accessible asteroseismology with

lightkurve

Oliver J. Hall
+ the Lightkurve Collaboration

TASC5/KASC12
MIT - Cambridge

bit.ly/2XBiUPs

UNIVERSITY OF BIRMINGHAM

23 Jul 19

STELLAR ASTROPHYSICS CENTRE

asteronomer

Message: Hello!

accessible asteroseismology with

lightkurve

notebooks!

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Message: Hello!

1 change a lightcurve to a periodogram
2 flatten and smooth the periodogram
3 plot the smoothed periodogram

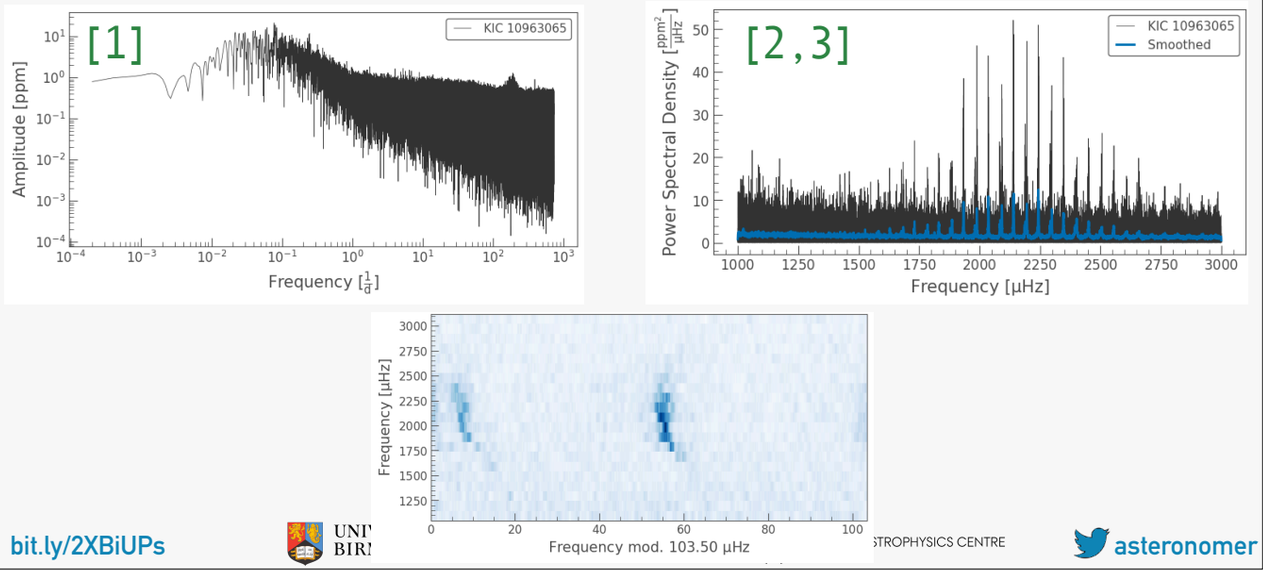
Message: Its super easy to string commands together like a sentence

1 change a lightcurve to a periodogram
2 flatten and smooth the periodogram
3 plot the smoothed periodogram

```
[1] periodogram = lightcurve.to_periodogram()
[2] smooth = periodogram.flatten().smooth()
[3] smooth.plot()
```


Message: Its super easy to string commands together like a sentence

lightkurve.periodogram



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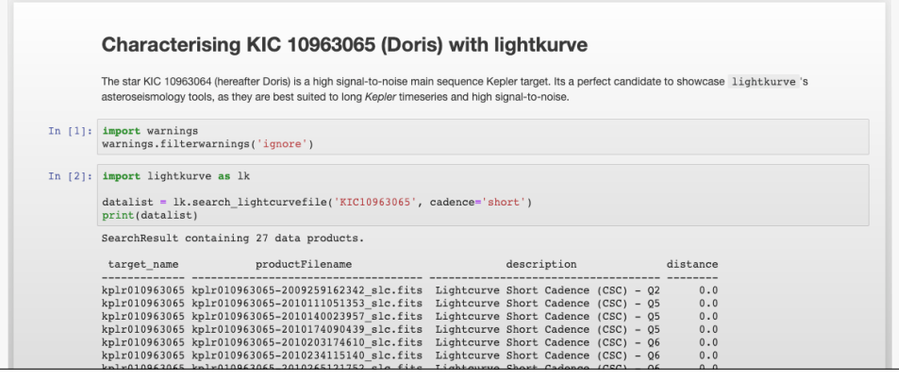
These are the kinds of products we'll get out!

better to show than tell

we'll work through a quick tutorial
feel free to join in!



Characterising KIC 10963065 (Doris) with lightkurve

The star KIC 10963064 (hereafter Doris) is a high signal-to-noise main sequence Kepler target. Its a perfect candidate to showcase `lightkurve`'s asteroseismology tools, as they are best suited to long *Kepler* timeseries and high signal-to-noise.

In [1]:
```
import warnings
warnings.filterwarnings('ignore')
```

In [2]:
```
import lightkurve as lk

datalist = lk.search_lightcurvefile('KIC10963065', cadence='short')
print(datalist)
```

```
SearchResult containing 27 data products.

 target_name            productFilename                 description              distance
------------- ------------------------------------ ------------------------------------ --------
kplr010963065 kplr010963065-2009259162342_slc.fits  Lightcurve Short Cadence (CSC) - Q2      0.0
kplr010963065 kplr010963065-2010111051353_slc.fits  Lightcurve Short Cadence (CSC) - Q5      0.0
kplr010963065 kplr010963065-2010140023957_slc.fits  Lightcurve Short Cadence (CSC) - Q5      0.0
kplr010963065 kplr010963065-2010174090439_slc.fits  Lightcurve Short Cadence (CSC) - Q5      0.0
kplr010963065 kplr010963065-2010203174610_slc.fits  Lightcurve Short Cadence (CSC) - Q6      0.0
kplr010963065 kplr010963065-2010234115140_slc.fits  Lightcurve Short Cadence (CSC) - Q6      0.0
```

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Message: I'm going to show you some stuff

you can help out on this too!

by

[1] *reporting issues (please do this!)*

[2] *joining in conversations*

[3] *contributing yourself!*

[4] *getting others involved (e.g. undergrads!)*

Message: You can get involved, and its easy to do so

you can do really simple quick-look asteroseismology with lightkurve

and so can your undergraduates, colleagues, and anybody else with a basic grasp on Python!

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Message: You can get involved, and its easy to do so

you can get started with this right now

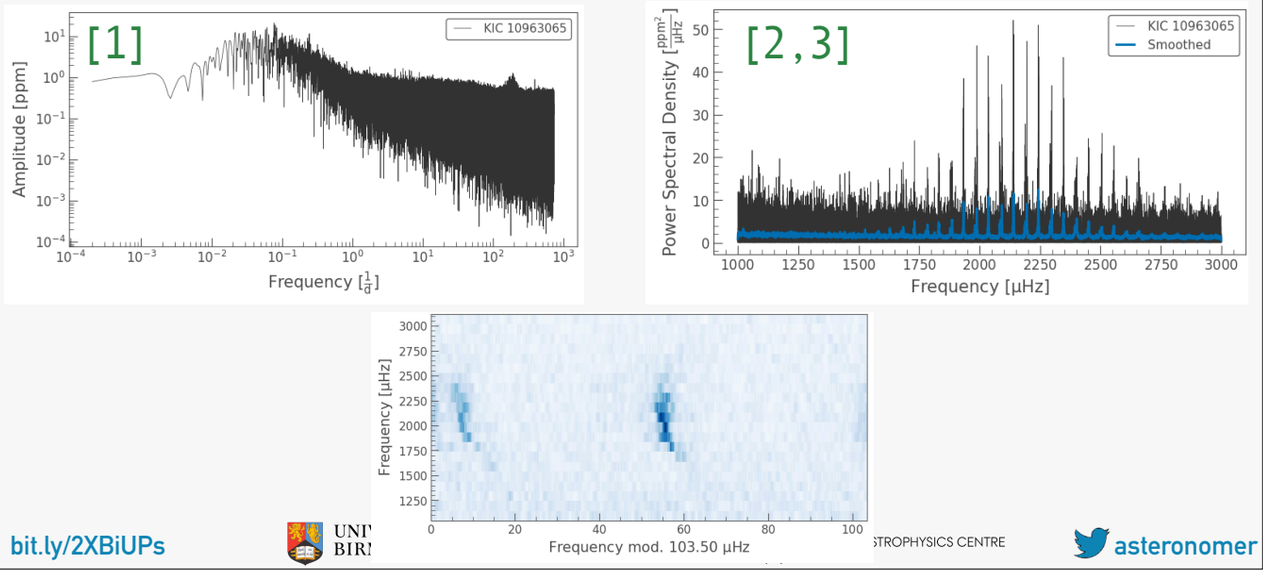
Read the documentation	https://docs.lightkurve.org
Install lightkurve with pip	`pip install lightkurve --user`
Work with us on GitHub	https://github.com/KeplerGO/lightkurve

Enjoy!

Message: Thanks for listening, you can browse these links during questions

EXTRAS BELOW

lightkurve.periodogram



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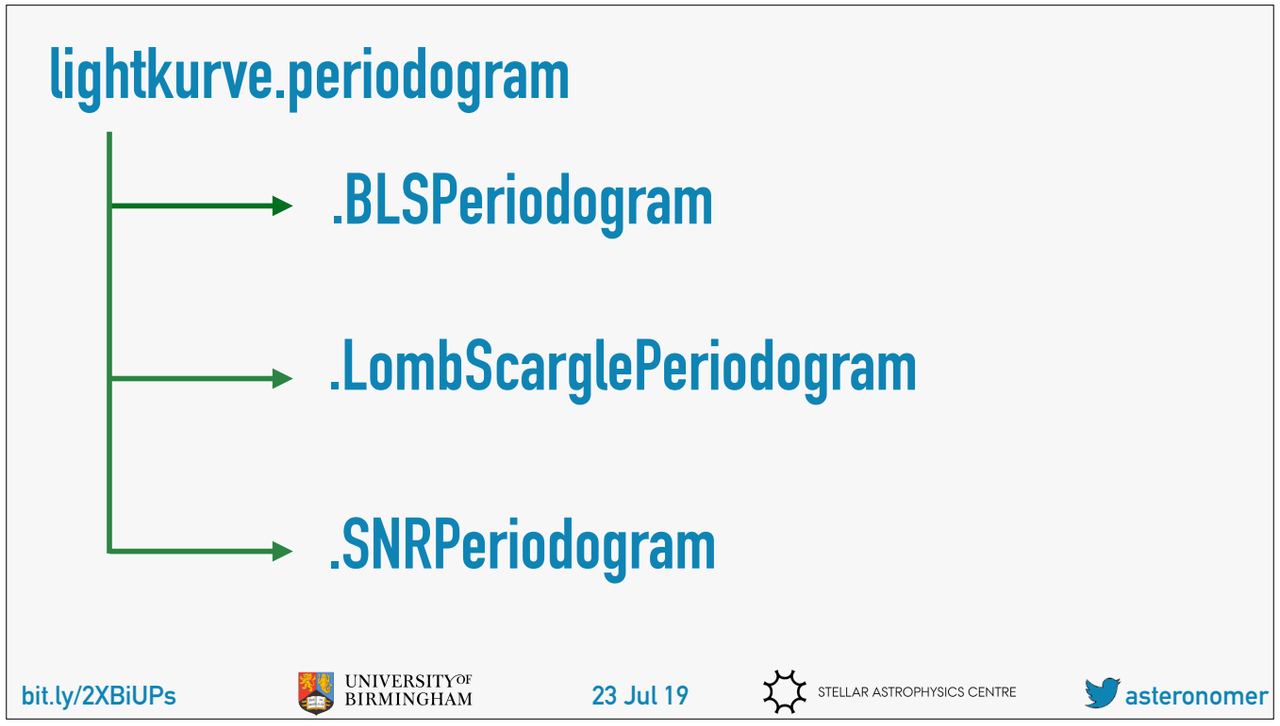
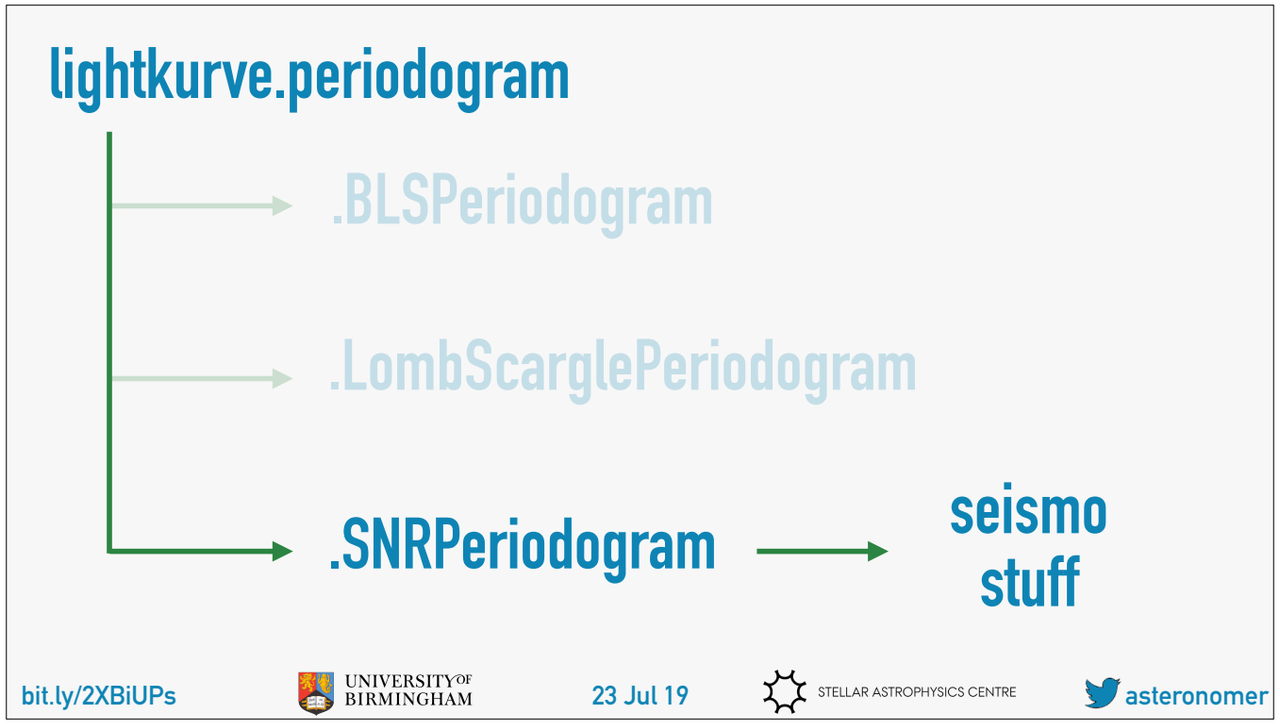


Message: There are different types of periodogram. We want the SNRPeriodogram for seismology stuff!



Message: There are different types of periodogram. We want the SNRPeriodogram for seismology stuff!

```
lk.periodogram.SNRPeriodogram()
    .estimate_numax(numaxs, window, spacing)
    .estimate_numax_diagnostics(numaxs,  window, spacing, return_metric = False)
    .estimate_deltanu(numax)
    .estimate_deltanu_diagnostics(numax, return_metric = False)

lk.periodogram.Periodogram().plot_echelle(deltanu, numax)

lk.seismology()
    .estimate_mass(numax, deltanu, teff, **errors)
    .estimate_radius(numax, deltanu, teff, **errors)
    .estimate_logg(numax, teff, **errors)
```


Extra slide: All the seismology functionality avaialable