

The L^AT_EX Extension Package AGU⁺⁺ for Use with AGU_TE_X

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Abstract. This paper describes how to use the AGU package (AGU_TE_X) for producing manuscripts, preprints, and camera-ready copy, together with an unofficial extension package called AGU⁺⁺. This extension adds extra features such as author-year citations with BIB_TE_X and true figures in the preprint version. Other extra features include corrected coding to avoid having to give certain numbers explicitly, sublabelling of equations, figures, etc., and balancing two columns of text on the last page. These features were all part of my older unofficial AGU package and are thus well-known among its users.

Introduction

At the beginning of 1994, the American Geophysical Union (AGU) finally came out with its own official L^AT_EX package for producing manuscripts and camera-ready copy for its journals. At the same time the format of the journals was dramatically altered. Thus my unofficial L^AT_EX package for AGU (`art-jgr` and `art-gr1`) became not only superfluous but obsolete.

However, in looking over the instructions and coding of the official package, I realize that not only are some imperfections present, but many useful features of my styles are missing. The most noticeable of these is the means of using author-year citations with BIB_TE_X in an automated manner.

The coding imperfections are related to the way in which figure captions and tables are treated: they must be placed at the end of the document, and if an appendix is present, then the automatic numbering system will consider them as appendix figures and tables (numbered A1, A2, ...). To avoid this, explicit numbers must be given, something that violates the essential principles of a formatting program like L^AT_EX. A second implication of this treatment is that preprints will be missing the figures and tables in the text. In my older system, neither of these problems occurred.

By popular demand, I have undertaken to write an extension to the official AGU package, called AGU⁺⁺ (for AGU doubly-ionized or super-charged, as you please). It includes my extra features without changing any of the formats of the original package. The user should prepare his documents in the manner described by the AGU, except that figures, tables, and plates are to be included *in the text* as described below. A number of extra commands are available to control and/or enable the extra features.

Version 4.0 of AGU_TE_X was released in August 1996, adding the doubled captions and the supplemental abstract, things which already existed in AGU⁺⁺. Some recoding was necessary in this package to accommodate those changes. (Actually, the changes had to be nullified!)

This manual explains the official package with my extensions. This is to enable the user to obtain all the necessary information in one article rather than to have to search among several. It is not meant to serve as instructions for the standard AGU package alone, although differences will be indicated; neither is it intended to be a manual for L^AT_EX, since it assumes that the user already understands the workings of that text formatting scheme. The basic manual for L^AT_EX is *Lamport* [1994]; a more recent and more extensive work is by *Kopka and Daly* [1999].

The Official Package

The official AGU package is called AGU_TE_X. It consists of an instruction manual (`aguguide.tex`), a sample article (`sample.tex`), and, of course, a number of *style options* that are to be used with the standard main style `article`. These are

`agums` to produce a manuscript for submission;

`agupp` to produce a preprint in two-column format (like this paper) for distribution to colleagues;

`jgrga` to produce camera-ready copy (or *galley proofs*) for the *Journal of Geophysical Research* (JGR), the *Global Biogeochemical Cycles*, and *Paleoceanography*;

`grlga` to produce camera-ready copy for *Geophysical Research Letters* (GRL);

`tecga` to produce camera-ready copy for *Tectonics*;

`paleo` to produce camera-ready copy for *Paleoceanography*;

`radga` to produce camera-ready copy for *Radio Science*;

`rtjga` to produce camera-ready copy for *Russian Translation Journal*.

For example, the first line of the document should be something like

```
\documentstyle[jgrga]{article}
or \documentstyle[agums]{article}
```

for JGR camera-ready copy or a manuscript, respectively.

Note that the term *galley proofs* is more accurate than *camera-ready copy*, since the latter implies finished pages in 1-to-1 relation with the final journal article. In fact, the papers are still cut and pasted together, with figures and tables inserted by hand. However, I will continue to refer to the galley proofs as camera-ready copy since this is the terminology that most of us are used to.

The New L^AT_EX Standard

On 1994 June 1, a new improved, modernized L^AT_EX was released and declared to be the only supported standard. This new version is called L^AT_EX 2_ε. The older one, version 2.09, is still available but will no longer be updated. It is also expected that L^AT_EX programmers who write extension packages (like AGU_{T_EX} and AGU⁺⁺) will do so in future only for L^AT_EX 2_ε.

L^AT_EX 2_ε can operate in one of two modes. The *native mode*, which is more efficient, is invoked by calling `\documentclass` in place of `\documentstyle`. In the new jargon, what used to be *main style* (e.g., `article`) is now a *class*, and *style options* (like `agupp`) are called *packages*, to be loaded with the command `\usepackage`.

There is also a *compatibility mode* that emulates the 2.09 version, allowing older documents and many (but not all) extension packages to run just as before. It is the `\documentstyle` command that activates this mode. As it now stands, AGU_{T_EX} (version 4.0) will not run in native mode, but will proceed in compatibility mode, with some minor discrepancies. (In `agums`, for manuscripts, 12 pt should be selected, otherwise the file `art12.sty` is read in; this file no longer exists in L^AT_EX 2_ε.)

I now provide AGU⁺⁺ for both versions of L^AT_EX: as a style option `aguplus.sty` for 2.09 or compatibility, and as a class file `aguplus.cls` for L^AT_EX 2_ε native mode. The latter also fixes up the problems in AGU_{T_EX} so that it can run in native mode, but only with AGU⁺⁺.

By providing a class file for L^AT_EX 2_ε instead of a package, I can distinguish between the two with the file extension. The alternative would be to issue two versions with identical names, which could cause headaches.

The Extension Package

The AGU⁺⁺ extension package requires that AGU_{T_EX} be present and available on the system. It does not replace the official AGU package, but rather uses it with modifications.

For L^AT_EX 2_ε, AGU⁺⁺ is called as a class with one of the AGU_{T_EX} packages as an option, as e.g.

```
\documentclass[jgrga]{aguplus}
```

This loads the `article` class and then the selected package before making the AGU⁺⁺ modifications. (Do not load the AGU_{T_EX} package with `\usepackage`, since that would undo those modifications.)

Of the regular options to `article`, only `twoside` is meaningful, and then only with the preprint `agupp` choice; there is no point in selecting `titlepage`.

The manuscript produced with `agums` is double spaced. In order to generate a single space manuscript, add the option `tighten`, or include the command `\tighten` in the preamble. (Reminder: the *preamble* is everything that comes before `\begin{document}`.) To alternate between single and double spaced text, use the commands `\singlespace` and `\doublespace` anywhere in the text.

For L^AT_EX 2.09, AGU⁺⁺ is included by adding the option `aguplus` after the AGU_{T_EX} option name, as e.g.

```
\documentstyle[jgrga,aguplus]{article}
```

Organization of the Paper

Front Material

Before the main body of the text, some information about the manuscript and paper must be given. This information may actually be printed at the end of the article, depending on which option has been selected, but it is always entered at the start, before `\begin{document}`.

```
\received{date_received}
\revised{date_revised}
\accepted{date_accepted}
```

These commands enter the relevant dates, which are only meaningful for the camera-ready copy. They will be communicated to the author by the editor.

```
\journalid{vol}{journal_date}
\articleid{start_page}{end_page}
\paperid{manuscript_id}
```

Again, this information will be communicated to the author by the editor. (It seems that at the moment the first two do not really do anything at all, but may be provided for the future when AGU dispenses with cutting and pasting and goes to true camera-ready production.)

```
\copyright{type}{year}
\ccc{code}
```

These enter copyright information, for which *code* will be communicated to the author. The *type* is one of

AGU for AGU copyright

Crown for (Commonwealth) government copyright

PD for public domain (no copyright)

```
\lefthead{authors}
\righthead{short_title}
```

These commands permit text for the running heads to be included. For the camera-ready copy, they are (currently) printed out so many times at the end (later cutting and pasting!) but with `aguplus`, they will be added at the top of each page of the preprint.

```
\slugcomment{text}
```

With this command, the author may include his own text to be printed at the top of the preprint title page, such as “This article is to appear in ...” It should be given before the `\title` command.

The information that is printed at the end of the camera-ready copy comes after the list of references, and the output is part of that command. If there are no references, then the information must be forced out with the command

```
\forcesluginfo
```

following the main text.

Declarations for AGU⁺⁺

A number of additional AGU⁺⁺ declarations are available to enable or modify some of the features. These may all be given in the preamble too, although some may actually be permitted anywhere in the document. They are all described later, but are listed here for completeness.

`\sectionnumbers` turns on section numbering; default is no numbering, as preferred by AGU; must be given before the first `\section` command.

`\extraabstract` prints a supplemental abstract at the end of the camera-ready version, as required by JGR; this may be invoked anywhere in the paper, for it only enables the output which always comes at the end.

`\printfigures` causes the figures and plates to be output at the end of the manuscript and camera-ready copy; this is in addition to the figure captions that are always output and is only meaningful if the `figure` and `plate` environments really contain something to print.

`\figmarkoff` suppresses the printing of marginal notes next to the location where `figure`, `plate`, and `table` environments occur; by default such marginal notes are enabled.

`\figmarkon` re-enables the marginal notes; these two declarations may be given as often and wherever one feels they are needed.

`\doublecaption{35pc}` enables the printing of all figure and plate captions in two widths: once in the single column width and again in the width specified, here 35 pc; JGR requires that all captions be provided in two sizes. (AGU_{TEX}-4.0 provides this feature automatically.)

`\afour` changes the page layout to be more appropriate to European A4 paper; for camera-ready this means only that the page is slightly longer but the column width remains the same.

Title and Authors

The preamble is ended with `\begin{document}`, and the title and author information are given.

*Contrary to standard L^AT_EX, the title and authors are printed by the commands that enter the information. This means these commands **may not be given in the preamble!** For many authors, this means changing long-standing habits.*

The coding in AGU⁺⁺ corrects this, so that the traditional L^AT_EX behavior is re-established.

```
\title{full_title}
\author{names}
\affil{organization}
\authoraddr{full_address}
```

The order of these commands is important. First comes the `\title`, the argument of which may be broken up into lines with `\\` commands (not absolutely necessary). Next come sets of `\author` and `\affil` commands, one set per author organization. (*This again is different from standard L^AT_EX where \author is given only once.*) Finally, the `\authoraddr` command is given (anywhere) once for each author, with the name and full postal address as argument.

An alternative method of presenting the authors is with footnotes for the affiliations. This is done with the commands

```
\altaffilmark{numbers}
\altaffiltext{number}{text}
```

The first command is included in the text of the `\author` command; the second is given once per footnote afterwards. For example,

```
\author{J. P. Smith\altaffilmark{1,2}
and C. J. Jones\altaffilmark{2}}
\altaffiltext{1}{On leave}
\altaffiltext{2}{Research Institute X}
```

The two methods (`\affil` or footnotes) may be combined.

The `\authoraddr` commands should rightly come in the preamble after the copyright information. Their arguments are printed out only for the camera-ready copy, at the end.

The Abstract

Following the title comes the abstract. This is given as in standard \LaTeX within an `abstract` environment, as

```
\begin{abstract}
This is the text of the abstract. . .
\end{abstract}
```

The Text Body

The rest of the body of the article is organized into *sections*, *subsections*, and *sub-subsections*, with commands `\section{heading}`, `\subsection{heading}`, and `\subsubsection{heading}`, whereby the third-level *heading* should capitalize only the first word and end with a period.

For $\AGU\TeX$ version 4.0 and later, all the text from the first section to the end of the references is to be included within the `\begin{article}... \end{article}` environment. With \AGU^{++} , this environment is optional.

This is a third-level heading. It has been entered with: `\subsubsection{This is a third-level heading.}` with the final period included. (In the camera-ready copy, the third-level heading is run into the following text on the same line.)

Sections are normally not numbered, unless the \AGU^{++} declaration `\sectionnumbers` has been issued. The \AGU manual states that section numbering should be carried out *by explicitly including the numbers in the heading text*. This would violate a fundamental principle of a formatting language like \LaTeX , and will lead to much annoyance when sections are referred to or are changed. The \AGU 's argument is that \LaTeX will not

format the numbered sections in the way that it wants them. \AGU^{++} has corrected so that the automatic numbering may be used.

Appendices

As in normal \LaTeX , the declaration `\appendix` is issued at that point where the appendices are to start. This command redefines a number of things so that the sectioning commands now function as appendix headers. The numbering of equations and tables is also changed.

With \AGU^{++} , the numbering of figures and plates is also changed. I think it was an oversight on the part of \AGU not to do this too, for it seems strange to have such inconsistent behavior. Besides, there are enough examples in previous \AGU publications where figures too are numbered within appendices.

If there is only one appendix, it should be introduced with the command `\section*` rather than `\section`. Recall that the starred versions suppress section numbering, or in the case of appendices, lettering.

The standard \AGU package requires that the appendix letter be included in the heading text. This is the same repugnant notion as putting section numbers in explicitly. In \AGU^{++} , this is not necessary. Thus where \AGU says to give `\section{Appendix A: Title}`, it is sufficient to type only `\section{Title}` (or `\section*{Title}` if there is only one appendix).

The Acknowledgments

Acknowledgments come after the main text, including appendices, but before the list of references. They are introduced with one of the commands

```
\acknowledgments
\acknowledgment
\acknowledgements
or \acknowledgement
```

Both the American and British versions of the command names print the same result: the American spelling!

Floats

The major difference between the official \AGU package and \AGU^{++} is the treatment of figures, plates, and tables, objects that are referred to as 'floats' in \LaTeX terminology because they do not appear where they are typed in in the text, but move around to an appropriate

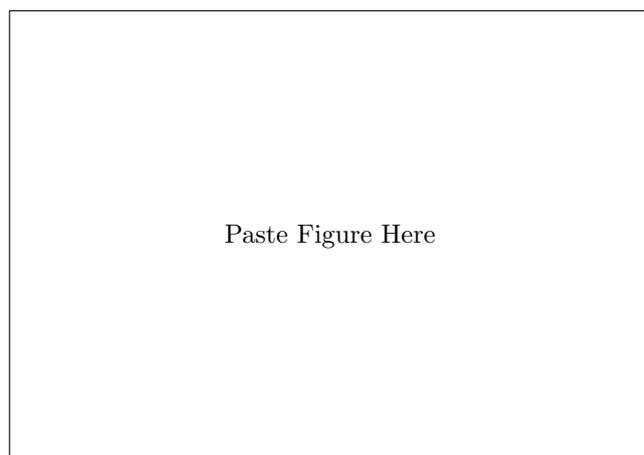


Figure 1. A demonstration paste-in figure. The width was given as `\hsize` (the column width), the height as 6 cm.

location. The AGU standard package wants *all* floats to appear at the end of the manuscript and camera-ready copy (fair enough), and the figures and plates to be printed *only as captions*. This means that the preprints will also only exhibit the captions, and that all floats come at the end and will not be integrated in the text.

Another major, ridiculous problem, is that if there is an appendix in the work, then all floats entered at the end must be given explicit numbers, for otherwise L^AT_EX automatic numbering will treat them as appendix items with corresponding numbering. I have already expressed my sentiment about explicit numbering.

With AGU⁺⁺, these problems are solved. Floats are entered in the text *where they are first referred to*. For preprints, they are then printed in the text as in a normal L^AT_EX article; for manuscripts and camera-ready copy, only a marginal note is printed with the number, something AGU insists on anyway. (This may be suppressed with `\figmarkfalse` and reinstated with `\figmarktrue`.) The figure and plate captions are then automatically listed at the end, followed by the tables, followed optionally by the figures and plates themselves.

Figures and Plates

Figures are entered in the `figure` or `figure*` environments, the latter being intended for double-column figures in two-column (preprint) format. Both environments produce identical results for manuscripts and camera-ready. The AGU provides a command `\figurewidth` to specify the *width of the camera-ready caption*; if it is omitted, the caption width is the normal column width. There is a limited number of allowed values as arguments: 20 pc (the default single-column width), 35 pc, and 41 pc. (For *Radio Science* with `radga`, the values are 19, 33, and 38 pc.)

JGR is still demanding that all figure captions be

printed twice, once in width 20 and again in 35 pc. To enable this, give `\doublecaption{35pc}` somewhere in the document, preferably in the preamble so you notice it.

The standard AGU package says that a `figure` environment should contain only an optional `\figurewidth` command and a compulsory `\caption` command, and nothing else. AGU⁺⁺ allows real figure contents to be included, but packed in a special `\figbox`. This command takes three arguments: the width and height of the box, and the figure contents. The contents may be merely a note about what figure is to be pasted here, or a diagram made with `picture` or PICT_EX, or an imported figure from other software, such as an encapsulated PostScript¹ file.

There is also a starred version `\figbox*` that behaves exactly the same as `\figbox` except that no frame is drawn around the figure. This is most useful for real figures, whereas the unstarred command is more appropriate for reserved space for glued-in figures.

Examples of input text for figures are:

```
\begin{figure}
\figbox{\hsize}{6cm}{Paste Figure Here}
\caption[] {A demonstration paste-in figure.
The width was given as {\tt hsize}
(the column width), the height as
6~cm.\label{fig:demo}}
\end{figure}

\begin{figure*}
\figurewidth{35pc}
\figbox*{}{}{%
\includegraphics[width=35pc]{myfig.eps}}
\caption{A plot of Y versus X for various
times\label{fig:my}}
\end{figure*}
```

For this to work, you must have loaded the `graphicx` package with `\usepackage` at the beginning, and you must have a PostScript driver for the output. (There are other packages with different syntaxes for importing graphics; use the one that you are most familiar with.)

The result of the first example is shown in Figure 1.

The `\figbox` command reserves a framed box of the specified size and centers the contents both horizontally and vertically. It makes use of the standard L^AT_EX `\framebox` command, which can be customized with the parameters `\fboxrule` and `\fboxsep`. To suppress the rule altogether, use `\figbox*` rather than setting `\fboxrule` to zero, since this will turn off the box around the marginal notes.

It is possible to have `\figbox` and `\figbox*` scale automatically to the size of its contents, something that

¹PostScript is registered trademark of Adobe-Systems Incorporated.

is useful when the contents are a real figure. If the first argument (the width) is left empty, both dimensions are automatically set; otherwise one can specify the width and leave the second (height) empty for automatic sizing. Thus the possibilities are:

```
\figbox{}{}{...}      scales both au-
                        tomatically
\figbox{\hsize}{}{...} sets width to
                        column width, height automatically
```

Plates are made up in exactly the same way as figures but with the `plate` and `plate*` environments. These are not part of standard L^AT_EX, but have been added for AGU publications. In place of `\figurewidth`, one must use `\platewidth`; however, `\figbox` and `\figbox*` work for plates as well.

Tables

Tables function somewhat differently from figures and plates because their contents will always be printed. Thus there is no equivalent of `\figbox` for tables.

Tables are constructed with the L^AT_EX `tabular` or `tabbing` environments, as described in the manuals. To make them into floats, they must be included in a `table` or `table*` environment. For AGU⁺⁺, they are to be placed in the text where appropriate, and not at the end as in standard AGU_TE_X. There is an AGU command `\tablewidth` to set the width of the table caption. Allowed values are 20, 30, 41, 48–57 pc, except for *Radio Science* which has 19, 20, 37, 43–51 pc.

The AGU package contains some additions to standard L^AT_EX to put footnotes and comments in a table. These are

```
\tablenotemark{letter}
\tablenotetext{letter}{text}
\tablecomments{cmnt_text}
```

The footnotes are numbered with lowercase letters which the author must enter explicitly. The `cmnt_text` is explanatory material that is printed below the table. These will all work with AGU⁺⁺ as well.

AGU_TE_X also provides an additional table-making environment, called `planotable`, for tables that may be continued over several pages. This too works with AGU⁺⁺.

The `planotable` environment is encouraged by AGU, because it automatically formats the tables with the three horizontal rules that they want: after the title, after the column headings, and after the table data. A typical example would look like

```
\begin{planotable}[lcc]
\tablewidth{20pc}
\tablecaption{Coordinates of stations}
\label{tab:coords}}
```

Table 1. Coordinates of stations

Station	θ^a	ϕ^b
Brixstone	45°	90°
Wilstone	−45°	−50°
Tipstone	56°	124°

^aLatitude, north > 0

^bLongitude, east > 0

Taken from Broodey [1976]

```
\tablehead{\colhead{Station} &
\colhead{\theta\tablenotemark{\it a}} &
\colhead{\phi\tablenotemark{\it b}}}
\tablenotetext{\it a}{Latitude, north >0}
\tablenotetext{\it b}{Longitude, east >0}
\tablecomments{Taken from Broodey [1976]}
\startdata
Brixstone & 45^\circ & 90^\circ \nl
Wilstone & -45^\circ & -50^\circ \nl
Tipstone & 56^\circ & 124^\circ
\end{planotable}
```

The result is shown in Table 1.

Additional commands possible are

`\tablebreak` to force a page break in the middle of table;

`\nodata` for table elements that are empty;

`\cutinhead` to add new heading centered across whole table.

Note: users who are familiar with the `longtable` environment from the package of the same name may use it too in place of `planotable`. However, be aware that that environment does not work in two-column mode. This means you can use it for manuscripts and camera-ready copy, but not for two-column preprints.

Citations and List of References

The great disappointment in AGU_TE_X is the lack of a decent author-year citation scheme and BIB_TE_X style file. This is corrected with AGU⁺⁺, which also provides the bibliography style file `agu.bst` along with the interfacing to use it correctly.

Even if one does not make use of BIB_TE_X to generate the list of references, one may type it in oneself as a `thebibliography` environment. The form of the entries must be observed, however.

```
\begin{thebibliography}{} %<-- Note {}
```

```
\bibitem[Smith {\it et al.}(1992)]{smi92}
Smith, J. G., P. G. Jones, and F. H. Weston,
Some results, {\it J. Strange Results},
{\it 32}, 345--350, 1992
```

```
\bibitem . . .
\end{thebibliography}
```

Each `\bibitem` entry contains in square brackets the text that should appear in the citation, *but with the year in round parentheses*. Following that is the *key* to refer to the citation, here `smi92`. This is also the key that is used to identify a reference in a BIB_{TEX} database. Of course, it is much easier to make up such a database and let BIB_{TEX} generate the `thebibliography` environment. This is done with commands

```
\bibliographystyle{agu}
\bibliography{database}
```

where *database* is the name of the bibliographic database file(s) that are to be searched by BIB_{TEX}. (The BIB_{TEX} program must also be run after at least one L^AT_{EX} processing, and then L^AT_{EX} must be run at least two times more.)

In the main text, the commands `\citet` and `\citep` are used almost as in standard L^AT_{EX} to print the citation, but with the following variations:

```
\citet{smi92}           ⇒ Smith et al. [1992]
\citep{smi92}           ⇒ [Smith et al., 1992]
\citep[p.~3]{smi92}     ⇒ [Smith et al., 1992, p. 3]
\citep[see []]{smi92}  ⇒ [see Smith et al., 1992]
```

Note that the use of optional arguments is somewhat different from that of normal L^AT_{EX} where only a single argument in square brackets is allowed to place a note *after* the citation. Here one optional argument behaves that way, but if there are two, then the first goes before, the second after the citation. This is because in author-year citations one often wants to say [see Smith *et al.*, 1992, and references therein].

Multiple citations may be made with one `\citep` command:

```
\citep{smi92,jam89} ⇒ [Smith et al., 1992;
                        James, 1989]
\citep{smi89,smi92} ⇒ [Smith et al., 1989, 1992]
```

It is also possible to cite the authors and years of a reference separately, as

```
\citeauthor{smi92} ⇒ Smith et al.
\citeyear{smi92}   ⇒ 1992
```

Other Features

These are the major features of AGU⁺⁺, but there are a few more nice frills that are provided at no extra charge.

Improved Preprint Title

The AGUT_{EX} style `agupp` puts the title, authors, and abstract on a titlepage and starts the two-column mode with the first `\section` command on the next page. Frankly, this looks cheap. By selecting the option `twocolumn` explicitly, the title and authors are put on the same page as the opening text, but the abstract goes into a narrow column. (This is actually standard L^AT_{EX}, so one should not complain.) AGU⁺⁺, on the other hand, puts the title, author, and abstract all across the two columns of the starting text. This is illustrated on the first page of this paper. Furthermore, the information in `\lefthead` and `\righthead` are added in the running heads; the option `twoside` may be used to effect here. This looks far more professional, more like a reprint than a preprint.

Notation List

If there is to be a list of notations used, AGU wishes it to appear after any appendices but before the acknowledgements and reference list. They recommend using the `tabular` environment, which has some inconveniences, such as it cannot continue on to another page and one has to adjust a width manually.

AGU⁺⁺ provides the `notation` environment for this, which takes as its argument the longest symbol to be listed. For example

```
\begin{notation}{$V_{\mbox{\small max}}$}
\item[$V$] velocity in general
\item[$V_{\mbox{\small p}}$]
      proton velocity
\item[$V_{\mbox{\small max}}$]
      maximum velocity
\end{notation}
```

This produces an unnumbered section heading **Notation** with the listing:

Notation

```

V   velocity in general
Vp proton velocity
Vmax maximum velocity
```

Supplemental Abstract

JGR requires an additional abstract with the paper number for printing in the JGR-Space Physics Subsets. By including the declaration

```
\extraabstract
```

anywhere in the paper (preferably in the preamble), this will be printed automatically as the very last page of the camera-ready copy. For other versions, it does nothing, so that it may be left in all the time.

Note: AGU_{TEX}-4.0 provides this feature too, with the command `\printabstract` just before `\end{document}`. This only works for `jgrga.sty`.

Sublabelling

Sometimes it is required to label some equations, figures, or tables as 4a, 4b, 4c, . . . , that is, to sublabel them. This can be done with the pair of commands

```
\sublabon{counter}
\sublaboff{counter}
```

where *counter* is one of `equation`, `figure`, `plate`, or `table`. For example,

```
\sublabon{figure}
\begin{figure}
  \caption{Caption of fig. 4a}
\end{figure}
\begin{figure}
  \caption{Caption of fig. 4b}
\end{figure}
\sublaboff{figure}
\begin{figure}
  \caption{Caption of fig. 5}
\end{figure}
```

The `\sublabon` contains an implicit `\sublaboff` so it is not necessary to turn the sublabelling first off then on again in order to step the main counter: a single `\sublabon` will do the job.

AGU_{TEX} provides a `mathletters` environment that is equivalent to `\sublabon{equation}`. There is no reason not to use this with AGU⁺⁺ too.

Balancing Two Columns

An annoying thing about the L^AT_{EX} two-column mode is that the two columns on the last page are of different lengths. The AGU⁺⁺ package contains the command `\balance` that activates the equalizing of columns of text on one page. Since this sometimes causes problems with floats and footnotes, it is better to issue it only on the last page. More precisely, it should appear somewhere in the text of the (unbalanced) left-hand column of the last page. Obviously, it only makes sense for preprints; in other modes, it has no effect, and may safely be left in the text.

The counter command `\nobalance` undoes the equalizing if this should be necessary.

Alternative Text for One and Two Columns

Often one needs to format text differently for the narrow columns of the preprint and camera-ready copy than for the wider columns of the manuscript. This is especially so for mathematical formulas. Since it is frustrating to have to alter the text every time one changes

between manuscript and other output, AGU⁺⁺ provides the command

```
\iftwocol{two_col_text}{one_col_text}
```

to be able to keep the alternative versions always present. The *two_col_text* will be printed for preprints or camera-ready copy (which ultimately appears as double columns) and *one_col_text* for manuscripts.

Conclusions

The extension package AGU⁺⁺ adds features to AGU_{TEX} that have been gained over many years of practical experience of providing camera-ready copy to JGR and GRL. It has not been thought up out of the blue, but derives from feedback between the author, his colleagues, other users, and their interactions with the AGU copy editors, who often have been quite frustrating in their demands. The extension package is a distillation from the full-fledged L^AT_{EX} styles `art-jgr` and `art-grl`. However, since AGU⁺⁺ is an extension to AGU_{TEX}, it simply assumes the layout specifications given to it, and so should be able to survive any future format alterations.

It is the offspring of a battle-tested warrior and as such should be able to provide much more sturdy service. Its major advantages over standard AGU_{TEX} are

1. explicit numbering of many items can be avoided,
2. figures, plates, and tables may be put into the text so that decent preprints are made with a minimum of changes (simply by changing an option in `\documentstyle` or `\documentclass`),
3. and yet figure captions and tables appear at the end as required for manuscripts and camera-ready copy,
4. author-year citations may be done comfortably with BIB_{TEX},
5. appendices do not require explicit lettering, nor do they imply that tables must be explicitly numbered afterwards,
6. sublabelling of counters other than `equation` is possible,
7. alternative text may be inserted for narrow and wide columns so that, for example, math formulas always fit properly,
8. the appearance of the first preprint page is improved, with title, authors, and abstract across the two columns of text,
9. the two columns on the last page of a preprint may be nicely balanced.

The main emphasis of AGU⁺⁺ is that explicit numbering should be avoided at all costs, and that the text should be able to output manuscripts, camera-ready copy, and preprints, with only a simple change to the `\documentstyle/class` command.

Appendix A: Encapsulated PostScript

As mentioned here, it is possible to include encapsulated PostScript files in a figure or plate, but within a `\figbox*` frame. What makes a PostScript file ‘encapsulated’ is the addition of certain standardized comments, the most important of which, for our purposes, is the *bounding box specifications*. This tells L^AT_EX (more properly the dvips driver) how to scale and shift the diagram to make it fit into the reserved space.

However, many application programs cheat on the bounding box. It is not trivial to calculate (I know, for I have written a program to do it), so many programs just give the size of the full page. In this case, the figure will not fit so well into `\figbox*`, which places the center of the specified bounding box in the center of the `\figbox*`. If your figures come out displaced, or too small, then this may be the problem. A bounding box adjustment is necessary.

For encapsulated PostScript diagrams, or for any other real figures, it is better to use `\figbox*` rather than `\figbox` in order to suppress the frame drawn around the figure.

Appendix B: A Template for an AGU⁺⁺ Article

I present here the outline of a source file with the essential AGUT_EX and AGU⁺⁺ shown.

```

\documentclass[twoside,agupp]{aguplus}
%\documentclass[agums]{aguplus}
%\documentclass[jgrga]{aguplus}
% STANDARD PACKAGE FOR GRAPHICS
\usepackage{graphicx}
% ALTERNATIVELY: (LaTeX 2.09)
%\documentstyle[twoside,agupp,aguplus]{article}
%\documentstyle[agums,aguplus]{article}
%\documentstyle[jgrga,aguplus]{article}
% AGU++ OPTIONS
%\printfigures           % ADDS FIGURES AT END
%\doublecaption{35pc}  % CAPTIONS PRINTED TWICE
%\sectionnumbers        % TURNS ON SECTION NUMBERS
%\extraabstract         % ADDS SUPPLEMENTAL ABSTRACT
%\afour                 % EUROPEAN A4 PAPER SIZE
%\figmarkoff            % SUPPRESS MARGINAL MARKINGS

% AGUTEX OPTIONS AND ENTRIES
%\tighten               % TURNS OFF DOUBLE SPACING
%\singlespace          % RESTORES SINGLE SPACING
%\doublespace          % RESTORES DOUBLE SPACING
\lefthead{authors}
\righthead{short title}

\received{date1}
\revised{date2}
\accepted{date3}
\journalid{JGRA}{Journal date}
\articleid{page1}{page2}
\paperid{94JZ12345}
\ccc{0000-0000/00/94JZ-12345\$\$05.00}
% \copyright{PD}{1994}
% \copyright{Crown}{1994}
% (No \ccc{} for Crown copyrights.)
\cpright{AGU}{1994}

\authoraddr{author1, full address}
\authoraddr{author2, full address}

\slugcomment{To appear ...}

% END OF PREAMBLE
\begin{document}
\title{Full Title}
%
% TWO METHODS FOR GIVING THE AUTHORS
%
\author{author set 1}
\affil{Institute 1}

\author{author set 2\altaffilmark{1}}
\affil{Institute 2}

\altaffiltext{1}{Other institute}

% ALTERNATIVELY:
%\author{author1\altaffilmark{1} and
%      author2\altaffilmark{2,3}}
%\altaffiltext{1}{Institute 1}
%\altaffiltext{2}{Institute 2}
%\altaffiltext{3}{Other institute}

%
% THE ABSTRACT
%
\begin{abstract}
Text of abstract.
\end{abstract}

%
% THE MAIN BODY OF TEXT
%
\begin{article}
\section{Introduction}\label{sec:lab}

\subsection{..}

\subsubsection{..}

%
% FLOAT EXAMPLES
%
\begin{figure}
\figbox{\hsize}{10cm}{Paste Fig Here}
\caption{Caption text.\label{fig:lab}}
\end{figure}

```

```

%
\begin{figure}
\figbox*{}{\includegraphics[height=10cm]{fig.eps}}
\caption{Caption text.\label{fig:eps}}
\end{figure}

\begin{plate*}
\platewidth{35pc}
\figbox{35pc}{12cm}{Paste Plate Here}
\caption{Caption text.\label{pla:lab}}
\end{plate*}

\begin{table}
\caption{Caption of table.\label{tab:lab}}
\begin{tabular}{...}
.....
\end{tabular}
\end{table}

%
% CITATION EXAMPLES
%
As shown by \citet{smi92}, one may ...

It has been shown \citep{smi92} that one may ...

%
% APPENDIX
%
\appendix
\section{Some More Stuff}

%
% ACKNOWLEDGMENTS
%
\acknowledgments
We wish to thank...

%
% BALANCING PREPRINT COLUMNS

```

```

%
\balance
%
% LIST OF REFERENCES (BIBTEX)
%
\bibliographystyle{agu}
\bibliography{...}
%
% WITHOUT BIBTEX
%
%\begin{thebibliography}{}
% \bibitem[author {\it et al.}(year)]{key}
% reference text
%
% \bibitem[author1 and author2(year)]{key}
% reference text
%
%\end{thebibliography}

\end{article}
\end{document}

```

References

- Kopka, H., and P. W. Daly, *A Guide to L^AT_EX—Document Preparation for Beginners and Advanced Users*, 3rd ed., Addison Wesley Longman, Reading, MA, 1999.
- Lamport, L., *L^AT_EX—A Document Preparation System*, 2nd ed., Addison-Wesley, Reading, MA, 1994.
-
- P. W. Daly, Max-Planck-Institut für Aeronomie, D-37189 Katlenburg-Lindau, Germany

This preprint was prepared with AGU's L^AT_EX macros v5.01, with the extension package 'AGU++' by P. W. Daly, version 1.6b from 1999/08/19.