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Isaksson, Eva

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Bibliometric Evaluation of Finnish Astronomy

Eva Isaksson

Observatory, P.O. Box 14, 00014 University of Helsinki, Finland

Abstract. Finnish astronomy publishing provides us with an interesting data sample. It is small but not too small: approximately one thousand articles have been published in a decade. There are only four astronomy institutes to be compared. An interesting paradox also emerges in the field: while Finnish science assessments usually value highly the impact of scientific publishing, no serious evaluations using real bibliometric data have been made. To remedy this, a comprehensive ten-year database of refereed papers was collected and analyzed.

1. Introduction

The use of bibliometric indicators has been on the rise, as science administrators are finding effective ways to evaluate research. In my work as an astronomy librarian, this has been reflected in the growing thoroughness with which publications are being used in assessments. At the latest research assessment evaluation done at the University of Helsinki in 2005, the panel of experts asked for citation count data for the first time.

This made me interested enough to compile an overview of using bibliometric methods for evaluating Finnish astronomy in the form of an essay I wrote for a library studies course in 2004. I was surprised at how little bibliometric data has been used in Finland until recently. In a national evaluation of astronomy in 2000, the panel had made a quite superficial publication count using ADS to search for a few prominent names (Panel report 2000). There had been one serious bibliometric study of Finnish science, but it gave very little if any information about astronomy (Persson et al. 2004).

I decided to see how much bibliometric data I could collect to find out what it might tell me about Finnish astronomy publishing. For this, I used both ADS and ISI, in order to find out how they compare. Many Finnish astronomers are quite sceptical about ISI, while Finnish science administrators have probably never heard about ADS, and they do not take ADS data into account.

2. The Scope of the Study

There are four institutes doing astronomical research in Finland. These are: Observatory, University of Helsinki; Tuorla Observatory, University of Turku; Astronomy Division, University of Oulu; and Metsähovi Radio Observatory, Helsinki University of Technology.

For my study, I chose a ten-year period 1995–2004. One reason for this choice was the availability of lists of publications for this time period. Affiliations
are not consistently found in the ADS and ISI data, and I wanted to include those articles which would otherwise be missed. Publication lists maintained by institutes—while incomplete—helped to fill several gaps in cases where affiliation data was abridged or missing. Both Helsinki and Tuorla observatories have lists of publications going back several decades, but that is not the case for Oulu and Metsähovi, which are younger.

Several papers were published in other fields, like physics. Non-astronomy papers by authors affiliated with the four institutes were included to avoid the decision exactly where to draw a line. The number of these articles is relatively small.

Based on these criteria, I collected a database with 910 refereed papers. Of their 1,998 authors, 162 were listed with affiliations from one of the four Finnish astronomy institutes. Of the most productive 50 authors, (with more than 12 published papers) eight (16%) could be identified as female.

3. Counting Citations

Finnish astronomers are familiar with ADS citation data, and seem to suspect the ISI citation data. Science administrators on the other hand only use ISI data in their assessments. Since the University of Helsinki has access to the ISI Web of Science, I decided to use both. Citation data was gathered in November, 2005. Three citation counts were included: ISI Web of Science citations, ADS citations in refereed papers, and ADS citations in all papers.

ISI citation counts and ADS refereed citation counts should be practically the same for authors publishing in only astronomy journals. There are, however, some definite differences—neither ISI nor ADS gives perfect citation data.

I also counted $h$-index factors.\(^1\) It seems that they don’t give any additional information about author rankings among Finnish astronomers, as differences were quite small.\(^2\)

\begin{table}[h]
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\begin{tabular}{|l|c|c|}
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Institute & Papers & No. of Authors \\
\hline
Tuorla & 382 & 47 \\
Helsinki & 325 & 57 \\
Oulu & 196 & 32 \\
Metsähovi & 135 & 26 \\
\hline
\end{tabular}
\caption{Total numbers of refereed Finnish astronomy papers by institute according to ISI 1995–2004 and total number of authors affiliated with each institute}
\end{table}

\(^1\)See the paper by Grothkopf & Stevens-Rayburn in this volume for an explanation

\(^2\)More detailed data comparing the four Finnish astronomy institutes can be found at http://www.astro.helsinki.fi/library/biblio/
4. Competition and Cooperation

A very clear majority of papers were stand-alone in the sense that only one of the four Finnish institutes was involved. There was not even one paper with all of the institutes cooperating. Finnish research cooperation seems to be directed abroad instead of to other Finnish astronomy institutes.

Some authors list two institutional affiliations, making it difficult to discern cooperation patterns. It seems safe to assume that there is a marked Tuorla–Metsähovi connection and a particularly weak Oulu–Metsähovi connection.

Ignoring the sparse institutional overlap, according to Table 1 Tuorla currently holds the leading position, with Helsinki coming next. Looking more closely at publication years, Helsinki has overtaken Tuorla only in 2003. Oulu has been on a steady rise and Metsähovi currently holds the last position, but has also been catching up with the others. In the 1990s, Tuorla and Helsinki were leaders in the Finnish astronomy field in terms of numbers of publications, but the two smaller institutes aren’t lagging as much behind as they used to.

5. A Nordic Perspective

Does counting publications with Finnish affiliations and their citations tell us anything about Finnish astronomical research compared to other countries? Not really – for that we would need data for other countries as well. This is a difficult task for various reasons. Let’s remember that affiliation data is incomplete. For multi-author papers, bibliometric databases might not include affiliations for all authors. Many studies that compare countries often limit the number of authors taken into account, stressing the role of the first listed author.

Table 2. Percentages of publication activities in Nordic countries measured by number of papers (ADS) or number of pages (Woltjer)

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In 2004, I conducted a simple affiliations search in ADS to find out how Nordic countries compare in terms of productivity. The column for 1995–2004 in Table 2 shows shares of total publication counts of all papers (9,218 papers) for papers in which a country name is included in the affiliation data.

Another approach has been presented by L. Woltjer, who compared European countries, the quantity used as a measure of activity being the number of normalized pages published in astronomical journals in 2002 (Woltjer 2006). To make the task more manageable, only the first author’s affiliation was taken into account. Restricting my ADS search to the same year as Woltjer, I found some
– but not big – differences between percentages counted from numbers of pages and from Woltjer’s normalized page counts.

From Table 2, one could draw the conclusion that Sweden and Finland seem to have strengthened their astronomical research compared to Denmark and Norway. A comparative database of all papers with affiliations in these four countries, if one could be compiled, would be most interesting for assessing astronomical research in Nordic countries.

6. The Missing A&A Citations

Certain astronomy journals, which shortened their abbreviations, lost some ISI citation data in the period 1998–2001. All the papers from these journals can be found in the ISI Web of Science, but their citation counts could be wrong (Abt 2004; Sandqvist 2004).

Finnish astronomers publish mostly in these affected journals – for example, of all Finnish astronomy papers published between 1994–2004 a high percentage, 43%, were published in A&A. There has been some concern voiced over repercussions this could have for astronomy assessments. I wanted to find out whether there is a time dependent discrepancy between their ISI and ADS data, related to the year when the cited paper was published.

I could find a barely discernible discontinuity for A&A in 2001. A more marked difference between ISI and ADS could be found in 1996, with ISI giving a remarkably different, lower citation count for one highly cited article as compared to ADS.

7. Conclusion

There are efficient tools available for bibliometric studies of astronomy. Despite the incompleteness of affiliation data, it is relatively easy to get an overview of research done in a small enough country.

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