

Creating a Sunpy Function

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SUMMER SCHOOL sOLAR ASTROPHYSICS: MODERN TRENDS AND
TECHNIQUES

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CONTENTS

1 Project



CONTENTS

- 1 Project
- 2 How did I build it?



CONTENTS

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- 3 Creating the function



CONTENTS

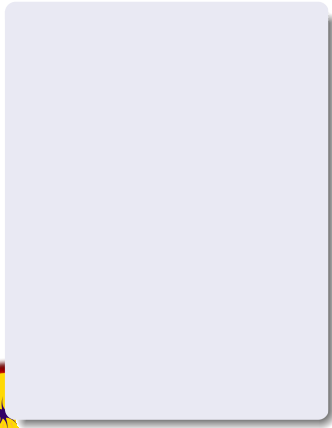
- 1 Project
- 2 How did I build it?
- 3 Creating the function
- 4 What are we missing that we need to do?



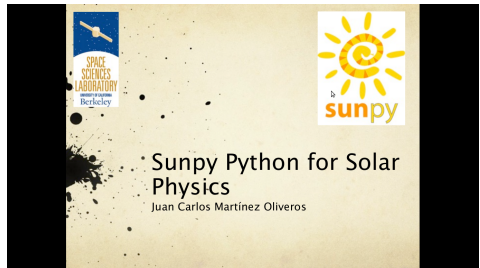
To create one function in Sunpy similar to *rot_map* in ssw.
Unresolved: To implement this function in libraries of Sunpy.



Project
How did I build it?
Creating the function
What are we missing that we need to do?



- In Juan Carlos presentation (Sunpy, the future of the Solar Physics)



- In Juan Carlos presentation (Sunpy, the future of the Solar Physics)
- He use `numpy.rot90` routine

Sunpy: Python for Solar Physics

```
import pylab as pl
import sunpy
import numpy as np

mdi_map = sunpy.make_map('fd_mdi.fits')
mdiarr = np.array(mdi_map)
mhdr = mdi_map.get_header()

# rotation 180 degrees NO arbitrary
rmdiarr = np.rot90(mdiarr,2)

# Create a map with the rotated data
rmdi_map = sunpy.make_map(rmdiarr, mhdr)

# sub_map
smap_mdi = rmdi_map.submap((-250, -50), (200, 400), units='data')

mdi_map =
sunpy.make_map([smap_mdi, 'lm_20050115_clean_2345679_40-100keV_peak40s_t0.fits']
)
mdi_map.set_levels([1,50,60,70,80,90], percent = True)

# save to eps
import matplotlib.pyplot as plt
fig = mdi_map.plot()
fig.savefig('20050115_over_mdi_hisclean.eps')
```



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Sede Santafé de Bogotá

- In Juan Carlos presentation (Sunpy, the future of the Solar Physics)
- He use `numpy.rot90` routine
- Using Scipy libraries (Scientific tools for python), `scipy.ndimage.interpolation.rotate` function.

```
auditorio@auditorio-Satellite-L745: ~/Downloads/sunpy-sunpy-be01e8d
auditorio@auditorio-Satellite-L745:~/Downloads/sunpy-sunpy-be01e8d$ ipython --py
lab
Python 2.7.3 (default, Apr 20 2012, 22:39:59)
Type "copyright", "credits" or "license" for more information.

IPython 0.12.1 -- An enhanced Interactive Python.
?                -> Introduction and overview of IPython's features.
%quickref        -> Quick reference.
help             -> Python's own help system.
object?         -> Details about 'object', use 'object??' for extra details.

Welcome to pylab, a matplotlib-based Python environment [backend: TkAgg].
For more information, type 'help(pylab)'.

In [1]: import sunpy

In [2]: from scipy.ndimage.interpolation import rotate

In [3]: mapin=sunpy.make_map('hmi.n_45s.2011.07.30_00_31_30_TAI.magnetogram.fits')

In [4]: hdrmap=mapin.get_header()

In [5]: array=array(mapin)

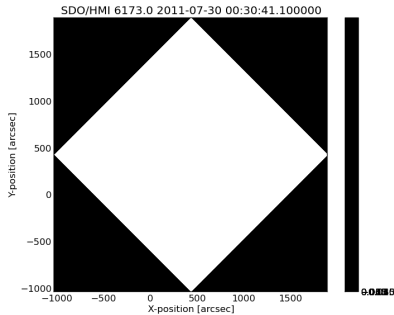
In [6]: rot=rotate(array,45)

In [7]: new=sunpy.make_map(rot,hdrmap)

In [8]: new.show()
```



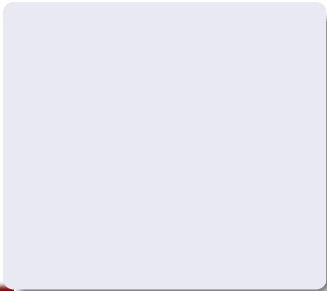
We obtain:



- What's up?

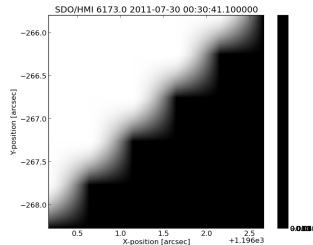


What am I doing wrong?



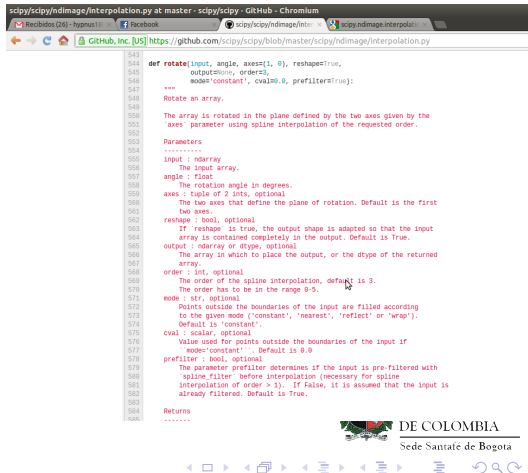
What am I doing wrong?

- So, I look through the routine rotate



What am I doing wrong?

- So, I look through the routine rotate
- Change to False prefilter and reshape



```
543
544
545 def rotate(input, angle, axes=(1, 0), reshape=True,
546           output=None, orders=3,
547           modes='constant', cval=0.0, prefilter=True):
548
549     """
550     Rotate an array.
551
552     The array is rotated in the plane defined by the two axes given by the
553     'axes' parameter using spline interpolation of the requested order.
554
555     Parameters
556     -----
557     input : ndarray
558         The input array.
559     angle : float
560         The rotation angle in degrees.
561     axes : tuple of 2 ints, optional
562         The two axes that define the plane of rotation. Default is the first
563         two axes.
564     reshape : bool, optional
565         If 'reshape' is true, the output shape is adapted so that the input
566         array is contained completely in the output. Default is True.
567     output : ndarray or dtype, optional
568         The array in which to place the output, or the dtype of the returned
569         array.
570     order : int, optional
571         The order of the spline interpolation, default is 3.
572         The order has to be in the range 0-5.
573     mode : str, optional
574         Points outside the boundaries of the input are filled according
575         to the given mode ('constant', 'nearest', 'reflect' or 'wrap').
576         Default is 'constant'.
577     cval : scalar, optional
578         Value used for points outside the boundaries of the input if
579         'mode' is 'constant'. Default is 0.0
580     prefilter : bool, optional
581         The parameter prefilter determines if the input is pre-filtered with
582         'spline_filter' before interpolation (necessary for spline
583         interpolation of order > 1). If False, it is assumed that the input is
584         already filtered. Default is True.
585
586     Returns
587     -----
```



What am I doing wrong?

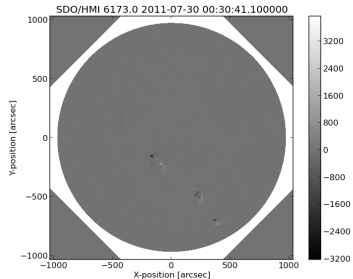
- So, I look through the routine rotate
- Change to False prefilter and reshape
- The new image obtained

```
auditorio@auditorio-Satellite-L745: ~/Downloads/sunpy-sunpy-be01e8d
In [1]: import sunpy
In [2]: from scipy.ndimage.interpolation import rotate
In [3]: mapin=sunpy.make_map('hmi.n_45s.2011.07.30_00_31_30_TAI.magn
')
In [4]: hdrmap=mapin.get_header()
In [5]: array=array(mapin)
In [6]: rot=rotate(array,45)
In [7]: new=sunpy.make_map(rot,hdrmap)
In [8]: new.show()
In [9]: rot=rotate(array,45,prefilter=False,reshape=False)
In [10]: new=sunpy.make_map(rot,hdrmap)
```



What am I doing wrong?

- So, I look through the routine rotate
- Change to False prefilter and reshape
- The new image obtained
- `new.show()`

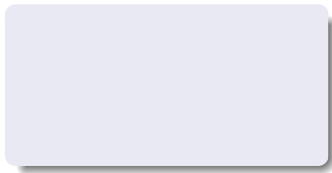



```
from sunpy import *
from scipy.ndimage.interpolation import rotate
import numpy as np

def rot_map(mapin,degrees):
    mapinhdr=mapin.get_header()
    array=np.array(mapin)
    arrayrotate=rotate(array,degrees,prefilter=False,;
    reshape=False)
    maprotate=sunpy.make_map(arrayrotate,mapinhdr)
    return maprotate
```



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- Running the new function

```
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In [1]: import sunpy

In [2]: import rot_map

In [3]: mapin=sunpy.make_map('hmi.n_45s.2011.07.30_00_31_30_TAI.nagnetogram.fits')

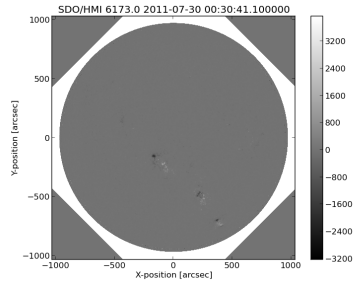
In [4]: tnrot=rot_map.rot_map(mapin,45)

In [5]: tnrot.show()

In [6]:
```



- Running the new function
- We can obtain the same image



Tasks

- To improve the actual function
- To implement
rot_mapfunctioninSunpyrepositoriesSunpy'steamsetusachallenge :
DifferentialrotationoftheSun.



• **THANKS!!!**

