

# Publication Trends in American Meteorological Society Technical Journals

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## Abstract

Some statistical measures of growth of American Meteorological Society technical journals have been compiled. A general upward trend in total number of articles, pages, and an increase (nearly doubling during the past 20 years) in the average length of articles is found. Approximately half of this growth appears to be attributable to the increasing figure content of papers and half to the expansion of text apart from figures. Growth causes and impacts are discussed.

## 1. Introduction

Among the important challenges facing science today, the rapidly expanding body of scientific literature is one of foremost concern. It has recently been pointed out by Batchelor (1981) that during the past 15 or 20 years as many new papers have been published in scientific journals as had been published throughout all previous history. In atmospheric and oceanic sciences we have seen a growth in publications not unlike that of the other sciences. While publications growth is inevitable, it is probably worthwhile to look at its pattern and character, since this growth does have an impact on the effectiveness of communication within the science and, in fact, on the progress of science itself. With this short article, we intend to explore this matter by examining publication statistics for several of the journals of the American Meteorological Society (AMS). For a more general treatment of publication in science, we refer the readers to an excellent article on this subject by Batchelor (1981).

During the history of AMS, there has been an expansion in technical journal offerings, from two as recently as 1961 (*Bulletin of the American Meteorological Society* and *Journal of Meteorology*) to eight today. Additionally, most AMS technical journals have also increased their frequency of publication. One exception is the *Monthly Weather Review* (MWR), which obviously might experience a name problem with such a change. The *Journal of the Atmospheric*

*Sciences* (JAS), if the present trend continues, will become a weekly publication in 1993!

Irrespective of these changes, we are encouraged by the observation that through this period AMS has been able to maintain its high standards of quality and an unchanging journal format which have long kept AMS journals attractive vehicles for dissemination of research results. It is our impression from readers' comments that the issue of quality is and will continue to be of foremost importance. In addition, quality is so important to contributors that page charges do not appear to be a serious limitation to article size. Considering that on the average page-charge expenses for AMS journal articles amount to 2–4% of a typical total research budget (based on our crude estimates), we feel that such charges are not a serious limitation on reporting research results, nor should they be a limitation on this most important final product of research.

The growth of the atmospheric and oceanic science literature has caused many of us to reflect regretfully on our diminishing ability to keep up with advances in all areas of the science. It appears that in some sciences (e.g., physics) the era of even staying abreast of research within one's own subdiscipline may have passed (Mermin 1988). Personal subscriptions to all relevant journals in atmospheric and oceanic science, even within the AMS offerings, is now economically prohibitive. Even with a few subscriptions, many of our bookshelves are severely overloaded. This situation places increasing demands on library holdings, and now many libraries appear to be unable to handle the expense of increased journal offerings and escalating subscription rates (Mermin 1988). The electronic media may eventually remedy some of the problems of sheer volume; however, the explosion-of-knowledge issue will remain.

In the course of examining statistics for past issues of the *Journal of the Atmospheric Sciences*, we have become aware of some intriguing trends. The most important is that the average length of JAS articles has nearly doubled in the last twenty years. After discovering this trend for JAS, we examined several other AMS journals and found a similar pattern of growth. Various aspects, causes, and implications of this trend will be discussed.

## 2. Statistics for the *Journal of the Atmospheric Sciences* and several other AMS technical journals

Statistics reported in this section are primarily for *JAS*, although some findings for other journals will be given for comparison.

The *Journal of the Atmospheric Sciences* was formed in 1962 when the *Journal of Meteorology* was split into the *Journal of Applied Meteorology* (*JAM*) and *JAS*. Since then, *JAS* has expanded from 6 to 24 issues per year. For purposes of discussion, we will divide manuscripts into three categories: articles, notes, and comment and reply exchanges.

### a. Articles

A graph of the number of article pages per year since the inception of *JAS* is shown in figure 1. The nearly linear trend apparent through this period corresponds to an average increase of about 150 article pages per year. The number of articles per year has also increased, but at a slower rate, particularly during the last 10 to 15 years. It should be noted that the page and text sizes have remained essentially the same throughout this period.

The divergence of the two curves in figure 1 indicates that the average length of articles is increasing. This trend is shown in figure 2. In the 1960s, a *JAS* article averaged about 9 pages in length. From 1969 to 1987 the average length of a *JAS* article increased from 8.4 pages to 16.3 pages, nearly doubling in about two decades.

Interestingly, the increasing trends found for *JAS* also exist for at least three other AMS journals. The average article length for *MWR* from 1974 (when it was first published by the AMS) to 1987 follows the *JAS* trend very closely. Average *JAM* article lengths show a slightly different behavior early in this period, holding steady from 1962 to 1977, but then increasing as did those of *JAS* and *MWR* during the past 10 years.<sup>1</sup> The *Journal of Physical Oceanography* (*JPO*) average article lengths exhibit a growth trend similar to that of *JAS* and *MWR*.<sup>2</sup>

Upon examining these results, several questions arise. First, we may ask whether or not an increasing number of exceptionally long articles (arbitrarily defined as more than 28 pages) may be the primary contributor to the escalation in average article size. A time series of the size distribution of *JAS* articles

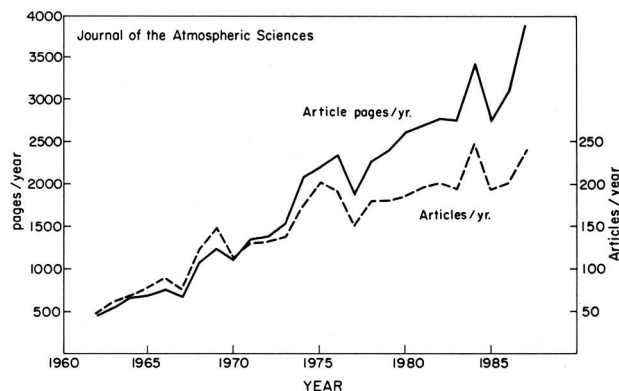


FIG. 1. Number of article pages per year and articles per year for the *Journal of the Atmospheric Sciences*.

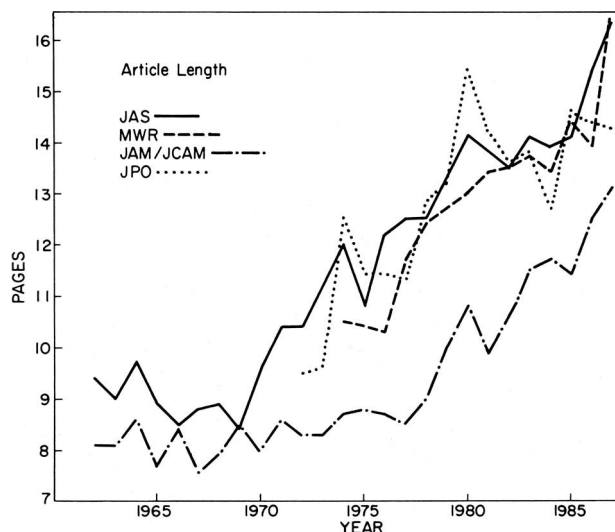


FIG. 2. Average article length for the *Journal of the Atmospheric Sciences* (*JAS*), *Monthly Weather Review* (*MWR*), *Journal of Applied Meteorology*/*Journal of Climate and Applied Meteorology* (*JAM/JCAM*), and *Journal of Physical Oceanography* (*JPO*).

(figure 3) suggests that the increase is not due to a greater number of exceptionally long articles. Since 1970 the percentage of articles exceeding 28 pages has not changed significantly. What has changed is the number of articles in the short (1–8 pages) and medium (9–20 pages) size ranges. Specifically, the number of short articles has decreased, whereas those in the medium-size range has increased. Additionally, the number in the 21–28 page range has been slowly creeping upward.

An obvious next question is: What is contributing to the increased article size? Is it longer texts, more figures, or a combination of both? To answer this question without expending an inordinate amount of effort, we elected to examine sample issues for their text-vs.-figure content (July issues primarily, at four-year intervals from 1962 to 1986). The results are

<sup>1</sup> *JAM* curve contains data for the *Journal of Climate and Applied Meteorology* from 1983 to 1987.

<sup>2</sup> An escalation in article length has also been observed for the *Journal of Fluid Mechanics* (*JFM*) by Batchelor (1981), although the growth there (40% from over a 25-year period from 1956 to 1981) has been more modest.

TABLE 1. JAS figure statistics.

Year	Number (Percent) of Pages Sampled	Months	Avg. Number of Figures per Article	Figure Area Percentage*
1962	134 (30%)	Jul., Sep.	$7.8 \pm (7.6)^\dagger$	16.6
1966	247 (33%)	Jul., Sep.	$9.2 \pm (7.7)$	24.6
1970	157 (14%)	May $^\ddagger$	$11.5 \pm (7.3)$	28.0
1974	270 (13%)	Jul.	$16.2 \pm (12.6)$	26.0
1978	180 (8%)	Jul.	$15.2 \pm (11.4)$	26.5
1982	229 (8%)	Jul.	$19.9 \pm (11.3)$	34.2
1986	230 (7%)	Jul.	$25.8 \pm (16.9)$	33.4

\* Computed as [(total area of all figures in all articles)  $\div$  (total area of all articles including figures)]  $\times$  100.

$^\dagger$  Standard deviation.

$^\ddagger$  May was selected because in 1970 July was considered not representative.

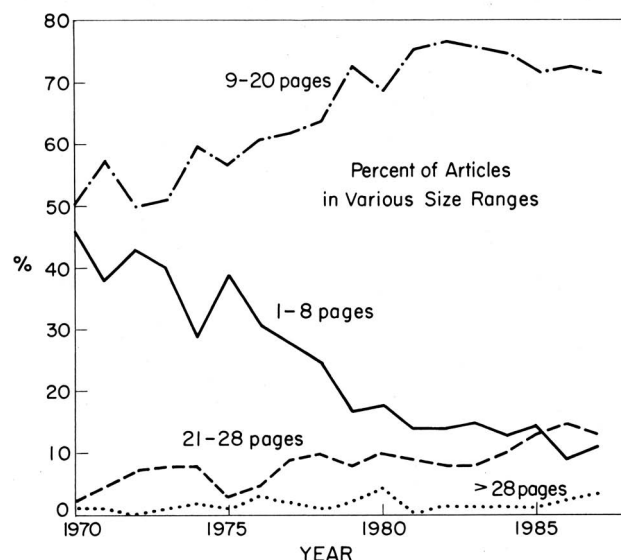


FIG. 3. Distribution of JAS articles by length.

shown in table 1.<sup>3</sup> This small sample from 1962 to 1986 indicates there has been a near doubling of the area occupied by figures in JAS articles, from about 17% to 33%. Similarly, the average number of figures per article has shown an upward trend, approximately tripling from eight to 26 between 1962 to 1986.

An important contributor to the doubling of JAS article length during the last twenty years has been an increase in their figure content. JAS articles have gone from an average 6.4 pages of text/2.1 pages of figures in 1966, to 10.3 pages of text/5.1 pages of figures in 1986. Some, though not all, of the four-page increase in text can probably be attributed to descriptions of the three additional pages of figures. A rough guess is that about half of the doubling of JAS articles can be attributed to figure and half to text growth (independent of figures).

<sup>3</sup> In counting figures, we have considered each component of a multi-part figure (often labeled a, b, c, etc.) to be a separate figure if it could approximately occupy a column width.

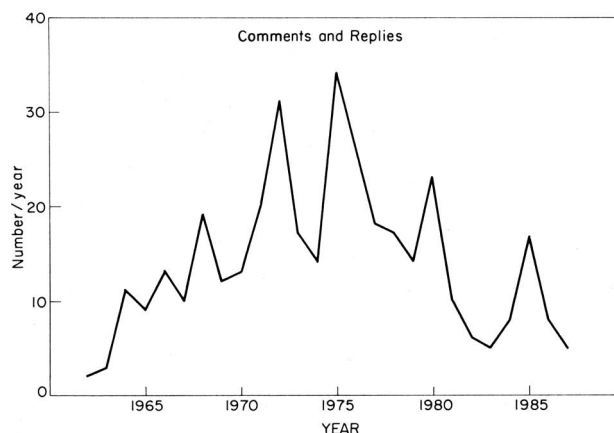


FIG. 4. Number of JAS Comments and Replies per year.

#### b. Notes

The average length of notes has shown the same escalating trend as articles (from three pages per note in 1962 to five pages in 1985). On the other hand, the average number of notes per year has declined significantly from a peak of about 43 per year from 1971 to 1973 to 17 per year in 1987. This change has no clear explanation, but may be attributable to the increasing length of notes, which could lead authors to prefer to submit their manuscripts as full-fledged articles.

#### c. Comments and replies

The frequency of comment and reply exchanges has shown an interesting behavior during the history of JAS. While the length of these submissions has not changed appreciably (averaging about two pages each over the period), the annual frequency of submissions has (figure 4). There appears to have been a peak in comments and replies in the early 70s, giving way to a general decline in recent years. We don't have an explanation for this trend, but hope that it is not an indication of an unwillingness to be openly critical in an environment of increased research proposal competitiveness. It may be simply an indication of the growing inability of the readership to keep up with the expanding publications.

### 3. Discussion

We had speculated prior to our study that the increase in article size might be a consequence of increasing figure content, considering the expanded availability of easily generated computer plots and graphs. A related speculation was presented by Batchelor (1981), namely, "that a significant part of the increase in the average length of papers in *JFM* [*Journal of Fluid Mechanics*] may be attributable to the vast amount of data (both experimental and theoretical) that is increasingly made available through the use of high-speed computers and to the lack of appreciation by some authors of the need to be selective in the presentation of such data." While an increasing figure content is indeed borne out by our analysis, and computer-generated plots may play an important role, we should be cautious about arguing that much of the increase in article length is unjustified and simply represents overuse of computer graphics. A case could be made, for example, that part of the escalation of article size is a justifiable reflection of the increased complexity of research today, as evidenced by far greater detail in observations (more sophisticated measurement systems) and modeling (greater computer power) than we have ever seen before.

We are not prepared to fully answer the question: Is the space used to present today's research results warranted? In part, it may indeed be. However, considering the implications of present doubling trends, there appears to be some justification for the viewpoint that changes in the way we prepare articles can and should be made. The imposition of limits on article length may seem like a reasonable solution, but it may have the undesirable effect of preventing the publication of justifiably long articles and, furthermore, may simply lead to the splitting of papers into several parts. A more attractive goal is conciseness in writing and presenting research results (not to the exclusion of essential details). Perhaps if more authors recognized the value of conciseness in enhancing the appeal of their work, they might commit more effort to this critical aspect of their research. Eventually, however, we may need to explore alternative approaches to publication, such as a combination of printed and electronic media (Batchelor 1981).

Rather than provide solutions here, it has been our purpose with this article to present some data relating publication trends within the AMS. It is hoped that further analysis and discussion of this problem will ensue.

As a guide for future thought and discussion on this matter, we present several ideas that have come to mind while considering these trends.

1. Our analysis indicates that expansion of figures and text account about equally for the increase in article length. This growth may to some extent be a natural reflection of the greater inherent detail and complexity of today's research. However, it could also be in part attributable to a general increase in authors' verbosity, as well as carelessness with increasingly available computer-generated plots. Curbing our appetite for these latter products may be a difficult task.
2. As the proliferation of articles continues, there will be a tendency for the longer papers not to be read, except by the appropriate specialists. This situation may tend to narrow the interest and research horizons of atmospheric and oceanic scientists.
3. Finally, we must also reluctantly admit that AMS journal editors could be viewed as being partly responsible for our dilemma. A common complaint seen in reviews is "given the information content, the paper is way too long." Often reductions are made, but they do not go far enough in the final versions of manuscripts. We probably cannot let editors off the hook, but it is likely that faults lie with all parties involved.

In summary, there is clearly evident today a growing challenge to effective communication in atmospheric and oceanic sciences. Satisfactory solutions to this problem probably do exist, but they will likely require important changes to the way we have traditionally presented our research results. In the least, we need to exercise restraint in the preparation of manuscripts if we want to keep the growth of published material in our sciences within normal and reasonable bounds.

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