The metsymb package*

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Abstract

This package introduces commands to generate professional meteorological symbols with vectorial quality. As of August 30, 2023, these include: oktas (○, ◴, ◔, ...), cloud genera (⇀, ∠, ◿, ...), and C_L–C_M–C_H cloud codes (⌓, ⌒, ⌒, ...). This package essentially introduces a new font in which each symbol is assigned to a glyph, which can then be called individually from LaTeX documents via dedicated commands.

Contents

1 Why metsymb ?

The creation of this package was motivated by the fact that in 2021, there were no dedicated Unicode elements for okta and cloud genera symbols. To the best of my knowledge, no LaTeX package provides a uniform set of these symbols either[1].

This package is a direct attempt to remedy to this unfortunate state of affair. Individual symbols are designed using TikZ[2]. They are then bundled into a dedicated font with FontForge[3]. Individual glyphs of this metsymb font are then tied to dedicted LaTeX commands via this package.

*This document corresponds to metsymb v1.2, dated 2022/09/10.
[1] If you know of one, please let me know and I shall list it here !
[2] https://www.ctan.org/pkg/pgf
[3] https://fontforge.org/en-US/

One key element of the metsymb symbols is that they are **designed using explicit (mathematical) TikZ commands**. This evidently helps to maintain a uniform look between the symbols, but also – and perhaps more importantly– it ensures that each symbol can be faithfully reproduced with different software in the future (should the need arise).

2 Usage

Using the metsymb package is straightforward. By importing it via a not-so-surprising `\usepackage{metsymb}` in the preamble of your documents, you will gain access to the commands listed in Tables 1 to 3.

Table 1: metsymb commands for the okta symbols.

○	`\zerookta`	◒	`\fiveoktas`
◴	`\oneokta`	◕	`\sixoktas`
◔	`\twooktas`	◐	`\sevenoktas`
◔	`\threeoktas`	●	`\eightoktas`
◑	`\fouroktas`	⊗	`\nineoktas`

Table 2: metsymb commands for the cloud genera symbols.

	`\cirrus`		`\nimbostratus`
	`\cirrocumulus`		`\stratocumulus`
	`\cirrostratus`	--	`\stratus`
	`\altocumulus`		`\cumulus`
	`\altostratus`		`\cumulonimbus`

Table 3: metsymb commands for the C_L, C_M, and C_H cloud symbols.

	`\clI`		`\cmI`		`\chI`
	`\clII`		`\cmII`		`\chII`
	`\clIII`		`\cmIII`		`\chIII`
	`\clIV`		`\cmIV`		`\chIV`
	`\clV`		`\cmV`		`\chV`
	`\clVI`		`\cmVI`		`\chVI`
	`\clVII`		`\cmVII`		`\chVII`
	`\clVIII`		`\cmVIII`		`\chVIII`
	`\clIX`		`\cmIX`		`\chIX`

2.1 Using metsymb with matplotlib

metsymb can be used to include meteorological symbols inside Python plots, provided that the use of a system-wide LaTeX installation is enabled via the setting `text.usetex` in your rcParams[4]. In fact, the assembly of a dedicated vectorial font to store the metsymb symbols[5] is directly motivated by the fact that matplotlib requires proper font metrics to include symbols in Python plots.

The following minimal working example, stored in `metsymb_mwe.py` inside the metsymb Github repository, illustrates how one can couple metsymb and matplotlib (see Fig. 1 for the result):

```
# -*- coding: utf-8 -*-
"""
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Module content: minimal working example of the metsymb LaTeX package
with matplotlib figures.
"""

# Import matplotlib
from matplotlib import pyplot as plt

# Set the proper rcparams elements
plt.style.use('./metsymb_mwe.mplstyle')

# Create a basic figure with some demo text in the center.
plt.close(1)
plt.figure(1, figsize=(4, 0.5))
plt.text(0.5, 0.5,
         r'\LARGE Hello World: \threeoktas \nimbostratus \chIX',
         ha='center')
plt.axis('off')

# Export to different format and display on-screen.
plt.savefig('metsymb_mwe.pdf')
plt.savefig('metsymb_mwe.png')
#plt.show()
```

where `metsymb_mwe.mplstyle` contains:

```
text.usetex: True
text.latex.preamble: \usepackage{metsymb}
```

Figure 1: Result of the `metsymb_mwe.py` demonstration script, illustrating how the metsymb package can be used with matplotlib.

[4] https://matplotlib.org/stable/tutorials/text/usetex.html
[5] instead of a simpler TikZ approach, for example

3 Code development and bug reports

The metsymb package is being developed inside a dedicated Github repository under the MeteoSwiss organization, located at: https://github.com/MeteoSwiss/metsymb. User contributions are welcome and will be examined in details. So are bug reports and suggestions for new symbols, which are best submitted as *Github Issues* directly on the code's repo at: https://github.com/MeteoSwiss/metsymb/issues

4 License and copyright

5 Ackowledgments

The following resources proved immensely useful to assemble the first version of this package:

- *How to Package Your LaTeXPackage*, Scott Pakin (2015): https://mirror.foobar.to/CTAN/info/dtxtut/dtxtut.pdf
- The FontForge documentation, and in particular the *FontForge and TeX* article: https://fontforge.org/docs/techref/PfaEdit-TeX.html
- The *TeX font errors: Cheatsheet*: https://texdoc.org/serve/tex-font-errors-cheatsheet/0

Several StackOverflow users also proved extremely helpful when building metsymb, in particular:

- those that provided clarifications and help in this post, in that post, and in that other post.

Thank you also to jklymak and anntzer.lee from the matplotlib discourse community for their clarifications in this post.

6 Font table

The complete font table for metsymb, generated via the command `pdftex testfont` with the `\sample` call, is visible in Fig. 2.

7 Implementation

The metsymb package very simply defines new commands to fetch individual glyphs from the `metsymb` font. As such, its LaTeX side is rather simple.

`\zerookta` The 0 okta symbol:

```
\newcommand{\zerookta}{{\usefont{U}{metsymb}{m}{n} \char33 }}%
```

`\oneokta` The 1 okta symbol:

```
\newcommand{\oneokta}{{\usefont{U}{metsymb}{m}{n} \char34 }}%
```

`\twooktas` The 2 oktas symbol:

```
\newcommand{\twooktas}{{\usefont{U}{metsymb}{m}{n} \char35 }}%
```

`\threeoktas` The 3 oktas symbol:

```
\newcommand{\threeoktas}{{\usefont{U}{metsymb}{m}{n} \char36 }}%
```

`\fouroktas` The 4 oktas symbol:

```
\newcommand{\fouroktas}{{\usefont{U}{metsymb}{m}{n} \char37 }}%
```

`\fiveoktas` The 5 oktas symbol:

```
\newcommand{\fiveoktas}{{\usefont{U}{metsymb}{m}{n} \char38 }}%
```

`\sixoktas` The 6 oktas symbol:

```
\newcommand{\sixoktas}{{\usefont{U}{metsymb}{m}{n} \char39 }}%
```

`\sevenoktas` The 7 oktas symbol:

```
\newcommand{\sevenoktas}{{\usefont{U}{metsymb}{m}{n} \char40 }}%
```

`\eightoktas` The 8 oktas symbol:

```
\newcommand{\eightoktas}{{\usefont{U}{metsymb}{m}{n} \char41 }}%
```

`\nineoktas` The 9 oktas symbol:

```
\newcommand{\nineoktas}{{\usefont{U}{metsymb}{m}{n} \char42 }}%
```

`\cirrus` The cirrus symbol:

```
\newcommand{\cirrus}{{\usefont{U}{metsymb}{m}{n} \char43 }}%
```

`\cirrocumulus` The cirrocumulus symbol:

```
\newcommand{\cirrocumulus}{{\usefont{U}{metsymb}{m}{n} \char44 }}%
```

`\cirrostratus` The cirrostratus symbol:

```
\newcommand{\cirrostratus}{{\usefont{U}{metsymb}{m}{n} \char45 }}%
```

`\altocumulus` The altocumulus symbol:

```
\newcommand{\altocumulus}{{\usefont{U}{metsymb}{m}{n} \char46 }}%
```

`\altostratus` The altostratus symbol:

```
\newcommand{\altostratus}{{\usefont{U}{metsymb}{m}{n} \char47 }}%
```

`\nimbostratus` The nimbostratus symbol:

```
\newcommand{\nimbostratus}{{\usefont{U}{metsymb}{m}{n} \char48 }}%
```

`\stratocumulus` The stratocumulus symbol:

```
\newcommand{\stratocumulus}{{\usefont{U}{metsymb}{m}{n} \char49 }}%
```

`\stratus` The stratus symbol:

```
\newcommand{\stratus}{{\usefont{U}{metsymb}{m}{n} \char50 }}%
```

`\cumulus` The cumulus symbol:

```
\newcommand{\cumulus}{{\usefont{U}{metsymb}{m}{n} \char51 }}%
```

`\cumulonimbus` The cumulonimbus symbol:

```
\newcommand{\cumulonimbus}{{\usefont{U}{metsymb}{m}{n} \char52 }}%
```

`\clI` The $C_L = 1$ cloud symbol:

```
\newcommand{\clI}{{\usefont{U}{metsymb}{m}{n} \char53 }}%
```

`\clII` The $C_L = 2$ cloud symbol:

```
\newcommand{\clII}{{\usefont{U}{metsymb}{m}{n} \char54 }}%
```

`\clIII` The $C_L = 3$ cloud symbol:

```
\newcommand{\clIII}{{\usefont{U}{metsymb}{m}{n} \char55 }}%
```

`\clIV` The $C_L = 4$ cloud symbol:

```
\newcommand{\clIV}{{\usefont{U}{metsymb}{m}{n} \char56 }}%
```

`\clV` The $C_L = 5$ cloud symbol:

```
\newcommand{\clV}{{\usefont{U}{metsymb}{m}{n} \char57 }}%
```

`\clVI` The $C_L = 6$ cloud symbol:

```
\newcommand{\clVI}{{\usefont{U}{metsymb}{m}{n} \char58 }}%
```

`\clVII` The $C_L = 7$ cloud symbol:

```
\newcommand{\clVII}{{\usefont{U}{metsymb}{m}{n} \char59 }}%
```

`\clVIII` The $C_L = 8$ cloud symbol:

```
\newcommand{\clVIII}{{\usefont{U}{metsymb}{m}{n} \char60 }}%
```

`\clIX` The $C_L = 9$ cloud symbol:

```
\newcommand{\clIX}{{\usefont{U}{metsymb}{m}{n} \char61 }}%
```

`\cmI` The $C_M = 1$ cloud symbol:

```
\newcommand{\cmI}{{\usefont{U}{metsymb}{m}{n} \char62 }}%
```

`\cmII` The $C_M = 2$ cloud symbol:

```
\newcommand{\cmII}{{\usefont{U}{metsymb}{m}{n} \char63 }}%
```

`\cmIII` The $C_M = 3$ cloud symbol:

```
\newcommand{\cmIII}{{\usefont{U}{metsymb}{m}{n} \char64 }}%
```

`\cmIV` The $C_M = 4$ cloud symbol:

```
\newcommand{\cmIV}{{\usefont{U}{metsymb}{m}{n} \char65 }}%
```

`\cmV` The $C_M = 5$ cloud symbol:

```
\newcommand{\cmV}{{\usefont{U}{metsymb}{m}{n} \char66 }}%
```

`\cmVI` The $C_M = 6$ cloud symbol:

```
\newcommand{\cmVI}{{\usefont{U}{metsymb}{m}{n} \char67 }}%
```

`\cmVII` The $C_M = 7$ cloud symbol:

```
\newcommand{\cmVII}{{\usefont{U}{metsymb}{m}{n} \char68 }}%
```

`\cmVIII` The $C_M = 8$ cloud symbol:

```
\newcommand{\cmVIII}{{\usefont{U}{metsymb}{m}{n} \char69 }}%
```

`\cmIX` The $C_M = 9$ cloud symbol:

```
\newcommand{\cmIX}{{\usefont{U}{metsymb}{m}{n} \char70 }}%
```

`\chI` The $C_H = 1$ cloud symbol:

```
\newcommand{\chI}{{\usefont{U}{metsymb}{m}{n} \char71 }}%
```

`\chII` The $C_H = 2$ cloud symbol:

```
\newcommand{\chII}{{\usefont{U}{metsymb}{m}{n} \char72 }}%
```

`\chIII` The $C_H = 3$ cloud symbol:

```
\newcommand{\chIII}{{\usefont{U}{metsymb}{m}{n} \char73 }}%
```

`\chIV` The $C_H = 4$ cloud symbol:

```
\newcommand{\chIV}{{\usefont{U}{metsymb}{m}{n} \char74 }}%
```

`\chV` The $C_H = 5$ cloud symbol:

```
\newcommand{\chV}{{\usefont{U}{metsymb}{m}{n} \char75 }}%
```

`\chVI` The $C_H = 6$ cloud symbol:

```
\newcommand{\chVI}{{\usefont{U}{metsymb}{m}{n} \char76 }}%
```

`\chVII` The $C_H = 7$ cloud symbol:

```
\newcommand{\chVII}{{\usefont{U}{metsymb}{m}{n} \char77 }}%
```

`\chVIII` The $C_H = 8$ cloud symbol:

```
\newcommand{\chVIII}{{\usefont{U}{metsymb}{m}{n} \char78 }}%
```

`\chIX` The $C_H = 9$ cloud symbol:

```
\newcommand{\chIX}{{\usefont{U}{metsymb}{m}{n} \char79 }}%
```

	′0	′1	′2	′3	′4	′5	′6	′7	
′04x		○	⦶	◔	◔	◑	◑	◕	″2x
′05x	◐	●	⊗	⊸	⊸	⊸	◡	◿	
′06x	◿	⊸	--	⌒	⌒	⌓	⌓	⌓	″3x
′07x	⊸	⌣	—	---	⌧	⌧	⌿	◿	
′10x	⌣	⌿	⌿	⌘	⌿	M	⌿	⌐	″4x
′11x	⌐	⌐	⌿	⌿	⌿	⌿	⌿	⌿	
	″8	″9	″A	″B	″C	″D	″E	″F	

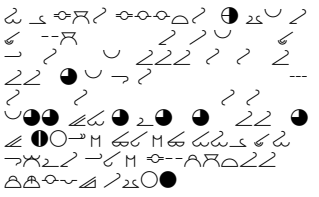

Figure 2: Complete font table for metsymb.