An example Geophysics article, with a two-line title

Joe Dellinger* and Sergey Fomel†

ABSTRACT
This is an example of using geophysics.cls for writing Geophysics papers.

INTRODUCTION
This is an introduction. $\LaTeX$ is a powerful document typesetting system (Lamport, 1994). An excellent reference is (Kopka and Daly, 2004). The new geophysics.cls class complies with the $\LaTeX$2e standard.

THEORY
This is another section.

Equations
Section headings should be capitalized. Subsection headings should only have the first letter of the first word capitalized.

Here are examples of equations involving vectors and tensors:

$$\mathbf{R} = \begin{pmatrix} R_{XX} & R_{YX} \\ R_{XY} & R_{YY} \end{pmatrix} = \mathbf{P}_{M\rightarrow R} \mathbf{D} \mathbf{P}_{S\rightarrow M} \mathbf{S} , \quad (1)$$

and

$$R_{j,m}(\omega) = \sum_{n=1}^{N} P_{j}^{(n)}(x_{R}) D^{(n)}(\omega) P_{m}^{(n)}(x_{S}) . \quad (2)$$

Note that the macro for the $\text{\texttt{\textbackslash tensor}}$ command has been changed to force tensors to be bold uppercase, in compliance with current SEG submission standards. This is so that documents typeset to the old standards will print out according to the new ones: e.g., tensor $\mathbf{T}$ (note converted to uppercase).

Figures
Figure 1 shows what it is about.

![Diagonalized data](image)

Figure 1: This figure is specified in the document by $\texttt{\textbackslash plot\{waves\}}\{\texttt{width=\textbackslash columnwidth}\}{\texttt{This caption.}}$.

Multiplot
Sometimes it is convenient to put two or more figures from different files in an array (see Figure 2). Individual plots are Figures 2a and 2b.

The first argument of the $\texttt{\textbackslash multiplot}$ command specifies the number of plots per row.

Tables
The discussion is summarized in Table 1.

ACKNOWLEDGMENTS
I wish to thank Ivan Pšencík and Frédéric Billette for having names with non-English letters in them. I wish to
Figure 2: This figure is specified in the document by \texttt{\multiplot*\{2\}\{exph,exgr\}\{width=0.8\\columnwidth\}\{This caption.\}}.

Table 1: This table is specified in the document by \texttt{\tabl*\{example\}\{This caption.\}\{\ldots\}}.

<table>
<thead>
<tr>
<th>Migration</th>
<th>Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>migration</td>
<td>$\omega \rightarrow k_z$</td>
</tr>
<tr>
<td></td>
<td>$k_y^2 + k - z^2 \cos^2 \psi = 4\omega^2/v^2$</td>
</tr>
<tr>
<td>zero-offset</td>
<td>$k_z \rightarrow \omega_0$</td>
</tr>
<tr>
<td>diffraction</td>
<td>$k_y^2 + k_z^2 = 4\omega_0^2/v^2$</td>
</tr>
<tr>
<td>DMO+NMO</td>
<td>$\omega \rightarrow \omega_0$</td>
</tr>
<tr>
<td></td>
<td>$\frac{1}{4}v^2 k_y^2 \sin^2 \psi + \omega_0^2 \cos^2 \psi = \omega^2$</td>
</tr>
<tr>
<td>radial DMO</td>
<td>$\omega \rightarrow \omega_s$</td>
</tr>
<tr>
<td></td>
<td>$\frac{1}{4}v^2 k_y^2 \sin^2 \psi + \omega_s^2 = \omega^2$</td>
</tr>
<tr>
<td>radial NMO</td>
<td>$\omega_s \rightarrow \omega_0$</td>
</tr>
<tr>
<td></td>
<td>$\omega_0 \cos \psi = \omega_s$</td>
</tr>
</tbody>
</table>
thank Červený (2000) for providing an example of how to make a bib file that includes an author whose name begins with a non-English character and Forgues (1996) for providing both an example of referencing a Ph.D. thesis and yet more non-English characters.

**APPENDIX A**

**APPENDIX EXAMPLE**

According to the new SEG standard, appendices come before references.

\[
\frac{\partial U}{\partial z} = \left\{ \sqrt{\frac{1}{v^2} - \left[ \frac{\partial t}{\partial g} \right]^2} + \sqrt{\frac{1}{v^2} - \left[ \frac{\partial t}{\partial s} \right]^2} \right\} \frac{\partial U}{\partial t} \tag{A-1}
\]

It is important to get equation A-1 right. See also Appendix B.

**APPENDIX B**

**ANOTHER APPENDIX**

\[
\frac{\partial U}{\partial z} = \left\{ \sqrt{\frac{1}{v^2} - \left[ \frac{\partial t}{\partial g} \right]^2} + \sqrt{\frac{1}{v^2} - \left[ \frac{\partial t}{\partial s} \right]^2} \right\} \frac{\partial U}{\partial t} \tag{B-1}
\]

Too lazy to type a different equation but note the numer-ation.

The error comparison is provided in Figure B-1.

![Figure B-1](image_url)

Figure B-1: This figure is specified in the document by \plot{errgrp}{width=0.9\columnwidth}{This caption.}. 

% An example of defining macros
\newcommand{\rs}[1]{\mathstrut\mbox{\scriptsize\rm #1}}
\newcommand{\rr}[1]{\mbox{\rm #1}}

\begin{document}
\title{An example \emph{Geophysics} article, \ \ with a two-line title}
\renewcommand{\thefootnote}{\fnsymbol{footnote}}
\address{
\footnotemark[1]BP UTG,
200 Westlake Park Blvd,
Houston, TX, 77079, \\
\footnotemark[2]Bureau of Economic Geology,
John A. and Katherine G. Jackson School of Geosciences,
The University of Texas at Austin,
University Station, Box X,
Austin, TX 78713-8924}
\author{Joe Dellinger\footnotemark[1] and Sergey Fomel\footnotemark[2]}
\footer{Example}
\lefthead{Dellinger \& Fomel}
\righthead{\emph{Geophysics} example}
\maketitle
\begin{abstract}
This is an example of using \textsf{geophysics.cls} for writing \emph{Geophysics} papers.
\end{abstract}
\section{Introduction}
This is an introduction. \LaTeX\ is a \new{powerful} document typesetting system \cite{lamport}. An excellent reference is \cite{kopka}. The new \textsf{geophysics.cls} class complies with the \LaTeX2e\ standard. \old{We had something else written here but decided to get rid of it}.

\section*{Theory}
This is another section.

\subsection{Equations}
Section headings should be capitalized. Subsection headings should only have the first letter of the first word capitalized.

Here are examples of equations involving vectors and tensors:
\begin{equation}
\begin{pmatrix}
R_{\rs{XX}} & R_{\rs{YX}} \\
R_{\rs{XY}} & R_{\rs{YY}}
\end{pmatrix}
\end{equation}
\begin{equation}
\label{SVD}
tensor{P}_{M \rightarrow R} \; \tensor{D} \; \tensor{P}_{S \rightarrow M}
\; \; \; \tensor{S},
\end{equation}

and

\begin{equation}
R_{j,m}(\omega) = \\
\sum_{n=1}^{N} \, \, P_{j}^{(n)}(\mathbf{x}_R) \, \, D^{(n)}(\omega) \, \, P_{m}^{(n)}(\mathbf{x}_S) \; \; \; .
\label{SVDray}
\end{equation}

Note that the macro for the \verb#\tensor# command has been changed to force tensors to be bold uppercase, in compliance with current SEG submission standards. This is so that documents typeset to the old standards will print out according to the new ones: e.g., tensor $\tensor{t}$ (note converted to uppercase).

\subsection*{Figures}
\renewcommand{\figdir}{Fig} % figure directory

Figure\textsuperscript{\ref{fig:waves}} shows what it is about.

\plot{waves}{width=\columnwidth}
{This figure is specified in the document by \texttt{$\backslash$plot\{waves\}\{width=$\backslash$columnwidth\}\{This caption.\}}.}

\subsubsection{Multiplot}

Sometimes it is convenient to put two or more figures from different files in an array (see Figure\textsuperscript{\ref{fig:exph,exgr}}). Individual plots are Figures\textsuperscript{\ref{fig:exph}} and\textsuperscript{\ref{fig:exgr}}.

\multiplot*{2}{exph,exgr}{width=0.8\columnwidth}
{This figure is specified in the document by \newline \texttt{$\backslash$multiplot*\{2\}\{exph,exgr\}\{width=0.8$\backslash$columnwidth\}\{This caption.\}}.}

The first argument of the \texttt{multiplot} command specifies the number of plots per row.

\subsection{Tables}

The discussion is summarized in Table\textsuperscript{\ref{tbl:example}}.

\tabl*{example}{This table is specified in the document by \texttt{$\backslash$tabl*\{example\}\{This caption.\}\{\ldots\}}.}

\begin{center}
\begin{tabular}{|c|c|c|}
\hline
\multicolumn{3}{|c|}{Table Example} \\ \\
\hline
migration\rule[-2ex]{0ex}{5ex} & & \\
\hline
\end{tabular}
\end{center}
<table>
<thead>
<tr>
<th>Transformation</th>
<th>Relation</th>
<th>Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\omega \rightarrow k_z$ &amp; $k_y^2 + k_z^2 \cos^2 \psi = 4\omega^2/v^2$</td>
<td>&amp;</td>
<td></td>
</tr>
<tr>
<td>&amp;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$k_z \rightarrow \omega_0$ &amp; $k_y^2 + k_z^2 = 4\omega_0^2/v^2$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&amp;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DM+HMO &amp; $\omega \rightarrow \omega_0$ &amp; $\frac{1}{4}v^2k_y^2\sin^2\psi + \omega_0^2\cos^2\psi = \omega^2$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( \text{ACKNOWLEDGMENTS} \)

I wish to thank Ivan P\'v\(s\)en\(v\)c\(i\)k and Fr\'ed\'eric Billette for having names with non-English letters in them. I wish to thank \cite{Cerveny} for providing an example of how to make a bib file that includes an author whose name begins with a non-English character and \cite{forgues96} for providing both an example of referencing a Ph.D. thesis and yet more non-English characters.

\section{Acknowledgments}

According to the new SEG standard, appendices come before references.

\begin{equation}
\frac{\partial U}{\partial z} = \left\{ \sqrt{\frac{1}{v^2} - \left[ \frac{\partial t}{\partial g} \right]^2} + \sqrt{\frac{1}{v^2} - \left[ \frac{\partial t}{\partial s} \right]^2} \right\} \frac{\partial U}{\partial t}
\end{equation}

It is important to get equation~\ref{eqn:partial} right. See also Appendix~\ref{equations}.

\begin{equation}
\frac{\partial U}{\partial z} = \left\{ \sqrt{\frac{1}{v^2} - \left[ \frac{\partial t}{\partial g} \right]^2} + \sqrt{\frac{1}{v^2} - \left[ \frac{\partial t}{\partial s} \right]^2} \right\} \frac{\partial U}{\partial t}
\end{equation}

Too lazy to type a different equation but note the numeration.
The error comparison is provided in Figure~\ref{fig:errgrp}.

\plot{errgrp}{width=0.9\columnwidth}
{This figure is specified in the document by \texttt{
  $\backslash$plot\{errgrp\}{$\backslash$width=0.9$\backslash$column\-width}{This caption.\}.}
}

\onecolumn

\append{The source of this document}
\verbatiminput{geophysics_two\_column.ltx}

\append{The source of the bibliography}
\verbatiminput{example.bib}

\twocolumn

\bibliographystyle{seg} \% style file is seg.bst
\bibliography{example}

\end{document}

APPENDIX D
THE SOURCE OF THE BIBLIOGRAPHY

@Book{lamport,
    author = {L[eslie] Lamport},
    title = {{\LaTeX}: A Document Preparation System},
    publisher = {Addison-Wesley},
    year = 1994
}

@Book{kopka,
    author = {H[elmut] Kopka and P[atrick] W[Daly]},
    title = {Guide to \LaTeX{}},
    publisher = {Addison-Wesley},
    year = 2004
}

@preamble{"\newcommand{\SortNoop}[1]{\}

@Book{Cerveny,
    author = {V[en{\SortNoop{Cerveny}}]erven\'{y}},
    title = {Seismic Ray Method},
    year = {2000},
    publisher = {Cambridge University Press}
}

@PHDTHESIS{forgues96,
    author = {E. Forgues},
    title = {Inversion lin{\SortNoop{e}}ar{\SortNoop{e}} multi-\SortNoop{param}\'etres via la th\'{e}orie des rais},
    school = {Institut Fran\'{c}ais du P\'{e}trole - University Paris VII},
    year = {1996}
}
REFERENCES