

Editorial: Impact of special collections in JGR Space Physics

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Key Points:

- JGR Space Physics published 51 special collections from 2006 – 2018, totaling 1009 papers out of 8881.
- Average citations and downloads are slightly higher for papers in special collections compared to those not in collections.
- Paper attributes thought to influence citations were analyzed, finding no statistically significant effect for special collection papers compared to others.

AGU Index Terms:

- 9815 Notices and announcements
- 2700 Magnetospheric physics
- 2400 Ionosphere
- 2100 Interplanetary physics
- 7500 Solar physics, astrophysics, and astronomy

Keywords:

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Abstract

Journals occasionally solicit manuscripts for special collections, in which all papers are focused on a particular topic within the journal's scope. For the *Journal of Geophysical Research: Space Physics*, there have been 51 special collections from 2005 through 2018, with a total of 1009 papers out of the 8881 total papers in the journal over those years (11%). Taken together, the citations to special collection papers, as well as other metrics, are essentially the same as the non-special-collection papers. Several paper characteristics were examined to assess whether they could explain the higher citation and download values for SC papers, but they cannot. In addition, indirect methods were conducted for assessing self-citations as an explanation for the increased citations, but no evidence was found to support this hypothesis. It was found that some paper types, notably Commentaries and Technical Reports, have lower average citations but higher average downloads than Research Articles (the most common type of paper in this journal). This implies that such paper types have a different kind of impact than "regular" science-result-focused papers. In addition to having higher average citations and downloads, special collections focus community attention on that particular research topic, providing a deadline for manuscript submissions and a single webpage at which many related papers are listed. It is concluded that special collections are worth the extra community effort in organization, writing, and reviewing these papers.

Plain Language Summary

Journals sometimes focus the attention of the research community by having a special collection, even an entire issue, devoted to a single topic. A reasonable question to ask is whether the extra effort of organizing, promoting, and maintaining the special collection is worthwhile. This paper examines paper impact in this journal, the *Journal of Geophysical Research Space Physics*, separating the special collection papers from the non-special-collection papers. The short answer is, on average, yes, at least based on the metric of citations. Some characteristics of the paper were also assessed, such as the use of a colon in the title, the average author team size, the average number of references in each paper, and the paper type of the articles. None of these factors explains the higher average citations and downloads for papers in special collections. In this analysis, though, it was found that several paper types have lower-than-average citations but higher-than-average downloads, including Commentaries (personal perspectives articles) and Technical Reports (describing new methods or data sets). This implies that such papers are being read but perhaps not heavily referenced (yet). The overall conclusion is that special collections are worth the extra work.

1. Introduction

The *Journal of Geophysical Research Space Physics* (JGR-SP) regularly publishes papers that are part of a special collection (SC). SCs are proposed by members of the research community and are focused on a particular topic within the scope of the journal. While open to submissions from anyone, SC proposals include a listing of potential authors and tentative paper titles, which are often presentation titles from a recent small workshop or session at a larger conference. With electronic publishing, the articles in an SC are no longer gathered into a single issue but rather appear online as they are accepted. They are, however, listed together on a

separate page within the journal website, allowing quick access for the research community to all papers in that collection.

There are three qualitative benefits to SCs. First, they provide a deadline for submitting manuscripts, which often serves as positive encouragement for researchers to finalize their study. The influence of these deadlines is a sizable increase in submissions to the journal around special collection deadlines. While this could be a shift of submissions that would have come in later, some of this is also from researchers prioritizing manuscript preparation in their busy schedules. That is, the existence of an SC likely leads to increased scientific production.

Second, an SC focuses community attention on a particular topic. As the organizers publicize the SC to relevant researchers, they raise awareness of the topic not only among potential authors but also across the broader discipline-wide community. This publicity and exposure continues as the papers are accepted and eventually published. The SC topic, or individual papers within it, might also receive extra promotion through an Editor's Vox, Research Spotlight, Editors' Highlight, or social media post. Whether or not a particular space physicist is conducting research in that focused topic of the SC, the extra contact with this topic raises its familiarity within the community.

Third, the SC page on the journal website is a single-stop location for researchers to find papers on this topic. While search engines are good at locating scholarly articles on a particular topic, sometimes the search results are overwhelming or contain many papers of only marginal relevance. However, finding just one paper from an SC will lead to a link to the SC's table of contents, providing easy access to many related papers.

Given the increased promotion and discoverability of these articles, it could be the case that SC papers have a higher impact, as measured by citation and download rates, than published papers not part of an SC. Of course, these are not the only contributing factors to citation and download rates, though. Moldwin and Liemohn (2018) conducted an assessment of citations to papers published in 2012 in JGR-SP, finding several parameters that lead to a statistically significant increase in citations. One of these is the use of a colon in the title, another is the number of authors, and a third is the number of references.

Yet another factor that might be linked to impact is the paper type of the published article. JGR-SP has several paper types. The most common, by far, is the Research Article, which needs to have a significant original contribution to our understanding of the physics of the space environment. The next most common currently active paper type is the Technical Reports: Methods paper, which should describe a significant advancement in how space physics is conducted with a discussion of the ways that this method could be used for scientific discovery.

Clark and Hanson (2017) compared the impact of several hydrology journals, finding remarkable citation similarity across the discipline. The caution, however, about the usage of citation data in evaluating science impact, encouraging the inclusion of other measures in making such assessments. Another measure of impact that is conveniently available in the past few years, as journals forego the print edition and switch to digital-only publication, is the number of full-text views or article downloads from the journal website.

Only a few studies have examined the effectiveness of special collections. Olk and Griffith (2004) assessed the impact of SCs in management research journals, finding several positive effects. Most notably, papers in SCs were published faster than non-SC papers and that

SCs publish a high proportion of exceptional articles of high impact. Another examination of SC effectiveness was conducted by Hendry and Peichel (2016), who examined papers in 7 collections resulting from an annual topical conference in evolutionary ecology. They found that, on average, papers within the selected SCs are cited about the same as those papers on this particular topic but not in SCs.

The effectiveness and impact of SCs for space physics has not been quantitatively examined. This study assesses the impact of papers in SCs published in recent years in JGR-SP. Note that SCs are sometimes called by the old names, most notably the special issue, when a hardcopy issue of the journal was devoted to the papers in the special collection, and the more recent special section, when the papers were scattered among several issues. The newest name, special collection, includes new submissions but also could be a compilation of already-published papers, or even a mixture of the two. In this paper, special collection is used, abbreviated to "SC" for convenience.

2. Methodology and Results

Impact metrics were examined for all papers published in JGR-SP from the beginning of 2006 to the end of 2018 and submissions from 2005-2018. There are a few published papers we analyzed that were submitted before 2005 but published in 2006, so they appear in our "published" paper dataset, but not in the "submitted" dataset. This time span includes the publication of papers from 51 SCs. The total number of published papers in our analysis is 8881, with 1009 papers listed within an SC. Note, however, that for joint special collections, i.e., those SCs that include papers from more than one AGU journal, only the JGR-SP papers from the SC were included in this analysis. This analysis excludes withdrawn and deleted manuscripts and corrections.

Download data is retrieved from Wiley Journal Insights, a proprietary platform operated by Wiley and includes the number of times a paper is viewed in full text online or downloaded in PDF formats on Wiley Online Library; it includes download activity of the past five years of all papers published in the journal. Citation data is retrieved from Dimensions Analytics platform, and includes citations by all content indexed in the Dimensions database (see Hook et al., 2018, section "2.3.2. Citations" for a detailed description of citation counts in Dimensions). Citing publications can include articles, chapters, preprints, or monographs. Download and citation data used in this analysis was retrieved 13 September 2019, and analyzed in Excel.

Figure 1 shows submissions to special collections in the time span from 2005 to 2018 and the papers published from 2006 through 2018. The current editor in chief, the first author of this study, made it a priority of his term to increase the number of special collections, and its effect is evident in Figure 1, which shows peak submissions to special collections in 2016, a year in which 9 special collections were open to submissions at least for some portion of the year.

A concern that is sometimes raised about SC papers is whether they receive the same editorial and reviewer scrutiny. One way to quantitatively evaluate this concern is to consider the proportionality of the final decisions for papers in special collections relative to the rest of the journal. Figure 1c shows these final decisions, with columns for the rates of acceptance for each year for SC and non-SC papers (withdrawn/deleted submissions excluded). Note that acceptance rate is calculated from the eventual final decision of each of the submitted manuscripts counted in Figure 1a. It is seen that in some years, the SC acceptance rate is higher and other years is

lower. For the all-years column, the values are both 74% (to be very specific, they are 74.34% and 73.97% for SC and non-SC papers, respectively). This difference is negligible; there is no preference for accepting a manuscript submitted to a special collection compared to non-SC submissions.

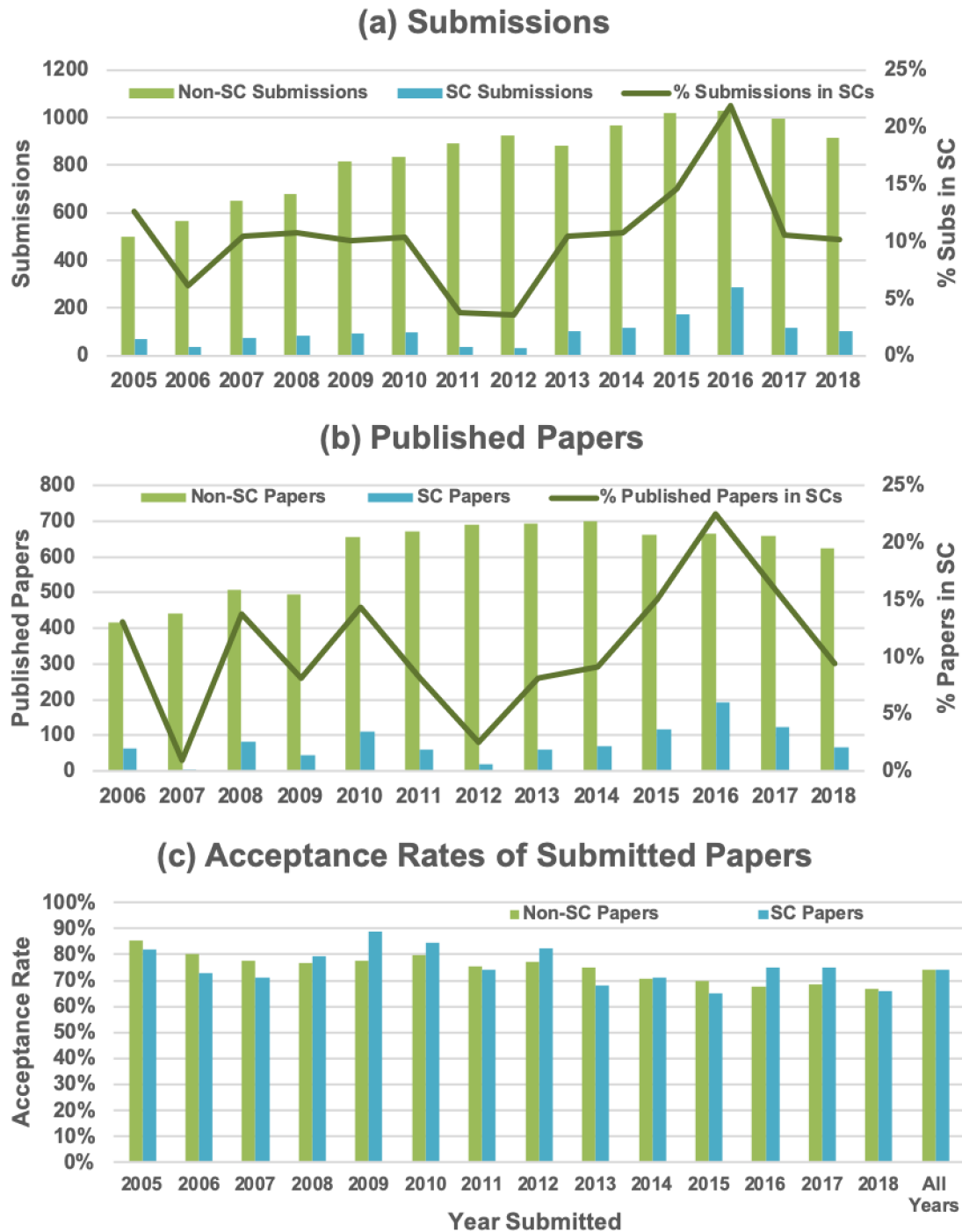


Figure 1. Submissions, published papers, and acceptance rates by year (panels a, b, and c, respectively). Non-SC manuscripts are shown with the green column, the special collection manuscripts with the blue columns, and the black lines in panels

a and b show the percentage of submissions and papers that were in special collections, using the right-hand scale.

Figure 2 presents two measures of the impact of papers in special collections versus non-SC papers published in the journal over the study epoch. The two metrics are average citations per paper and average downloads per paper. The download information only exists for the past 5 years, so Figure 2b focuses on this interval (August 2014 through August 2019). The definition of a “download” is online access to the full text article and includes both full/enhanced article (HTML) and PDF formats. Since download data is only from the past five years, this download chart does not show the immediate popularity of articles published prior to August 2014.

In Figure 2a, it is seen that the trend is a decreasing number of citations with each passing year from 2006 to the present. Because the citations are cumulative, this trend is expected. The obvious deviation to the trend is the citation rate for SC papers published in 2007, which have much lower average citations than expected for papers 7 years old. However, as seen in Figure 1b, there were only four SC papers published that year, so this value is not statistically robust.

Because the download data are only available for the last 5 years, several features are evident in Figure 2b. From 2014 to 2018, this value should decrease, as it does, because the papers were only available for part of the 5-year interval. For papers published in 2013 and before, they all have the same 5-year window of downloads included in the bar height. It is seen that the downloads decrease rather slowly, indicating that papers in JGR-SP have a long lifetime of interest to the research community.

It can be seen in Figure 2 that, for nearly every year and for both metrics, the SC paper value exceeds that of the non-SC paper value. This is also true for the “all years” columns, with average citations per paper of 20.8 and 17.6, and average downloads per paper of 403 and 335, for SC and non-SC articles, respectively.

To assess whether the differences in average citations or downloads per paper are statistically significant, Welch’s t tests were conducted. Poisson counting statistics were used to assign uncertainties to each value in Figure 2, based on the published paper numbers in Figure 1b. It was found that all pairs of values (SC versus non-SC metric for a given year) are highly significant, with all t values greater than 10 and many greater than 100, much larger than the 2.6 t value needed for 99% confidence of difference. The difference in the “all years” columns are also highly statistically significant.

It should be noted that some special collection papers are heavily influenced by a small handful of highly cited papers. These are particularly found in two collections published in 2016, “Big Storms of the Van Allen Probes Era” and “Major Results from MAVEN.” The median citation rate for the “Big Storms of the Van Allen Probes Era” special collection is 17; this means that over 50% of papers in this set from 2016 already have double-digit citations. A median less than the mean indicates a right-sided tail to the distribution; the skew of the citation counts for this special collection is 1.4. To assess if this is an unusual feature specific to this special collection, the skew values were calculated for each of the 37 special collections. While a few special collection citation counts have a skew that is below zero, indicating a slightly left-sided tail, nearly all have a positive skew value and over half of special collection citation count distributions have a skew above unity, indicating a heavy right-sided tail.

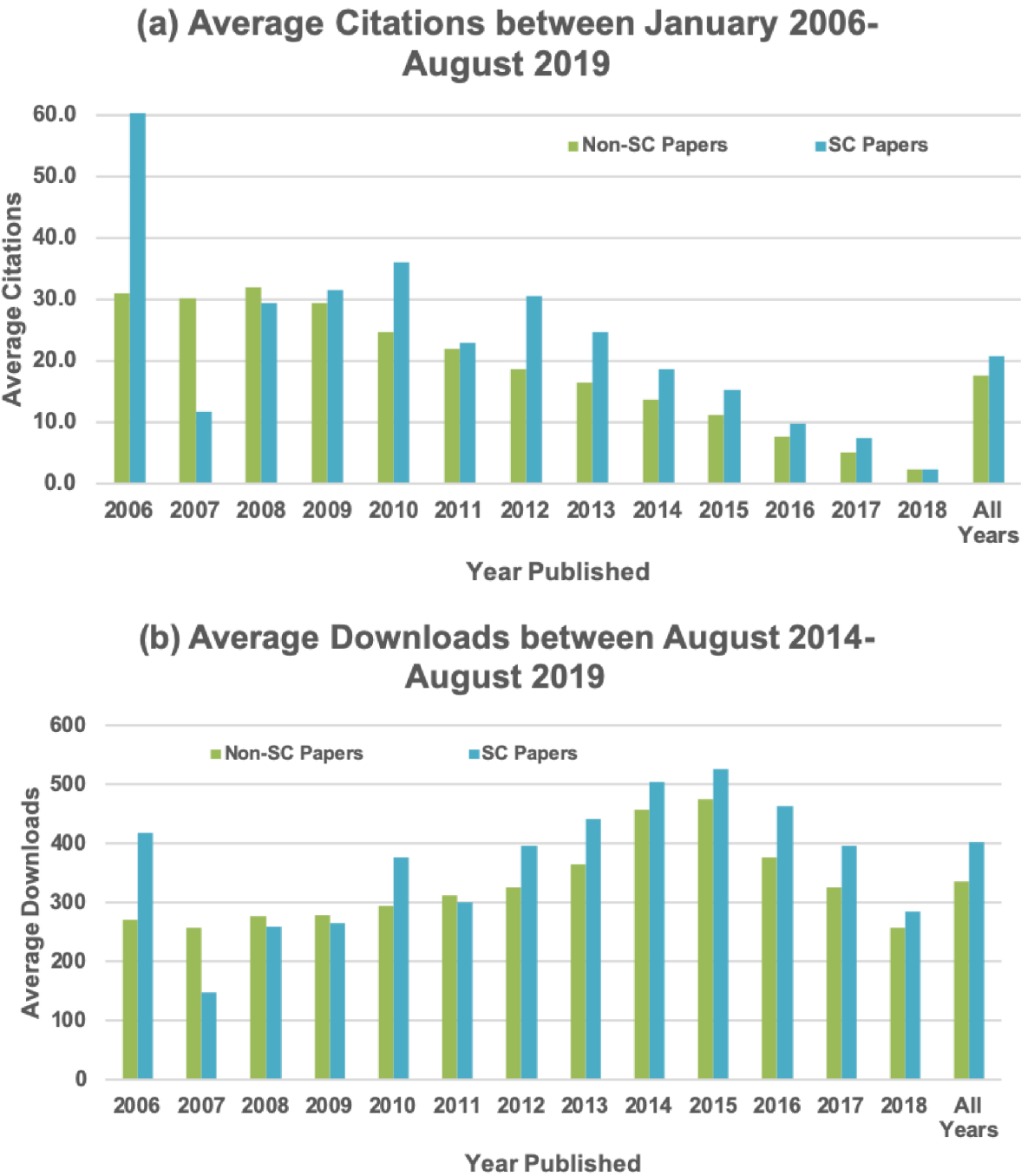


Figure 2. A comparison of impact metrics for papers in special collections (blue columns) against the values for non-SC papers (green columns), per year and for all years combined. Panel (a) shows average citations per paper (2006 – August 2019) and (b) presents average downloads per paper (August 2014 – August 2019). The average citations for papers published in the years 2006-2018.

To more thoroughly investigate if it is SC inclusion that increases citations and downloads or whether it is some other factor, the published papers were categorized according to four other parameters. The first three are the main organizers from Moldwin and Liemohn (2018): the use of a colon in the title, the number of authors on the paper, and the number of references in the bibliography. The fourth attribute is paper type. The breakdown of average citations (from January 2006 through August 2019) and average downloads (from August 2014 through August 2019) for the first three attributes are presented in Figure 3. The left column (Figures 3a-3c) shows average citations for the four parameters while the right column (Figures 3d-3f) shows average downloads.

Figures 3a and 3d show the results for the use of a colon in the title. For the SC papers, there are 234 with a colon and 775 without, while of the non-SC papers, 1715 include a colon and 6157 do not. We observe the result of Moldwin and Liemohn (2018) in average citations of non-SC papers and “all papers,” with papers with a colon in the title having a higher citation rate that is statistically significant. The opposite is true for SC papers, however, with the citation rate slightly lower, although still statistically significant. The download rates are not different by a statistically significant amount – the use of a colon does not change the download rate.

Figures 3b and 3e present the average citations and downloads based on author team size. While it appears that there is slight growth in both impact quantities with author team size, this is a bit misleading because the sample size in the higher bins becomes small. The highest author-count bin, for instance, has only 4 and 3 papers in it for non-SC and SC papers, respectively, and the previous bin has 29 and 23, respectively. At author team sizes of 20 and below, there is an upward trend for both non-SC and SC papers, consistent with what was found by Moldwin and Liemohn (2018). However, the increase with author team size is not large nor is it monotonic.

The impact based on references in the paper are shown in Figures 3c and 3f. These two plots reveal a clearer, more pronounced upward slope with references. For the top bin, there is significant scatter in individual paper citations and downloads but, even for this bin, the difference of the average citation and download values with its neighboring bin values is statistically significant.

The final parameter to consider is paper type, shown in Figure 4. Seven categories of paper type are shown: Research Articles; Review Articles; Brief Reports; Methods Reports; Data Reports; Commentaries; and Introductions to Special Collections. Comments, Replies, Corrections, and Editorials have been excluded since they are more editorial in nature and typically receive few to no citations. Also shown are columns for the “all-paper average” values of citations and downloads. Regarding counts of each type, the Research Article is by far the most common with 7227 and 892 non-SC and SC papers, respectively. Next is the Brief Report, which has 324 and 11 papers in the non-SC and SC categories, respectively. Note that JGR-SP no longer uses this paper type, and all “brief report” papers since 2014 are submitted as Research Articles. This is followed by Methods Reports, which includes two paper types, the old (pre-2014) Techniques papers and the new Technical Reports: Methods papers, with 111 and 52 papers in the non-SC and SC categories, respectively. Similarly, the Data Reports group includes the old Data Report paper type as well as the new Technical Reports: Data paper type, having 12 and 3 in the non-SC and SC categories, respectively. Review articles are next with 7 and 25 papers in the non-SC and SC categories respectively. The fifth in the list is Commentaries, with 13 and 14 in the two categories, and finally Introductions to Special Collections, of which there

11 (with zero outside of collections). Yes, the final three paper types for all have more papers in SCs than not.

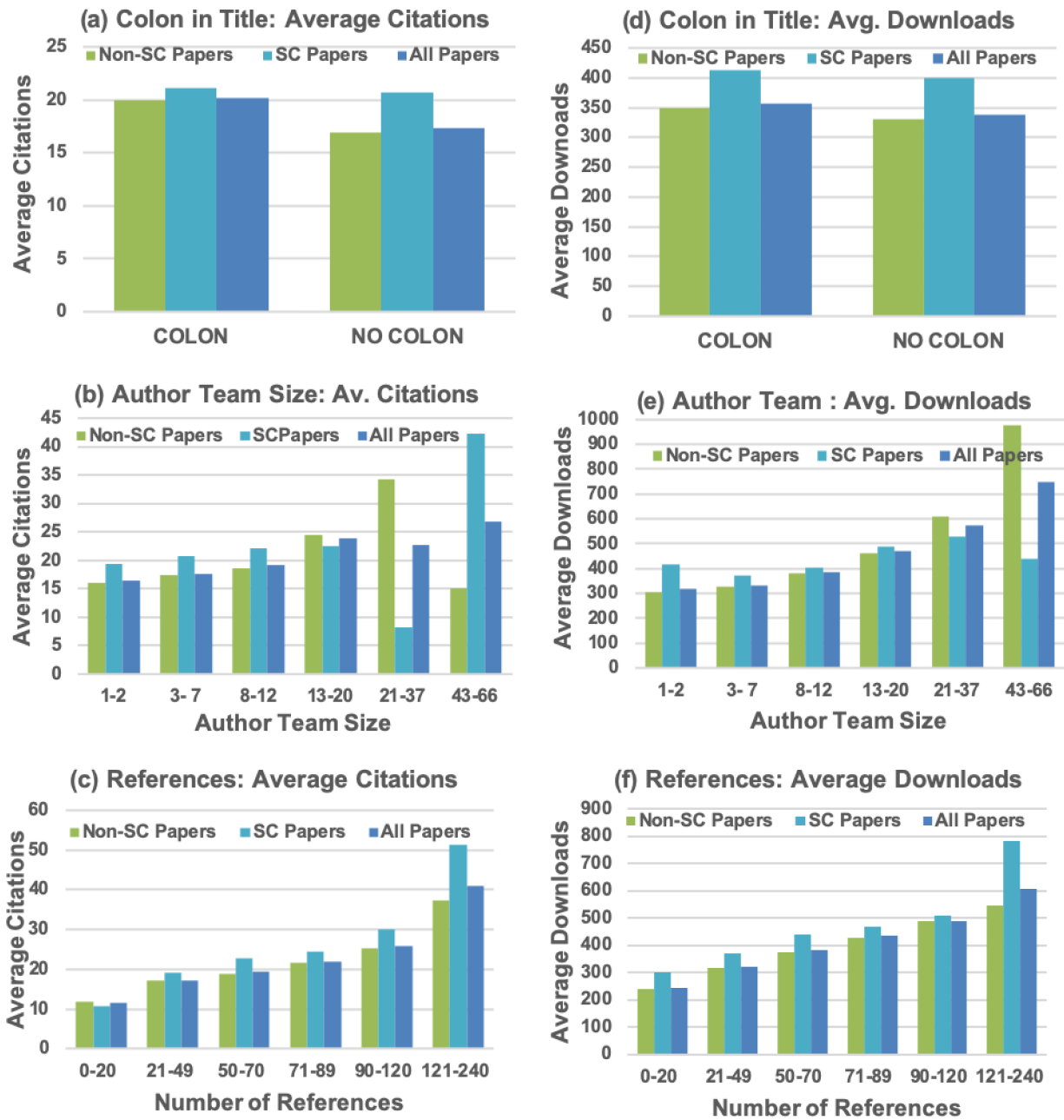


Figure 3. Parameter analysis of average citations (left column) and average downloads (right column), for the use of a colon in the title (panels a and d), the number of authors (panels b and e), and the number of references within the paper (panels c and f).

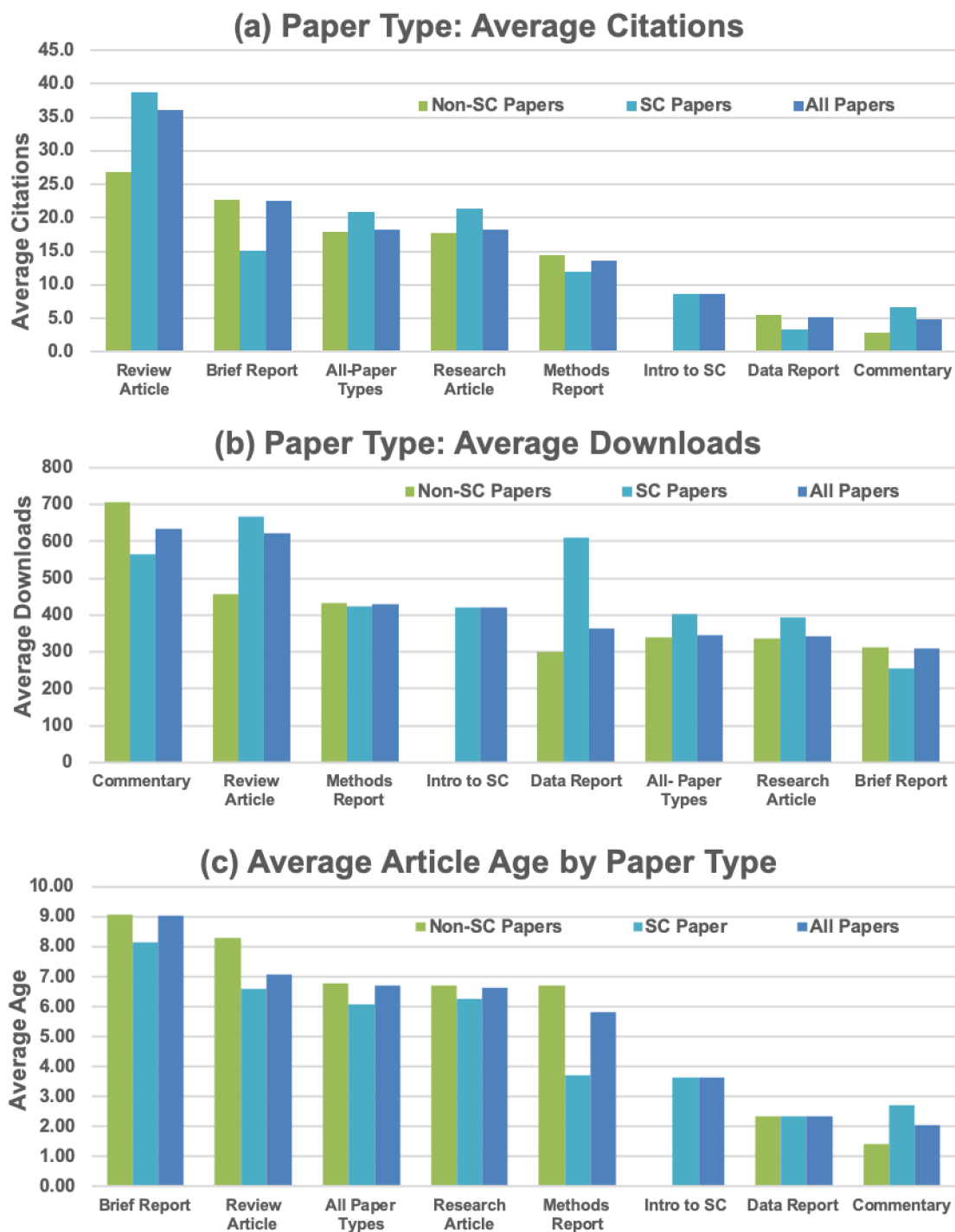


Figure 4. Average citations, average downloads, and average paper age according to paper type, with the columns showing results for papers in an SC or not.

It is seen in Figure 4a that citations of Review Articles outpace other paper types. This is expected. In addition to being a historically highly-cited paper type, in this dataset, after Brief

Report, they also have the highest average age compared to all of the articles (7 years old) as seen in Figure 4c, which allows them more time to accumulate citations. Brief report, a now retired paper type, is the oldest and second most highly cited paper type. It is interesting that Review Articles inside of SCs have a much higher average citation value than those not in SCs. It is also seen in Figure 4a that Methods Reports have fewer average citations than Research Articles, with SC Methods papers having fewer average citations than non-SC Methods papers while SC Research Articles have a higher average citation value than non-SC Research Article papers. Three categories – Introductions to SCs, Data Reports, and Commentaries – have significantly fewer citations than the other categories, whether in SCs or not. This is expected for Commentaries because they only came into usage for JGR-SP in 2016 (their average age is 2 years, as seen in Figure 4c).

The average downloads data in Figure 4b, however, reveals a different scenario. Commentaries are the most downloaded paper type. Despite their relative newness in JGR-SP, this high download value implies that they are widely read. Review articles are the second most highly downloaded article type, but just barely behind, with only 13 fewer average downloads (both SC and non-SC) than Commentaries. The next category is Methods Reports and Introduction to the Special Collection, both with an average of over 400 downloads per paper. Following these two is the Data Reports paper type, revealing a statistically significantly higher download count when these paper types are within an SC than when they are not. At the end of the list are the paper types of Research Article and Brief Report. These last two paper types were in the top half of citations.

Because the paper type average citations and average downloads are not further broken down by year, comparing any two paper types in Figures 4a and 4b needs to be done with the average paper age presented in Figure 4c. As revealed in Figure 2, the average citations in Figure 4a are biased toward the paper types with older papers, while the average downloads in Figure 4b are biased towards paper types with younger papers.

A caveat to Figures 2, 3, and 4 is that all SC papers were considered together instead of being considered separately for each of the collections published in JGR-SP. It is worth mentioning that the citation metrics presented here include citations to other papers in the same special collection. It could be that special collection papers are citing each other and, if this is true, then more papers in a collection would result in more citations to SC papers. This would be especially true for Preface/Introduction papers, which used to be written as short descriptions of the findings from each paper in the collection, thus contributing one citation to every paper in the collection. AGU journal editors decided in 2013 to end this practice, so none of the recent special collections include this augmentation to their citations. Also note that citations to other papers in the same collection would predominantly be within the same year as the original publication, because most papers in any given SC are published within the same calendar year. That is, this type of citation would mostly contribute to the Immediacy Index (average citations in year A to papers published in year A) of JGR-SP but not likely contribute to the Journal Impact Factor (average citations in year A to papers published in years A-1 and A-2) unless a citing paper within the same SC is published in the year following the cited paper's publication. Still, it is useful to assess whether attributes of the SC have an influence on impact.

To examine this, a final analysis was conducted to determine if some SCs have a particular characteristic that leads to more citations. One assessment considered the number of papers in the SC, addressing the question of whether larger SCs result in more citations for the

papers within them. This indirectly addresses the questions of within-collection-citations, being referenced by other papers within the SC, as well as self-citations, the authors of the SC papers more heavily citing the SC papers in later years, but doing so without going through the extra step of checking all citations to all papers in every SC. Plotting the average citations to papers in the SC against the paper count within the SC yields a linear correlation coefficient of -0.12, which is not statistically significant. There does not seem to be an influence on citations based on the number of papers in a collection.

A second assessment was conducted by calculating the average number of authors for all papers within each SC. This is another indirect way to check on self-citations, with the hypothesis being that more authors would lead to more citations of the papers from those authors. Plotting average citations to papers in the SC against the average author team size for papers in that SC yields a linear correlation coefficient of -0.06, which is not statistically significant. Therefore, at least through this indirect method, the evidence is against the notion of self-citations leading to more overall citations for papers in an SC.

3. Discussion

In summary, the impact metrics show that science-focused papers in special collections are more highly cited and read than non-special-collection papers published in JGR-SP. The increased download rate is also true for methods-focused special collection papers, but their citation rate is below that of non-special-collection papers.

One lesson to be learned from this is that special collections have a positive influence on the field. The qualitative reasons for having special collections that were listed in the introduction of this study are justified by the numerical analysis of recent special collections in the journal. The number of manuscript submissions goes up, as seen in Figure 1a with the steady upward trend of non-SC submissions and the transient bump of SC papers within the last 6 years. It is not just shifting of papers that would have been submitted later but a real increase in submissions as authors make the time in their schedules to complete their papers on these specific topics. As seen in Figure 2, both downloads of and citations to these papers are higher than for other papers in JGR-SP, indicating, at least by these metrics, a higher impact from papers in special sections.

A finding from Figure 3 is that the parameters found by Moldwin and Liemohn (2018) are confirmed in this larger database of papers but that none of the parameters examined here can explain the larger average citation and download values of SC papers. Specifically, the trends in both author team size and references in the bibliography are the same for both SC papers and non-SC papers. Furthermore, the use of a colon in the title is opposite for SC papers than for non-SC papers. These characteristics of the papers are not responsible for causing the increase in the citation and download metrics. Regarding the higher citations and downloads for SC papers relative to non-SC papers, it is either another factor not considered here or it is simply that the research community reads and cites a paper more when it is part of a collection.

Figure 4 reveals that there is some nuance to this simplistic finding of a positive influence. First, these plots show that citations to data-set-description and methodology-focused papers are cited less than their Research Article counterparts. By that metric, these papers are less impactful. Average downloads of these papers, however, especially when included in an SC, are significantly higher than for Research Articles. These findings imply that such papers do, in

fact, have a strong impact on the field, but this impact has not yet manifested in citations from scholarly publications.

A similar implication is seen in Figure 3d regarding Commentaries and Introductions to Special Collections. These paper types are cited less than Research Articles but have a statistically significantly higher average downloads value. They are not cited very much but they are read by others. Therefore, they have a notable impact on the field, even though they are not often cited by other scholarly literature.

Two assessments were conducted that indirectly address the issue of increased impact due to self-citations by authors of papers within the SC. No evidence was found supporting the idea that increasing papers or authors in the SC leads to more citations.

The differences in downloads and citations are statistically significant but not particularly large. That is, these are statistics, and any individual paper might flourish or flounder either within or outside of a special collection. In addition, there are, perhaps, other characteristics of papers that could lead to increased impact and citations that were not examined in this study.

The results of this analysis hopefully encourage those in the space physics research community, and even in other fields, to take part in more invited or special collections. Though there is an additional time commitment to contribute a paper that they may not have written otherwise, there seems to be a benefit to investing in such a project. Additionally, our results justify workshop/conference organizers to coordinate a special collection with a journal interested in accepting their themed submissions.

Acknowledgments and Data

This work was supported by the American Geophysical Union. This paper was written using citation data obtained on (13 September 2019), from Digital Science's Dimensions platform, available at <https://app.dimensions.ai>. Download and publication data was retrieved from Wiley Journal Insights on 13 September 2019. Submission data was retrieved from AGU's manuscript submission system. All of the data used in this analysis can be accessed via University of Michigan's Deep Blue repository, <https://deepblue.lib.umich.edu/data/>.

Submission note: a Deep Blue DOI will be minted upon acceptance of the paper. For submission, data files are zipped together and available as supporting information.

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