Stellar event ⇒ △ normal light curve

fei Dai Caltech Phd

TESS

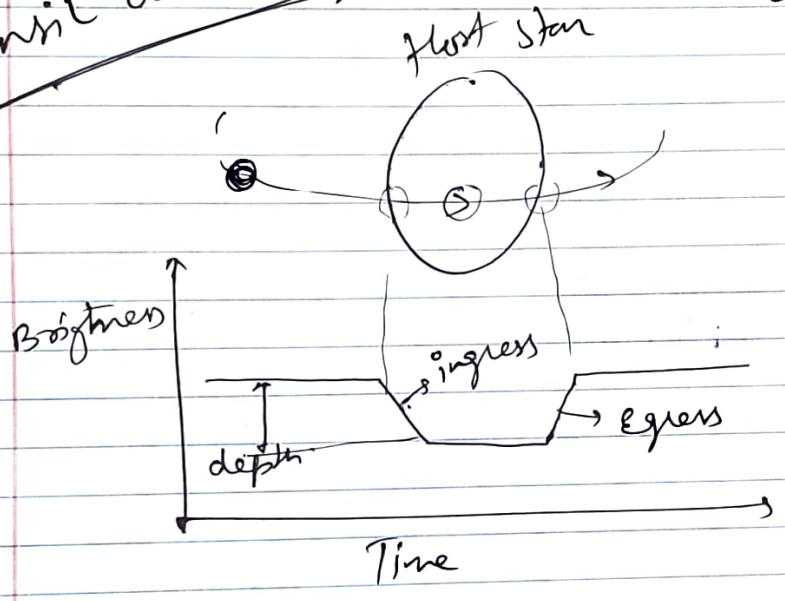
Transiting Exoplanet Survey Satellite

finding exoplanet → MIT + NASA

launched 2018

finding exoplanet

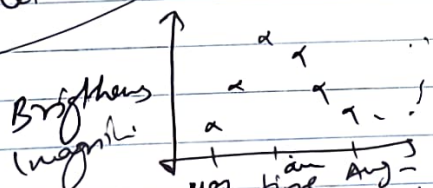
Transit detection Method



Find:

- Presence of a planet
- Radius of the planet
- Orbital period.

Radial Velocity Detection Method



Stars twinkle

↳ because of various atmospheric layers

- turbulence (△ brightness)

Light curve graphs ⇒ show brightness of an object over a period of time.

Objects: Eg: novae, supernovae, variable stars.

TESS + KEPLER data

Lightkurve → Python Library

Dev. by NASA

2 mins

27 day data arrive & made public available

each cycle

→ Every stars has a name (or) ID

sector(1)

eg: Pi Mensae TIC 261136679

star name

search_lightcurve ('Pi Mensae', mission='TESS', author='SPOC')

TESS/KEPLER

Pipeline

→ Nasa official pipeline

Test science process authorised centre.

API design for

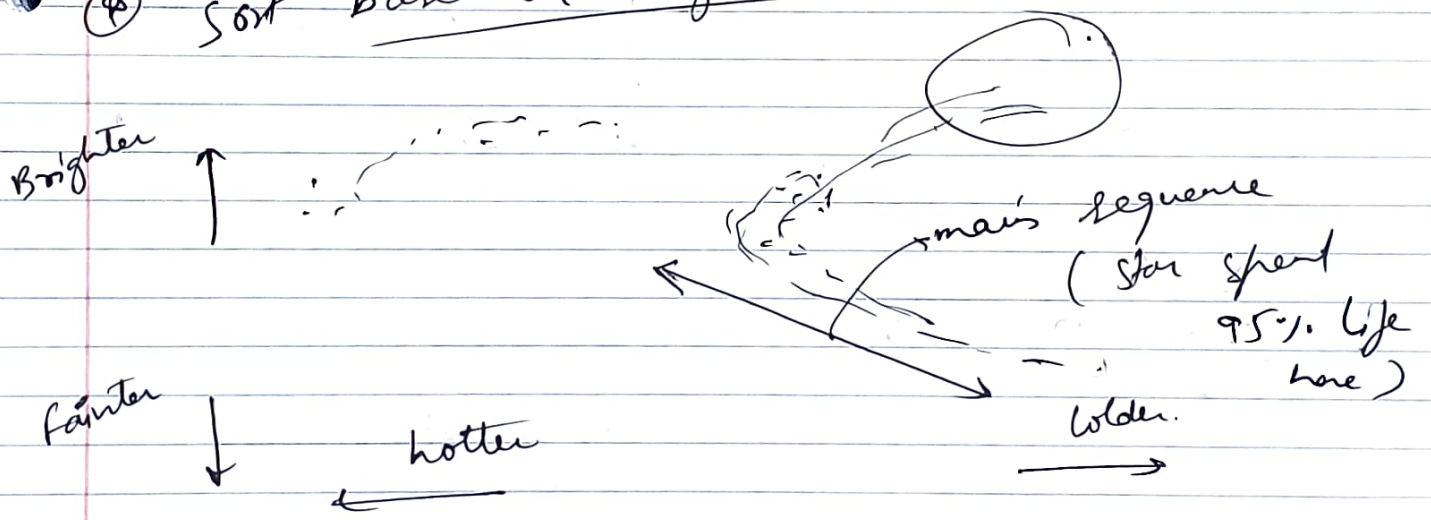
Stellar Variability.

Star → Size, Weight, Radius } ⇒ Light Curve

* Sorting stars based on temperature. ↑ Blue white ⇒ Hot; Red ⇒ Cool

↓

* Sort based on brightness



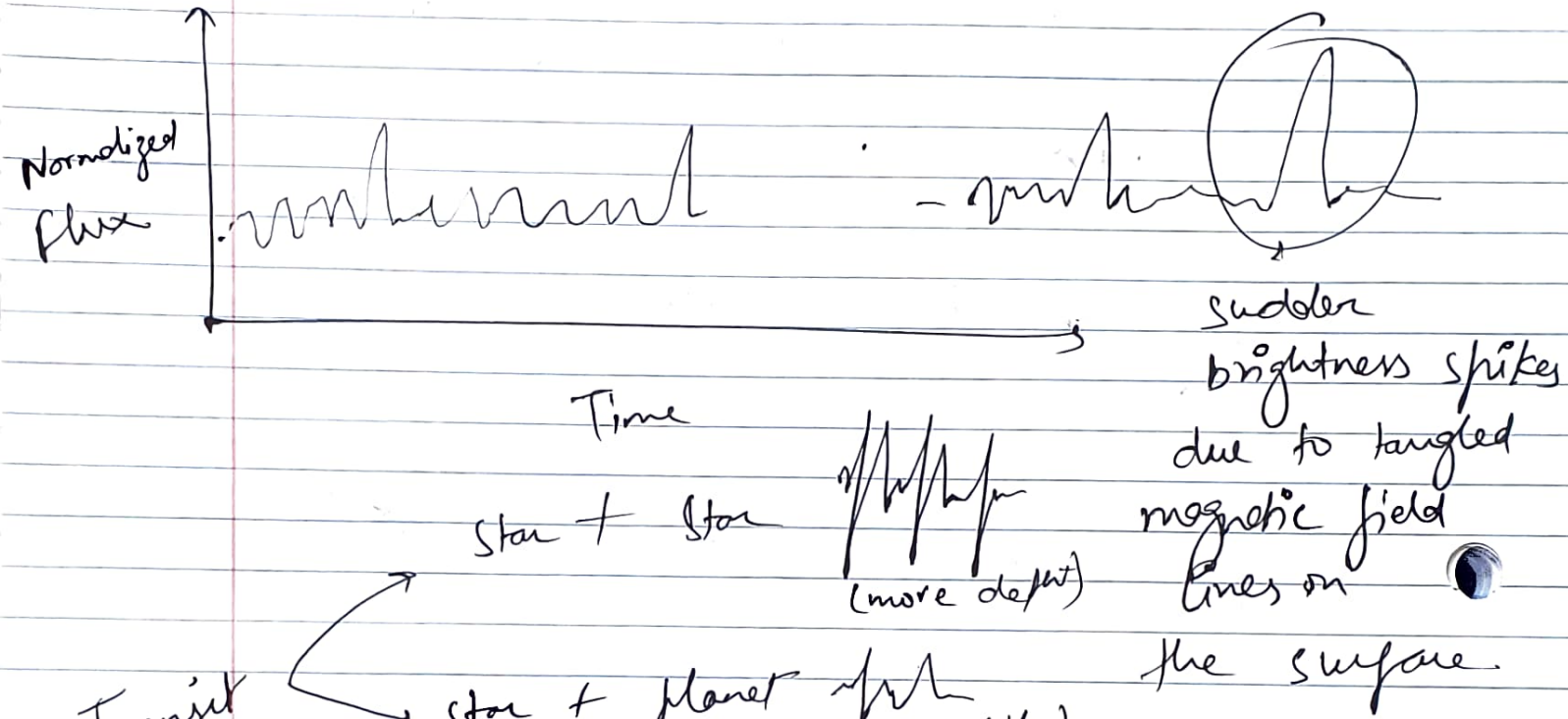
H-R diagram

↙

Hertzsprung-Russell diagram

⇒ Cold stars are active at their surface.

↳ have lots of flares



≠ star spots (rotates)

↳ contribute to factor of Δbrightness

search_tesscut

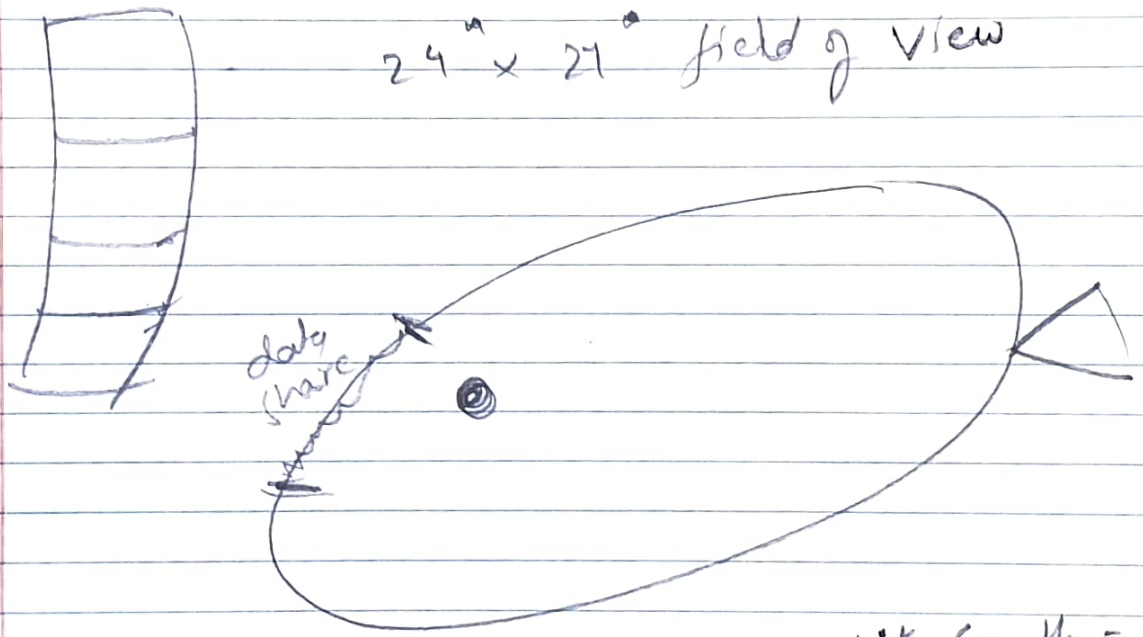
↳ searches MAST for TESS full-frame image cutouts containing a desired target (or) region

pdcsap-flux > sap-flux

(preprocessed flux) (raw)

Cleaner

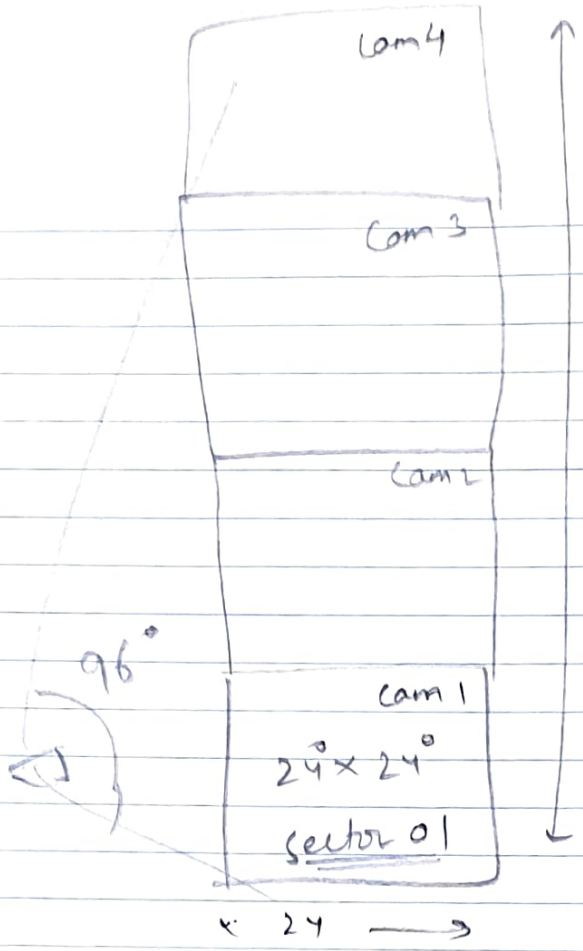
(Better)



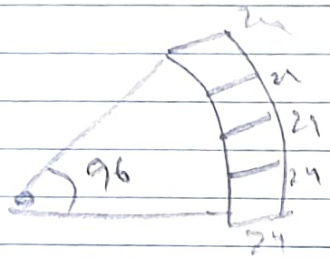
TESS orbit Earth = 13.7 day.

watches a patch of space for 2 orbit ≈ 1 month

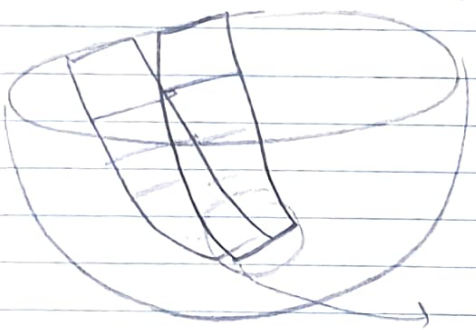
13.7×2



Staring this for
2 orbit
⇒ 27.4 days



13 such strips (started with southern hemisphere)



≃ 1.2 year

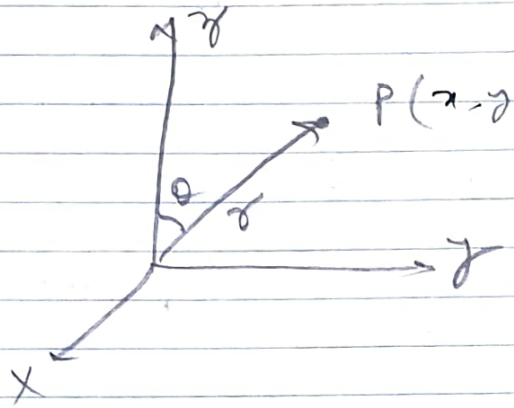
→ continuous viewing zone.

TESS observed 70% of the sky in 2 years

Spherical Co-ordinate System

Sphere

Lies in 3D space



Cartesian

r = radius of sphere

θ = Angle between r & z-axis
(Polar angle)

ϕ = Angle between r & x-axis
(Azimuth Angle)

$\Rightarrow$ Co-ordinate $= (r, \theta, \phi)$

$$z = r\cos\theta$$

$$x = r\cos\theta\cos\phi$$

$$y = r\cos\theta\sin\phi$$

Exoplanet

Naming

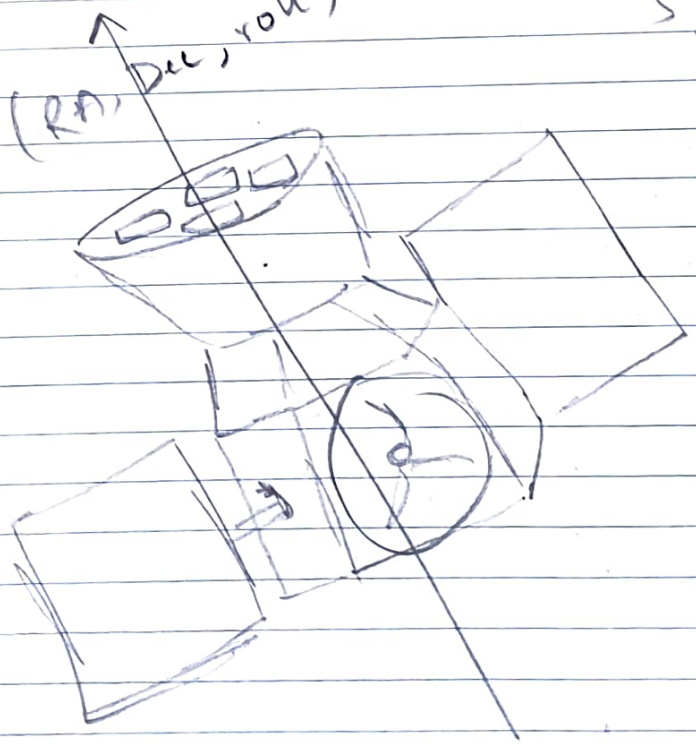
TESS Object of Interest

a → star

TOI 423 b

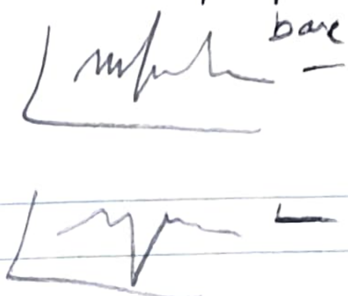
423 → Star system the planet belongs to (like a family name).

b → planet identifier.



Cutout grid → Sector wise

graphs — flux vs time →



Info: — Star name ..

(Common (TOI)) →

RA → Right Ascension

Dec → Declination

Name / TIC ID

Kepler ID

TIC ID