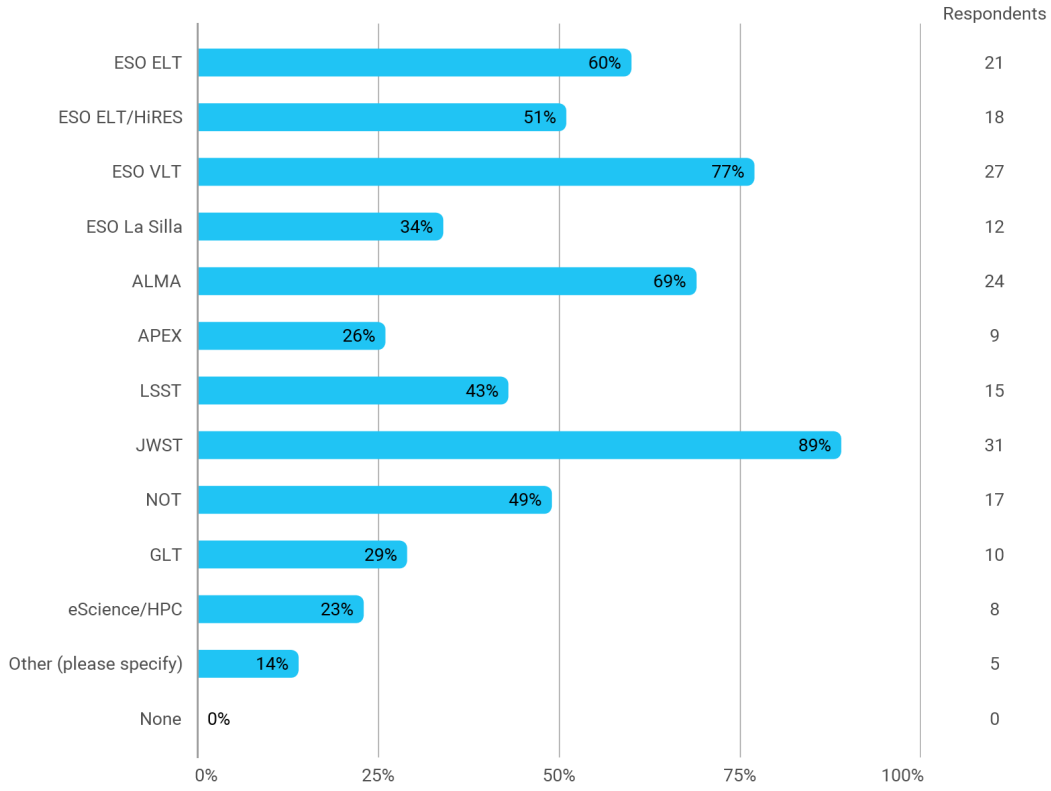
We can conclude there does not exist a complete overlap between NOT and ESO users. Moreover, the target ESO users are very heavy users of other infrastructure as well (especially NASA).

Questions not shown

For many of the questions, we see the same general trans as for the full sample. Therefore, we have chosen to skip presenting those here.

The future

Instruments or facilities which will be important for future research:

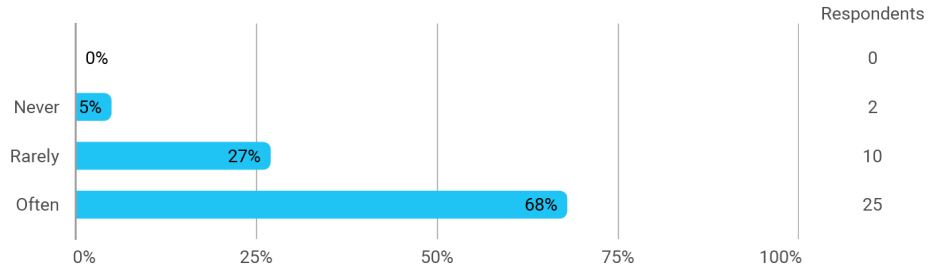


We see the same overall trends. However, generally this group deem research infrastructure even more important for the future. A clear preference for JWST are evident, followed by VLT, ALMA and ELT.

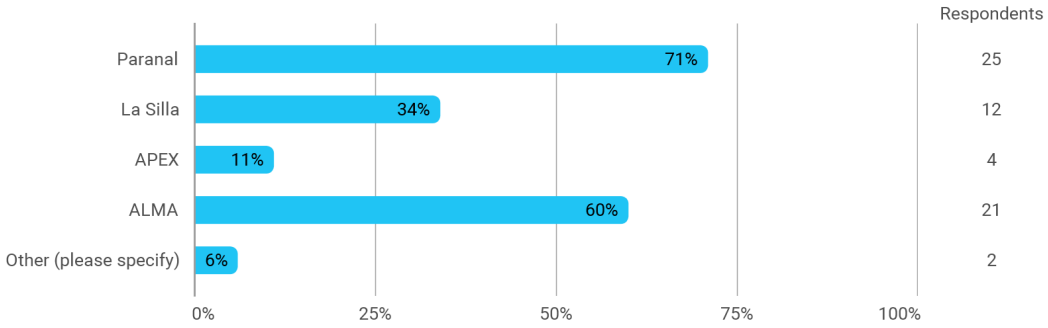
Additional ESO questions

In the survey, we asked some specific questions on the use of ESO – specifically on the use of data products from the ESO archive. Those were not presented in the general case in the first part but are shown here for the heavy ESO user group.

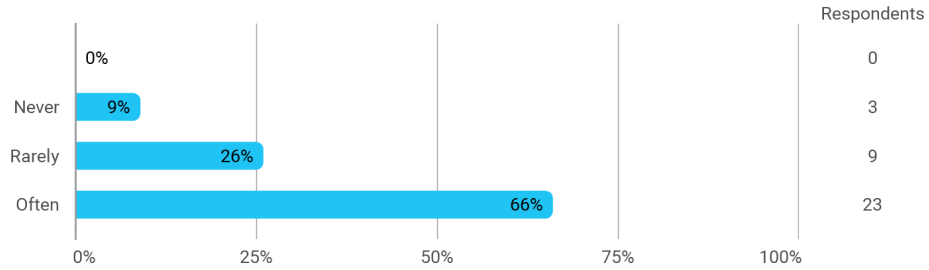
Answers to the question "*How often do you use data from the ESO archive (specifically, observations you have not performed yourself)?*":



Answers to the question (only if using archive data as indicated above) "*From which source(s) do you use ESO archive data?*":



Answers to the question "*Do you use the pipelines offered by ESO in connection to the use of archive data?*":



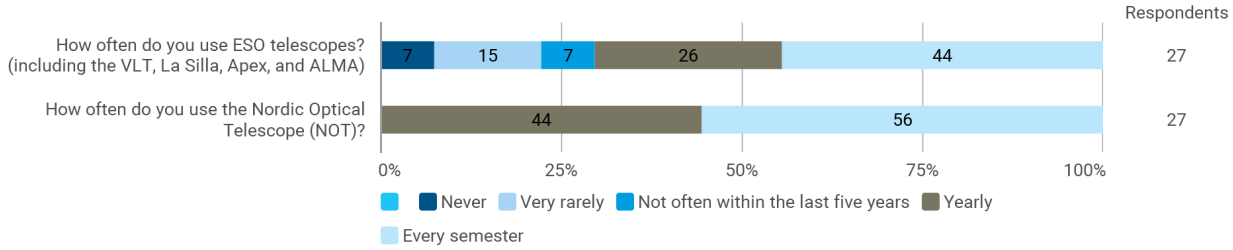
From this we can conclude that archive data play an important role for observational astronomy, and that the provided ESO pipelines are well used.

Filtered results – heavy NOT users

Applied filter: *Using NOT yearly or more often.*

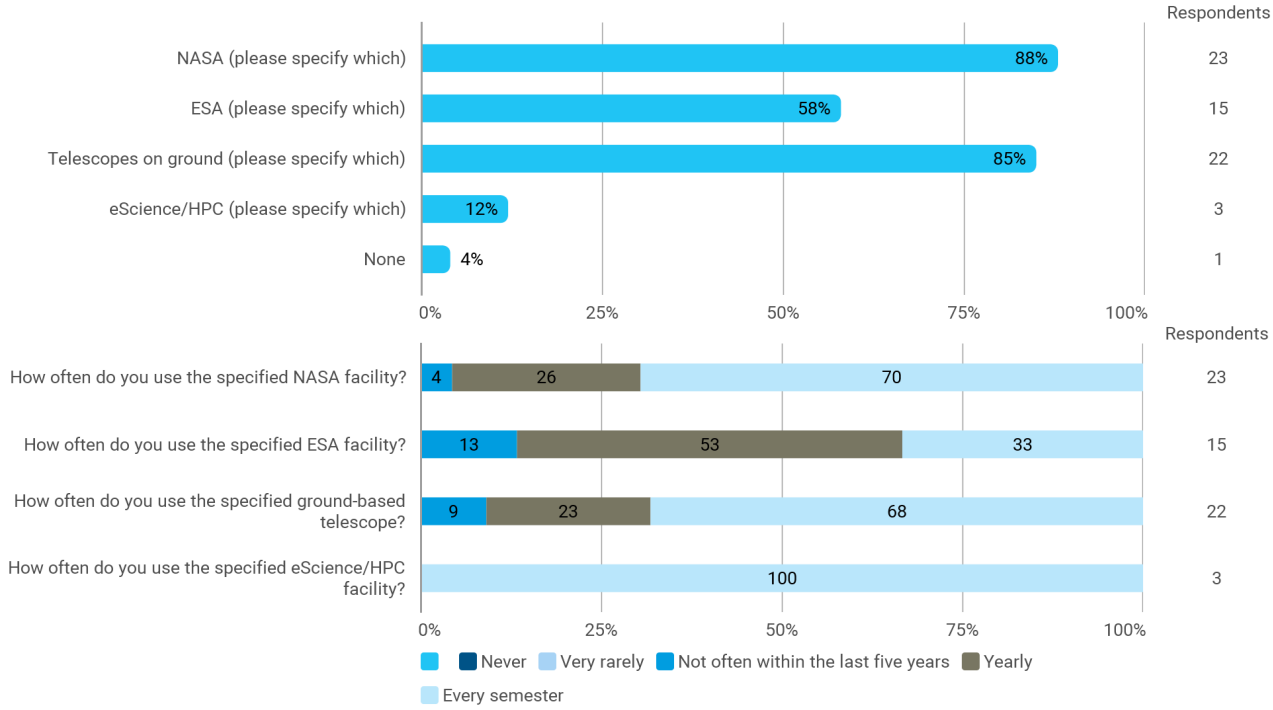
Use of infrastructure

The usage of ESO and NOT of the respondent group are as follows:



We see that 27 of the total 100 respondents are eager users of the NOT.

The usage statistics of other facilities is given below:



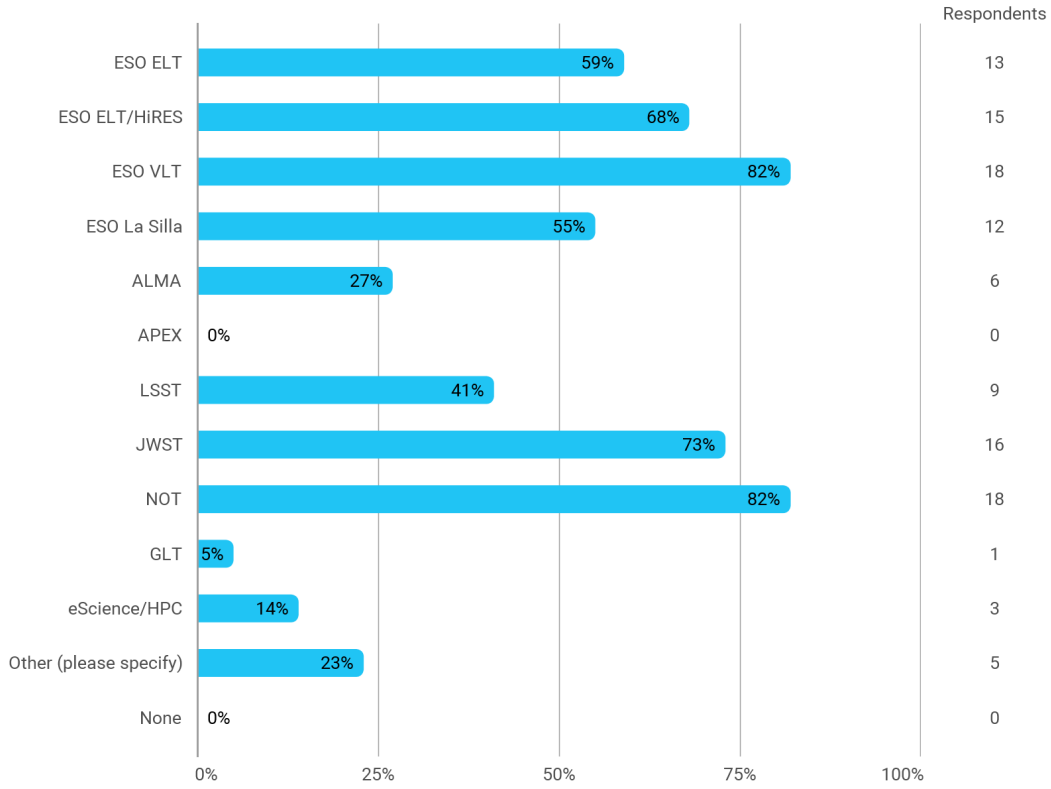
Again, we do not observe a full overlap between NOT and ESO users – but the correlation for this NOT sample is stronger than the other way round (see above). These NOT users (in similar fashion as ESO users) are very heavy users of other infrastructure as well (especially NASA).

Questions not shown

For many of the questions, we see the same general trans as for the full sample. Therefore, we have chosen to skip presenting those here.

The future

Instruments or facilities which will be important for future research:



We can conclude that NOT users think that the NOT will keep on being an important research facility in the future as well. For this group of respondents, both the VLT and NOT surpasses JWST. Again, the ELT is important as well.