AP Research Student Projects 2022

Tania Cintorino & Joanna McCloskey

Kerry Ann Wise

A Correlational Study Between Changes in Atmospheric Pressure and Temperature, in Central U.S. and Alaska Over the Past 100 years (1900-2009)

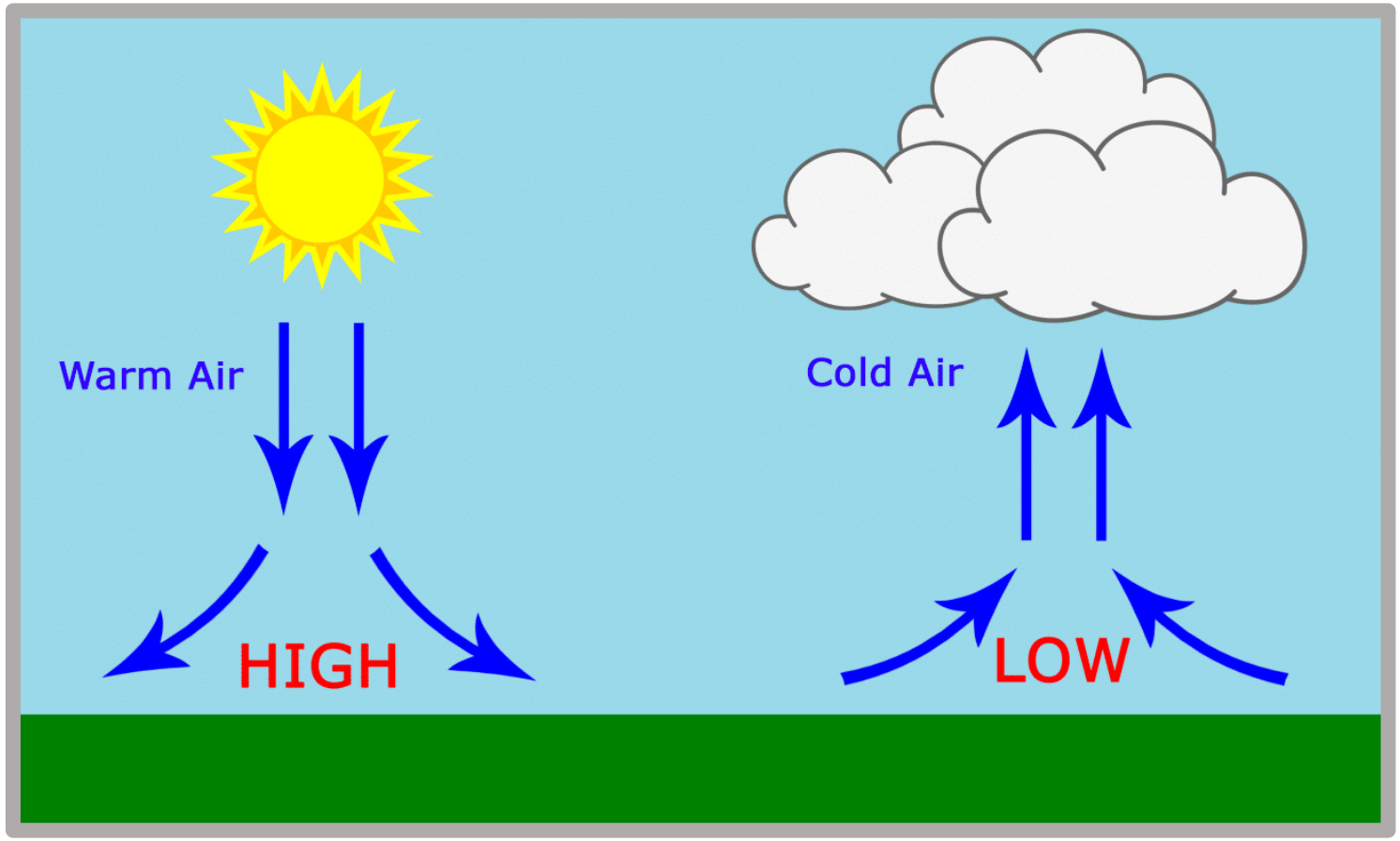
By: Kerry Ann Wise

Climate Change

- A long-term shift in temperature and weather patterns- History.com

Climate change

- Air pressure is another key factor in the cycle in climate change



Research Question- How will atmospheric pressure correlate to temperature changes in Central U.S. and Alaska over the past 100 years?

Methods

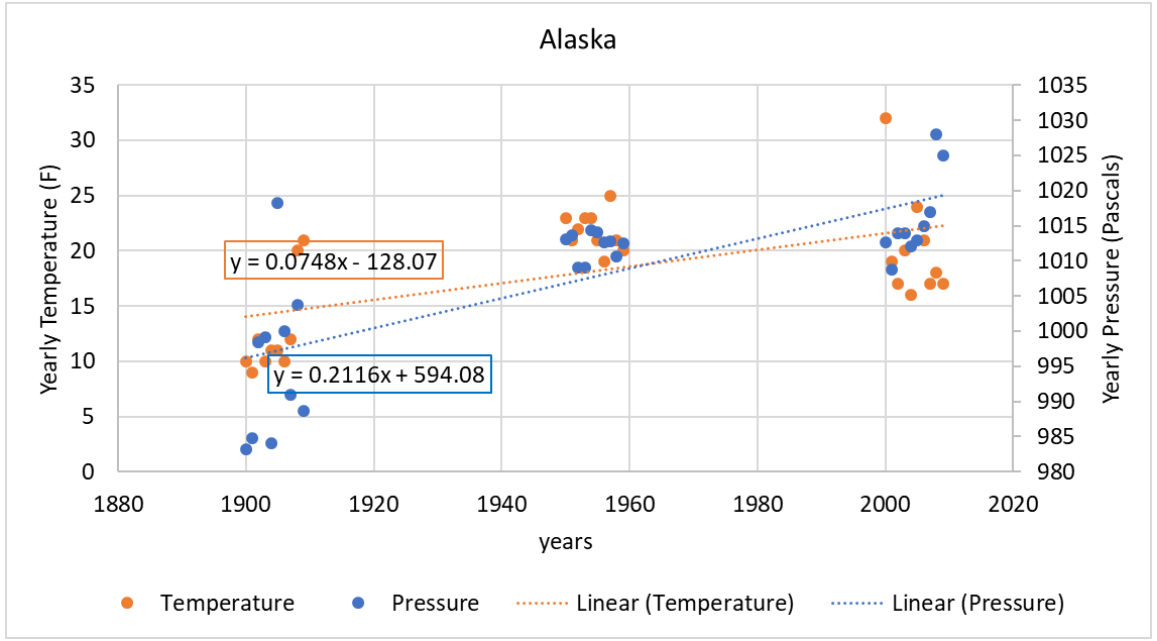
Collected Temperature and Pressure data

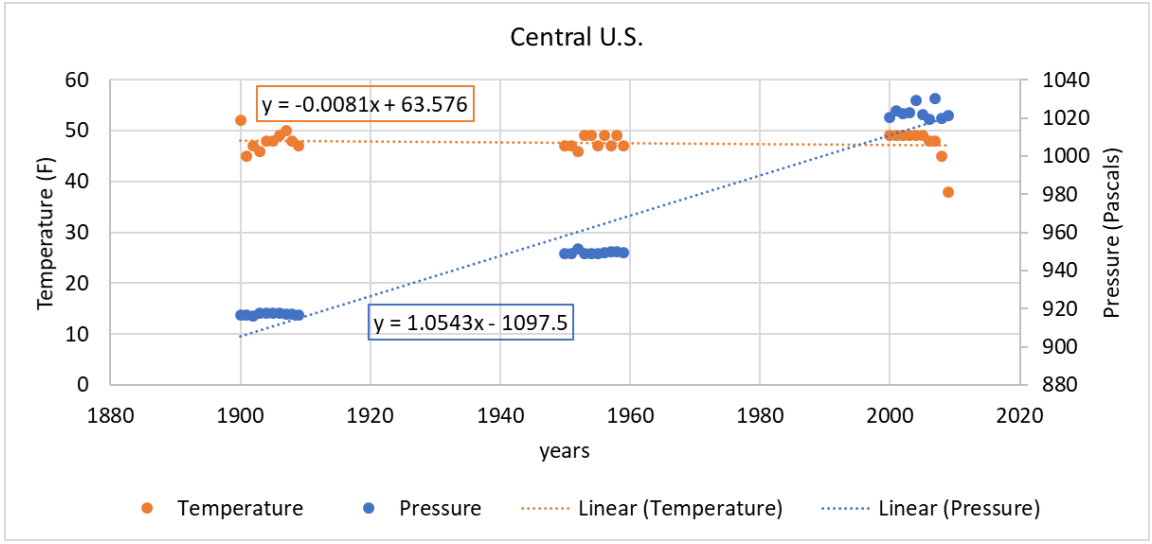
Organized data into Monthly averages

Graphed data into a scatterplot and calculated a linear trendline equation

Analyzed the data using a correlation test

Results


Alaska
y = 0.0748x - 128.07
y = 0.2116x + 594.08
Yearly Temperature (F)
Yearly Pressure (Pascals)
years
Temperature
Pressure
Linear (Temperature)
Linear (Pressure)


Central U.S.
y = -0.0081x + 63.576
y = 1.0543x - 1097.5
Temperature (F)
Pressure (Pascals)
years
Temperature
Pressure
Linear (Temperature)
Linear (Pressure)

Results

Alaska	
year	Correlation Coefficient
1900	0.08
1950	-0.06
2000	-0.30
all	0.53

Central U.S.	
Year	Correlation Coefficient
1900	0.10
1950	-0.41
2000	0.26
All	-0.11

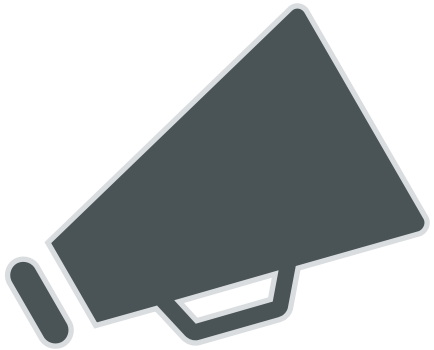
Conclusion

- There was a change that occurred in both pressure and temperature but there was no correlation
- This study can bring awareness to the process of climate change

Ella Bloom

CHEERLEADING IN THE NORTH AND SOUTH OF THE UNITED STATES

By Ella Bloom



“WHAT FACTORS PLAY A ROLE IN DETERRING MALE HIGH SCHOOL CHEERLEADERS IN THE NORTHERN STATE NEW YORK COMPARED TO THE SOUTHERN STATE FLORIDA?”

SURVEY METHOD

Surveys created and conducted using Microsoft Forms

Cheerleaders and coaches had separate surveys

Consent and anonymity

Distributed via email

RESULTS

Chi-Square

&

T-Test

- $p>0.05$ no statistically significant difference
- $p<0.05$ there is a statistically significant difference

NEW FINDINGS

Females are told more often that cheer is not a sport compared to males who cheer

Bullying is the same between males in Florida and New York

Coaches did not play a role in recruitment of males

Cheer is not viewed as a feminine sport

Kailly Nocera

Glacial and Fluvial Activity During Periods of High Obliquity in Arabia Terra

Kailly Nocera

Image retrieved from https://images.news18.com/ibnlive/uploads/2021/08/1627902340_mars-new-images-1600x1200.jpg

Tilt Cycle of Mars

Axis Tilt Cycle

Effects on climate

Large tilt intensifies water cycle

(Forget et al. 2014)

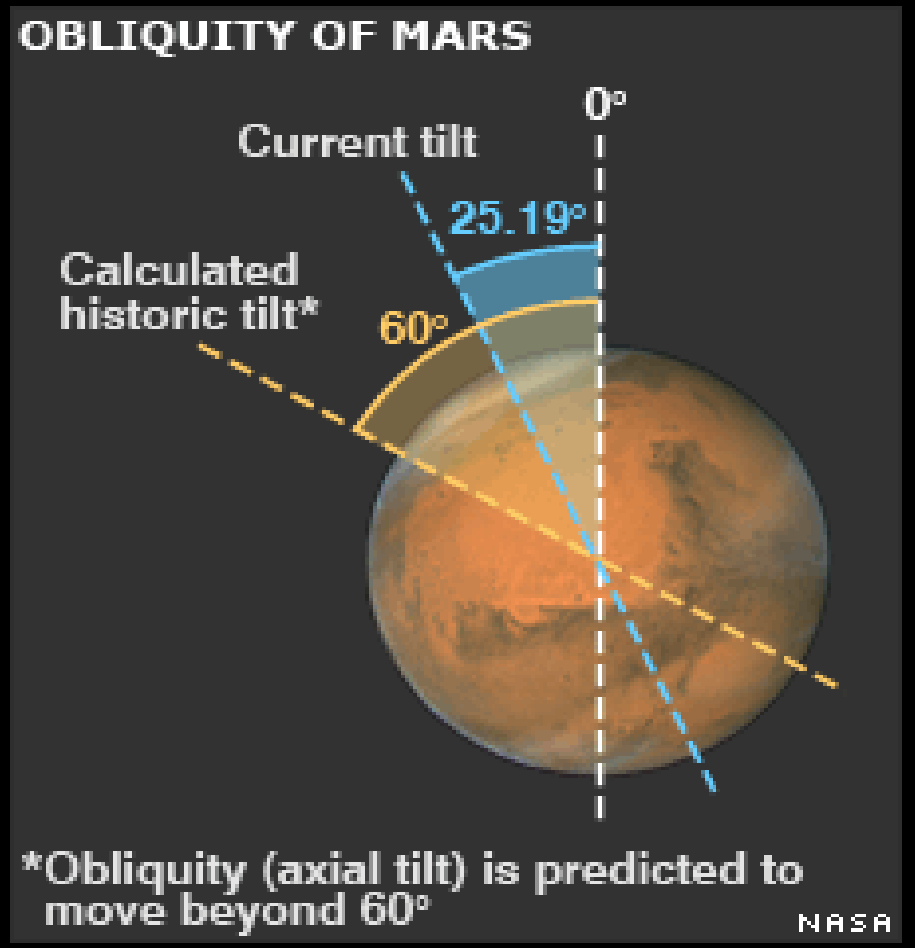
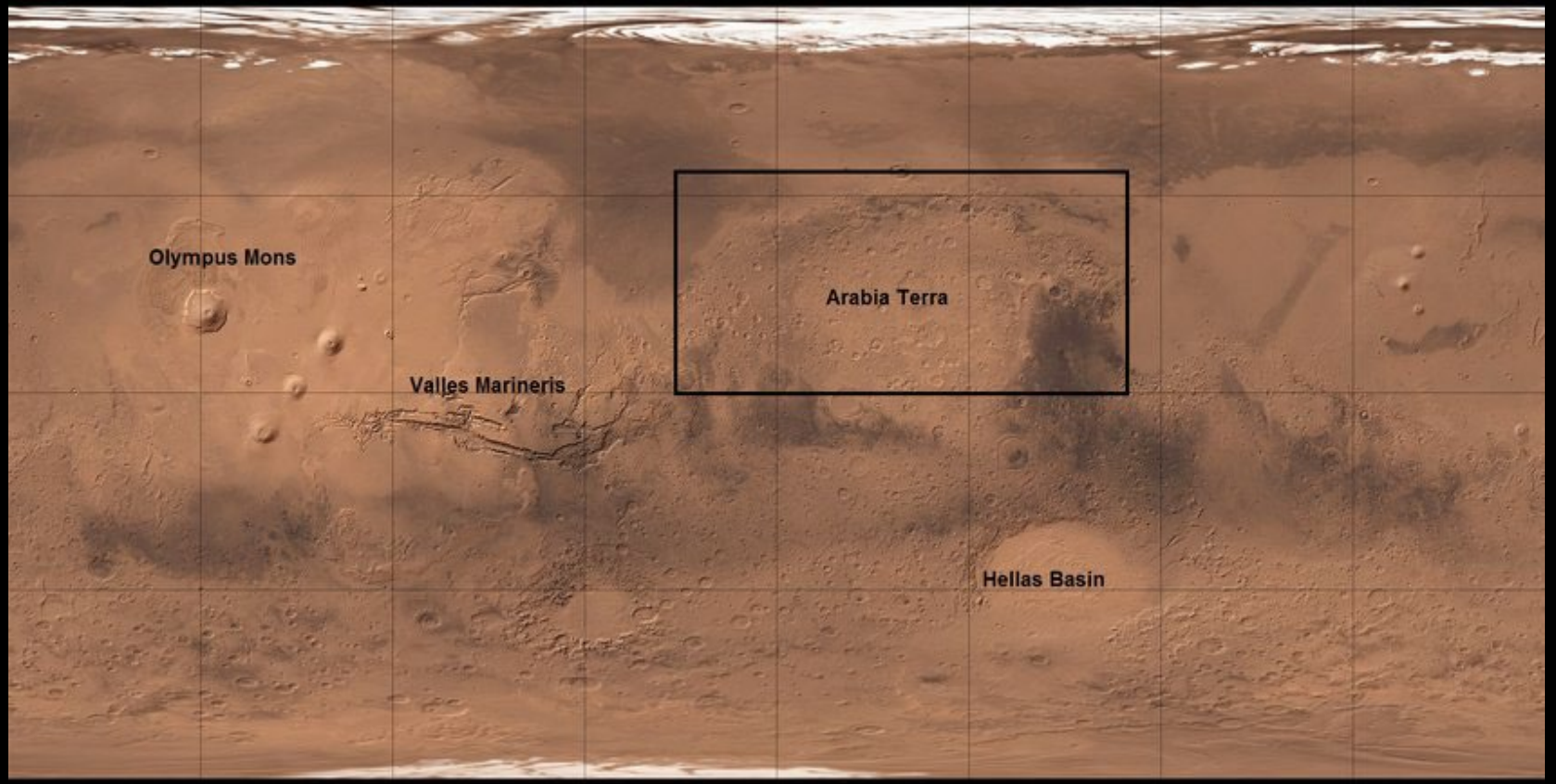


Image retrieved from https://www.google.com/url?sa=i&url=http%3A%2F%2Fnews.bbc.co.uk%2F2%2Fhi%2Fscience%2Fnature%2F7951880.stm&psig=AOvVaw012JOR_F6WHB3_g0LtPsb5&ust=1638641984438000&source=images&cd=vfe&ved=0CAsQjRxqFwoTCPCjhaKfyPQCFQAAAAAdAAAAABAX

Arabia Terra



- One of the oldest areas
- Substances that are easy to evaporate (Barlow et al. 2014)

Arabia Terra has implications for future habitability

Image retrieved from (Zeilnhofer 2015)

Importance and Reasoning

- Mars history
- Possible habitability
- Conditions in which life may have been possible

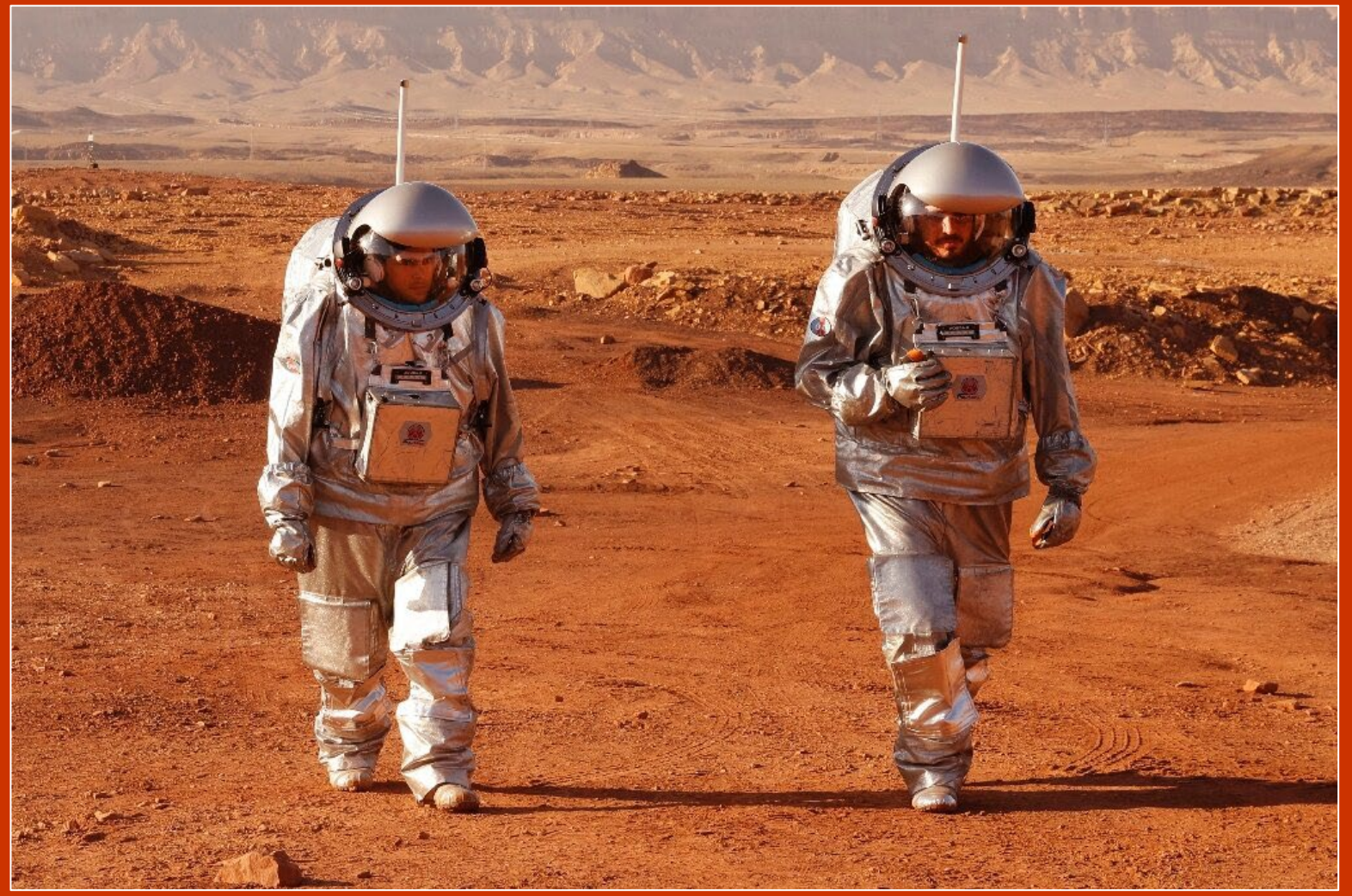
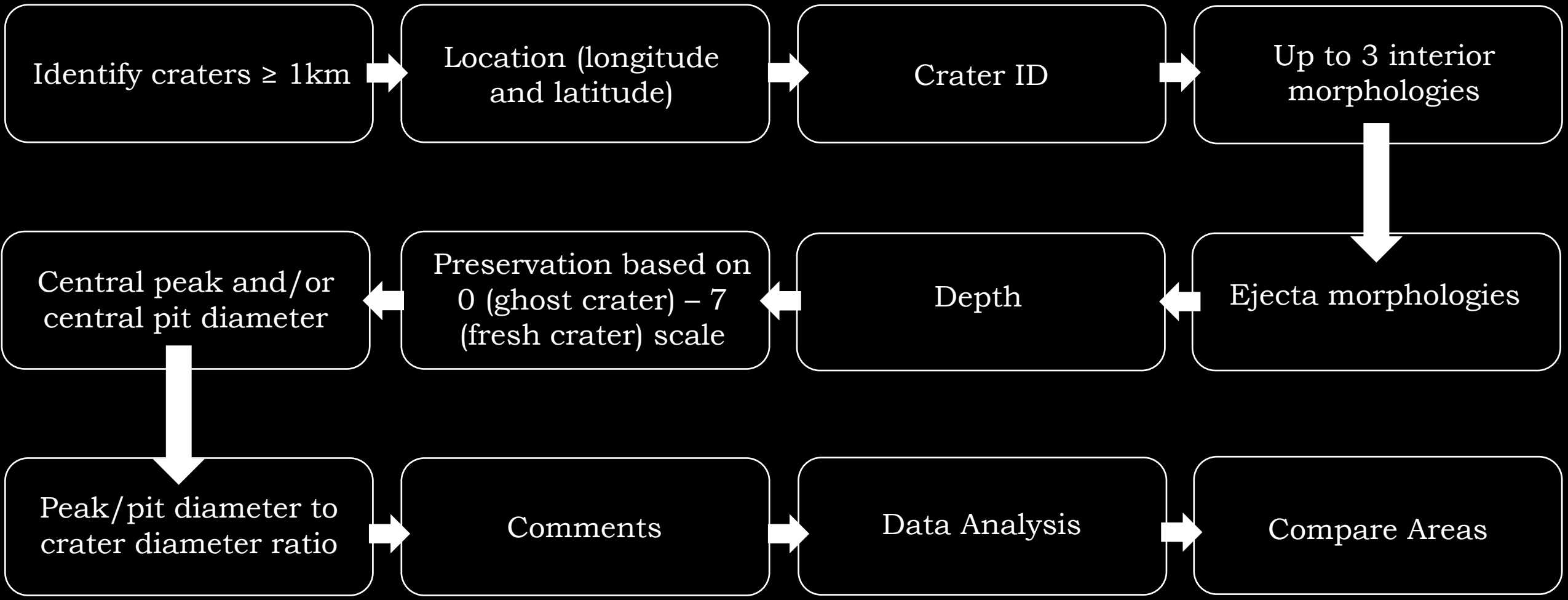


Image retrieved from https://scx2.b-cdn.net/gfx/news/2021/a-couple-of-trainee-as-1.jpg

Research Question

What do crater features on Mars in Arabia Terra indicate about the movement of water and ice caused by a large axis tilt?

Image retrieved from https://mars.nasa.gov/system/downloadable_items/36905_18_Mars_Crater_Ice.jpg

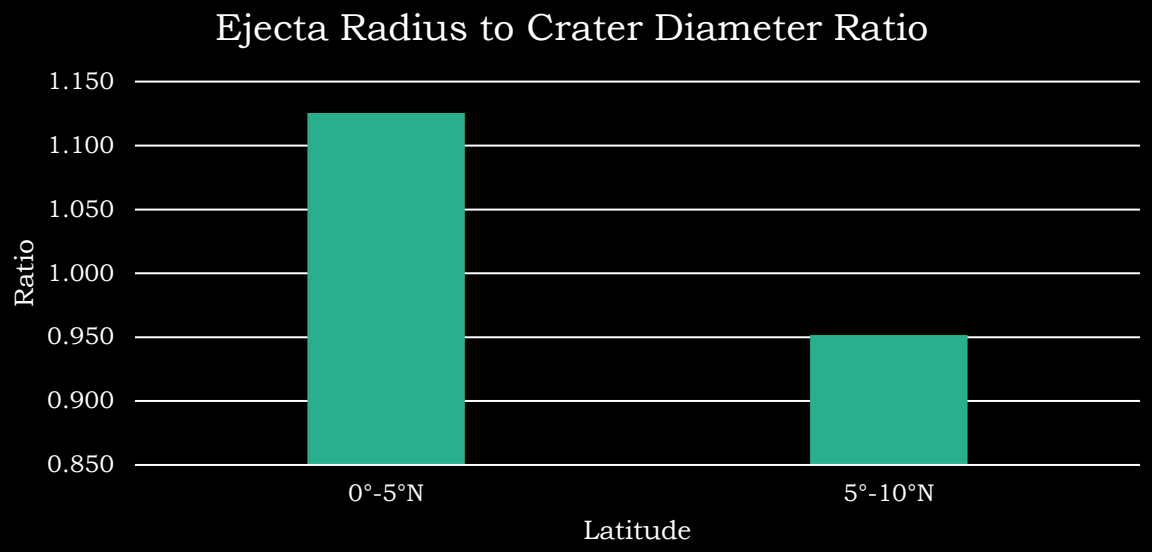


Crater ID	Longitude (E)	Latitude (N)	Diameter (km)	Int 1	Int 2	Int 3	Ejecta	Preservation	Peak Diameter	Dpk/Dc	Pit Diameter	Dp/Dc	Crater Depth (m)	Comments

Results

First Search Area:

- 255 craters
- Ejecta Radius/Crater Diameter: 1.126
- Median Diameter: 2.125 km
- Median Depth: 107.5 m
- Average Preservation: 3.66
- Fluvial Features: 67
- Glacial Features: 8



Second Search Area:

- 233 craters
- Ejecta Radius/Crater Diameter: 0.952
- Median Diameter: 2.398 km
- Median Depth: 93 m
- Average Preservation: 3.283
- Fluvial Features: 118
- Glacial Features: 27

Image retrieved from https://upload.wikimedia.org/wikipedia/commons/0/02/OSIRIS_Mars_true_color.jpg

Conclusions

- The median crater depth and ejecta radius to crater diameter ratio variation may indicate that a stronger crust is present in higher latitudes of Arabia Terra
- The average crater preservation may indicate that lower latitudes of Arabia Terra contain more recent craters than higher latitudes
- The amount of glacial and fluvial features being much greater in higher latitudes indicates that fluvial and glacial activity occurred less towards the equator

Natalie Masters

How Does Birth Order Influence the Weighted GPA of Students Who Attended Seaford High School Over the Past Ten Years?

BY: NATALIE MASTERS

Why This Topic?

- Youngest of 3 siblings
- Competitive sibling relationship
- Never heard of birth order theory

My study

- Correlation analysis
- Two sibling families and three sibling families
- Bar graphs to show statistical significance

Results

- Youngest sibling most frequently has the highest weighted GPA in 3 sibling families
- Youngest siblings in 3 person families have a higher mean weighted GPA than their siblings
- No statistically significant results in 2 sibling families

Grace Supinsky

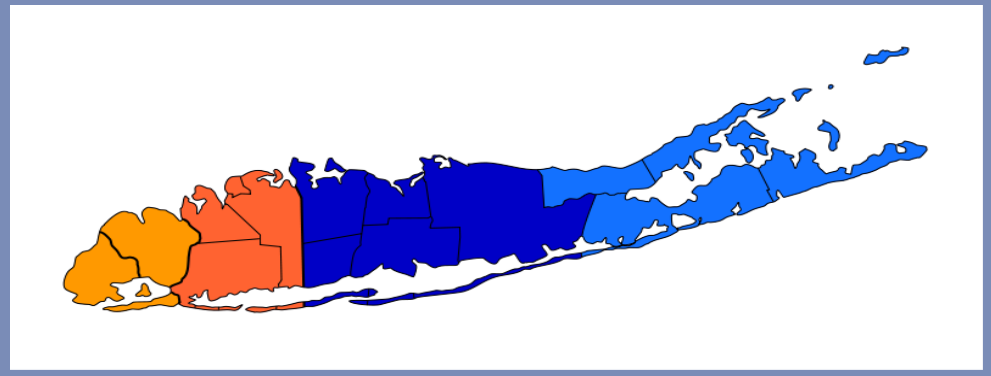
Elementary Education Impact From the COVID-19 Lockdown

By: Grace Supinsky

Topic of Inquiry

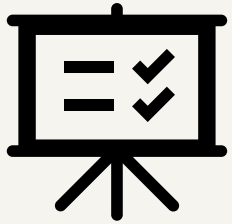
Covid-19 pandemic lockdown leaving negative effects on children's education

Gap: Location



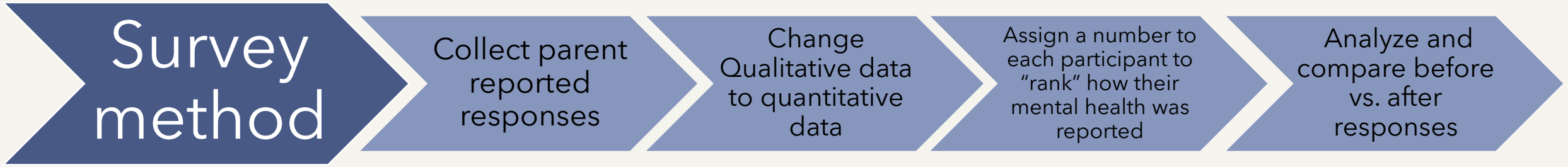
How has the Covid-19 pandemic lockdown affected the anxiety levels and academic performance of 2nd-5th grade elementary school students in Seaford Harbor elementary school.

Hypothesis



Children who had a more difficult time dealing with the stress and anxiety of the pandemic would have a decreased academic performance after the lockdown

Research


Survey method
Collect parent reported responses
Change Qualitative data to quantitative data
Assign a number to each participant to "rank" how their mental health was reported
Analyze and compare before vs. after responses

How questions were ranked

Numerical 1-5 system

1: Least negatively psychologically affected

3: Neutral

5: Most severely psychologically affected

Report card Grade significance

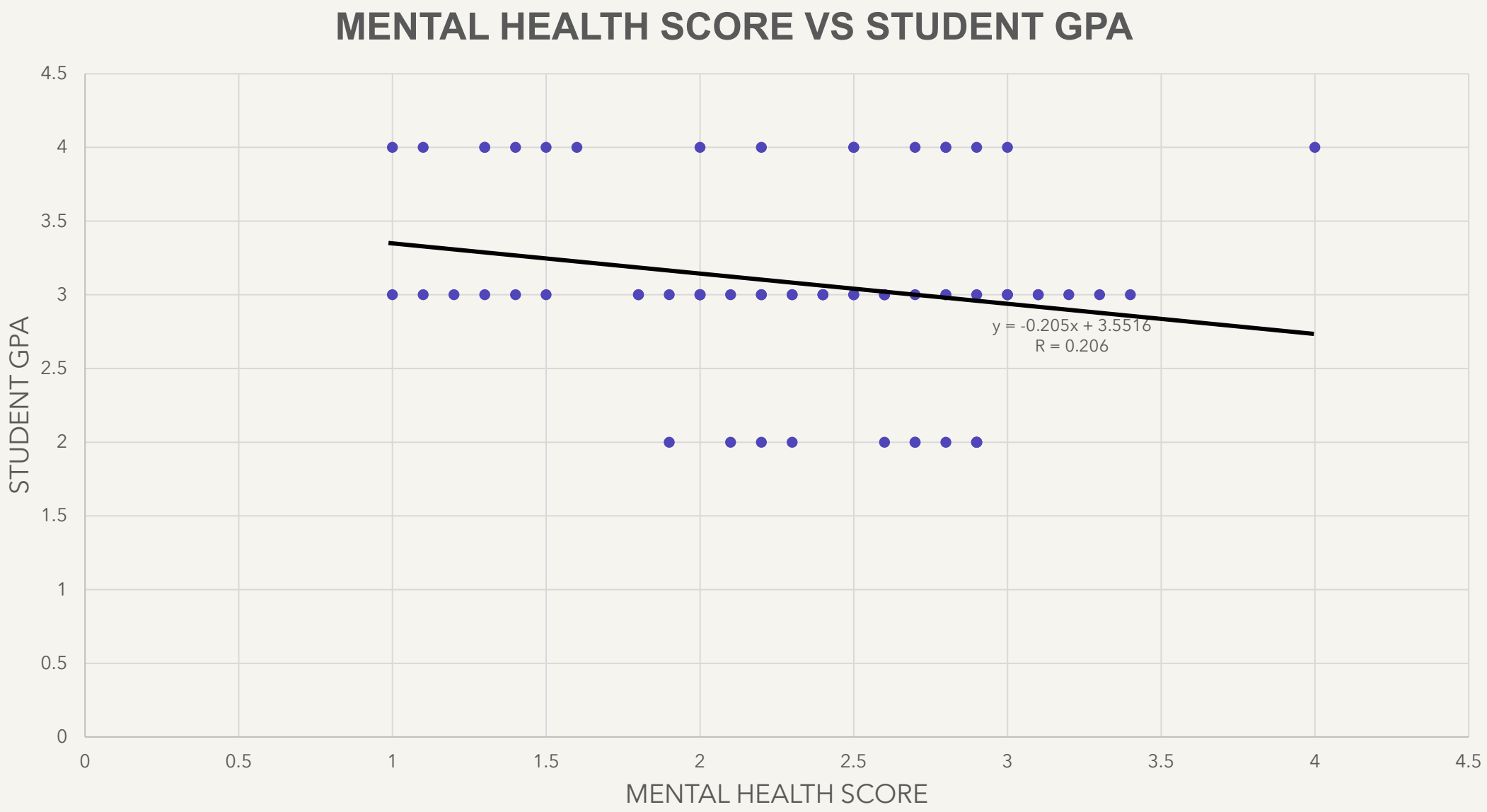
1	2	3	4
• Does not meet expectations	• Approaching expectations	• Meets expectations	• Exceeds expectations

Findings

Children struggled to adapt to the new learning environment

During the pandemic grades were the lowest

Mental health did not have an affect on academic performance


MENTAL HEALTH SCORE VS STUDENT GPA
STUDENT GPA
MENTAL HEALTH SCORE
y = -0.205x + 3.5516
R = 0.206
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5

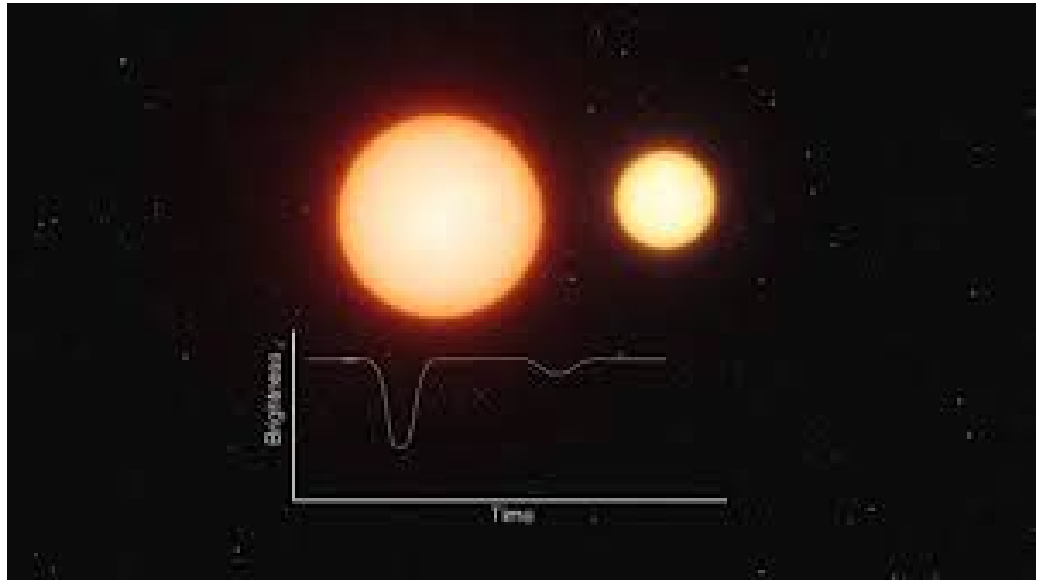
Thank you!

William Cascio

An Investigation Into Modeling the Binary Star System of PS Vir

William Cascio

What is PS Vir?



https://www.google.com/search?q=binary+star+configurations&tbm=isch&ved=2ahUKEwiE6qj-r4L3AhWDFFkFHdYMDX4Q2-cCegQIABAA&oq=binary+star+configurations&gs_lcp=CgNpbWcQAzoHCAAQsQMQQzoLCAAQgAQQsQMQgwE6BQgAEIAEOgQIABBDOggIABCABBCxAzoGCAAQCBAeOgQIABAYUIIJWM0tYLIvaABwAHgBgAHOA4gBmzSSAQgyLTIyLjIuMZgBAKABAaoBC2d3cy13aXotaW1nwAEB&sclient=img&ei=shFPYoTJH4Op5NoP1pm08Ac&rlz=1C1GCEU_enUS867US867

Research Question- How do the orbits of the binary stars in the system of PS Vir act over time?

Hypothesis- Using *Binary Maker 3* and light curve analysis, an accurate depiction of the orbits of PS Vir will be produced for the given nights

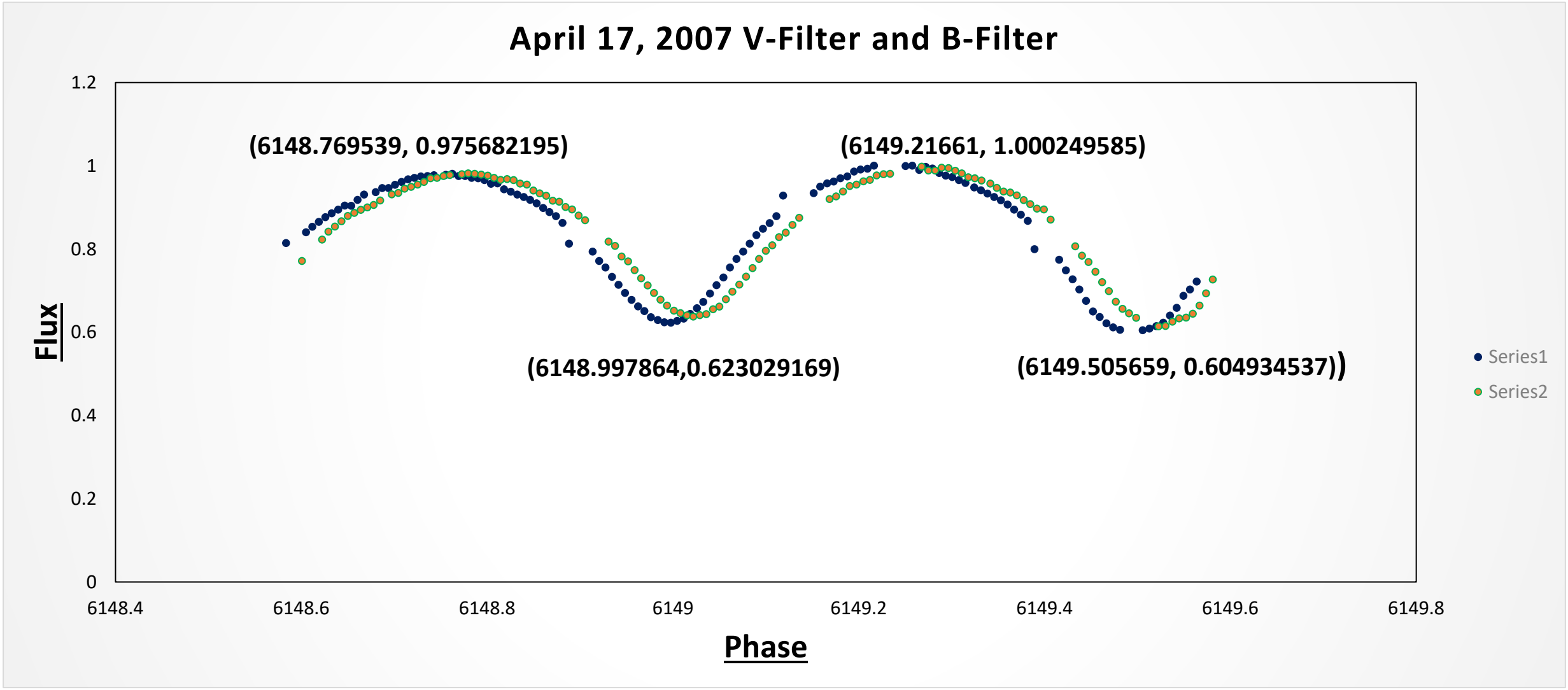


Figure 1- Flux versus phase data for April 17,2007 B-filter and V-Filter showing the Primary Maximum and Minimum and Secondary Maximum and Minimum coordinates of the light curve. Series 1- B-Filter Series 2- V-Filter

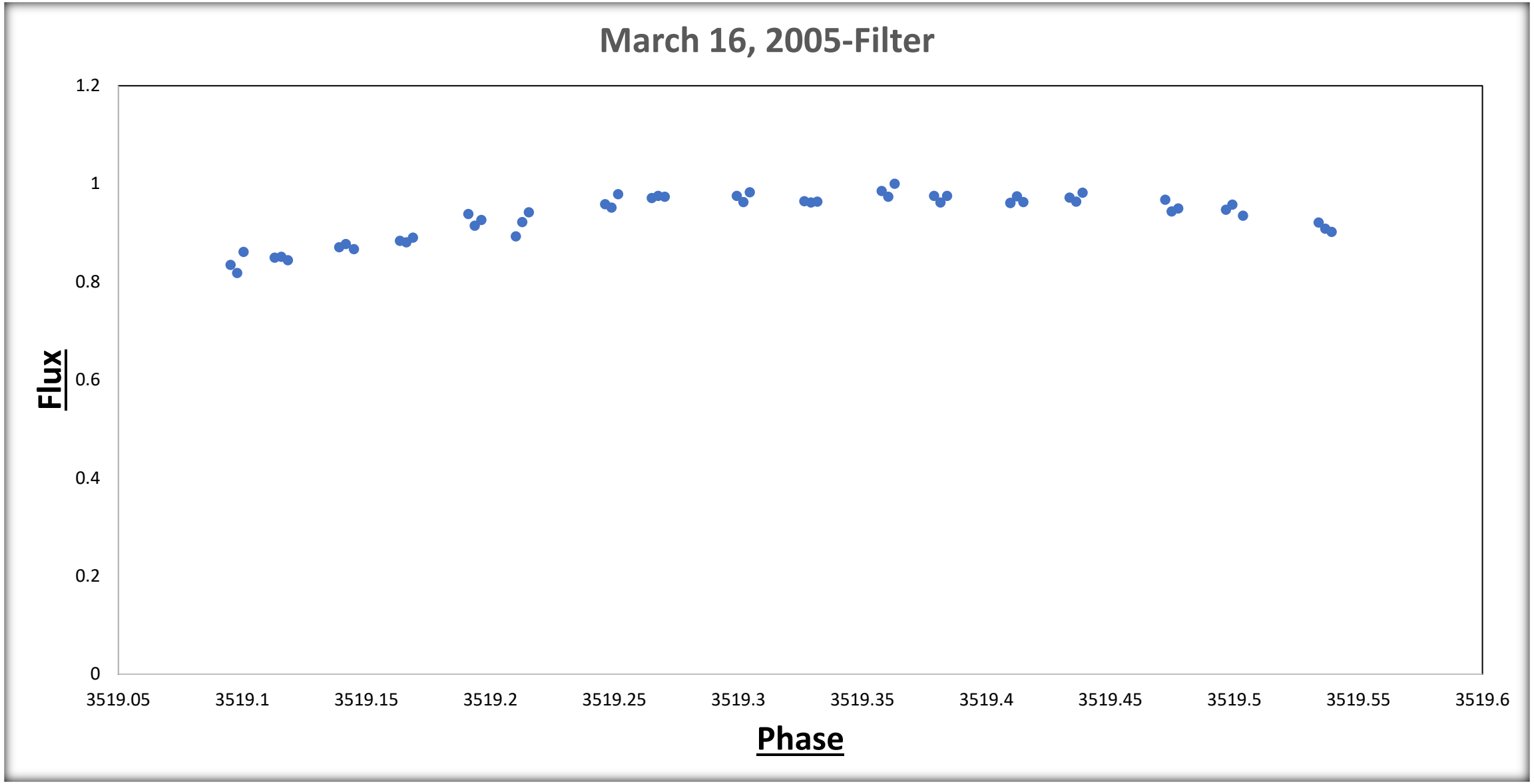


Figure 2- Flux versus phase data for March 16, 2005 V-Filter

User Input: LPUMaV.BM3

File Geometry Mode Spots Tools Windows Help

Latitude: 20

Longitude: 40

Grid Omegas Temperature

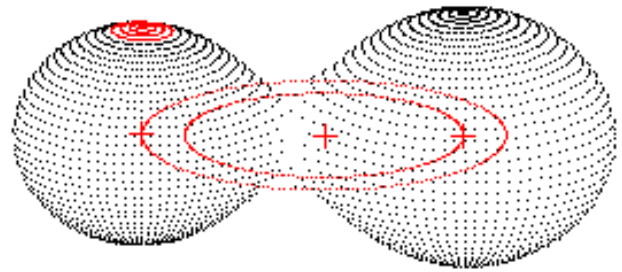
Limb Darkening Reflection Observer Spots

Eccentric Rotation Disk RV

Render

Binary

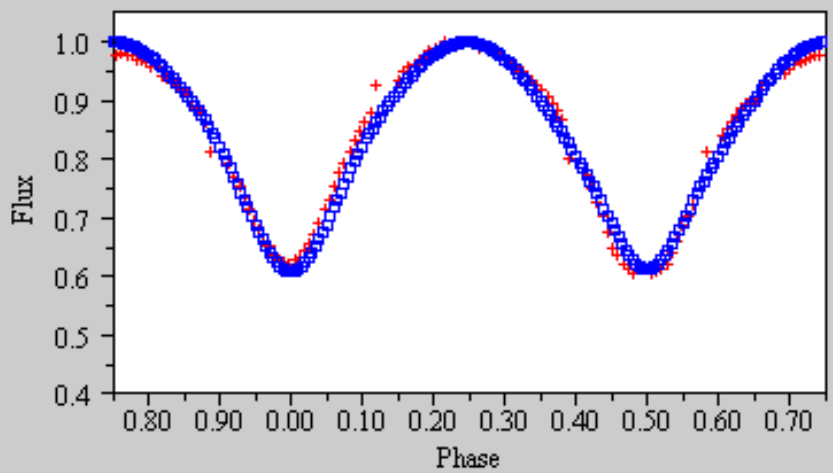
File Edit



0.245

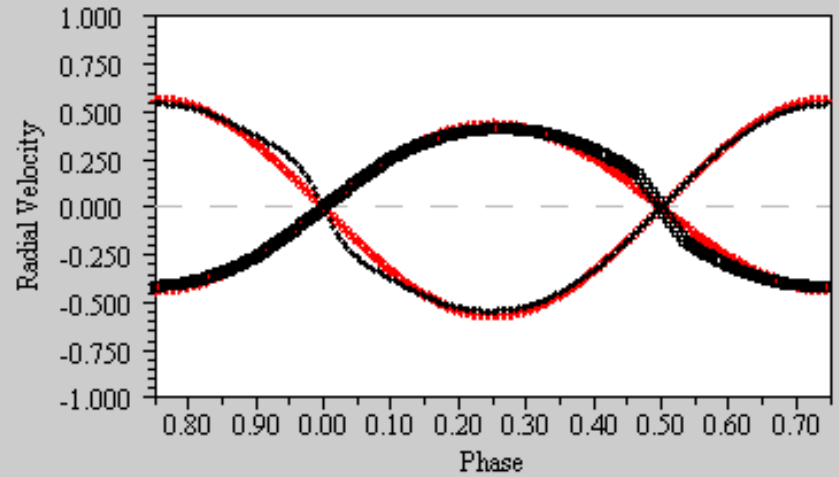
Light Curve Plot: April 17 2007 B.bm3

File Edit

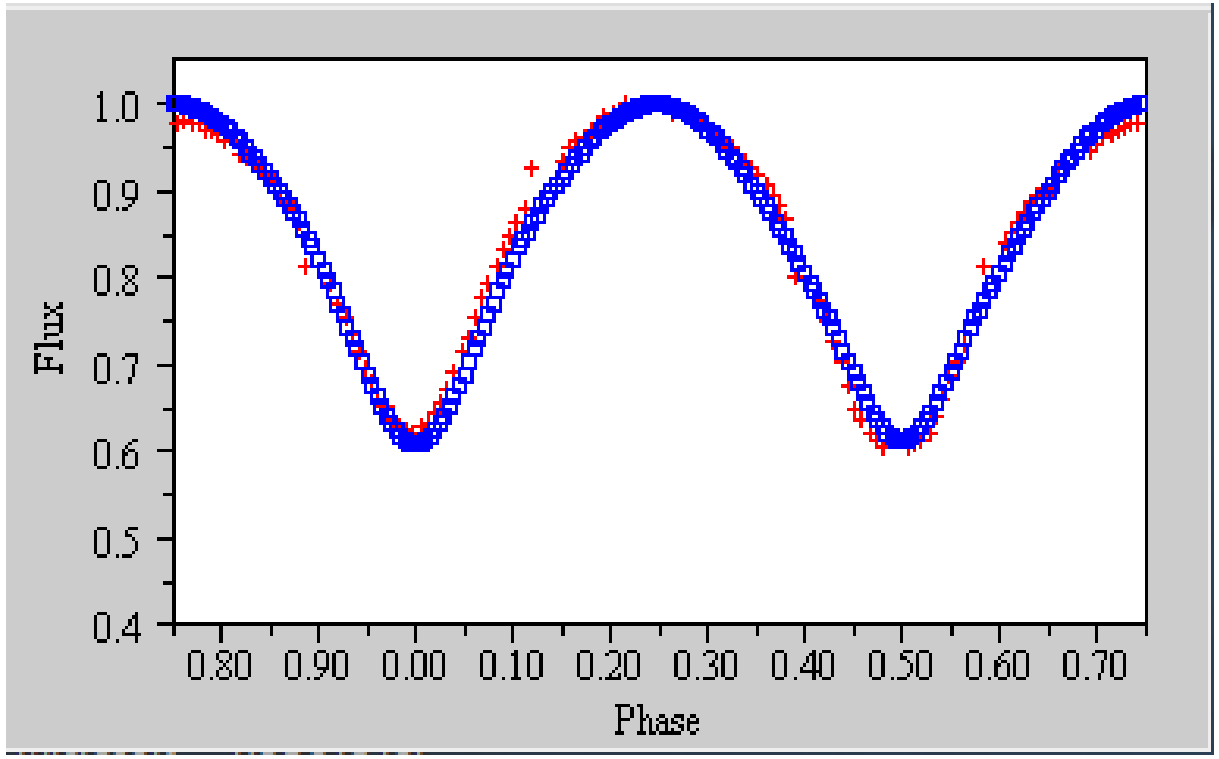


Radial Velocity Plot

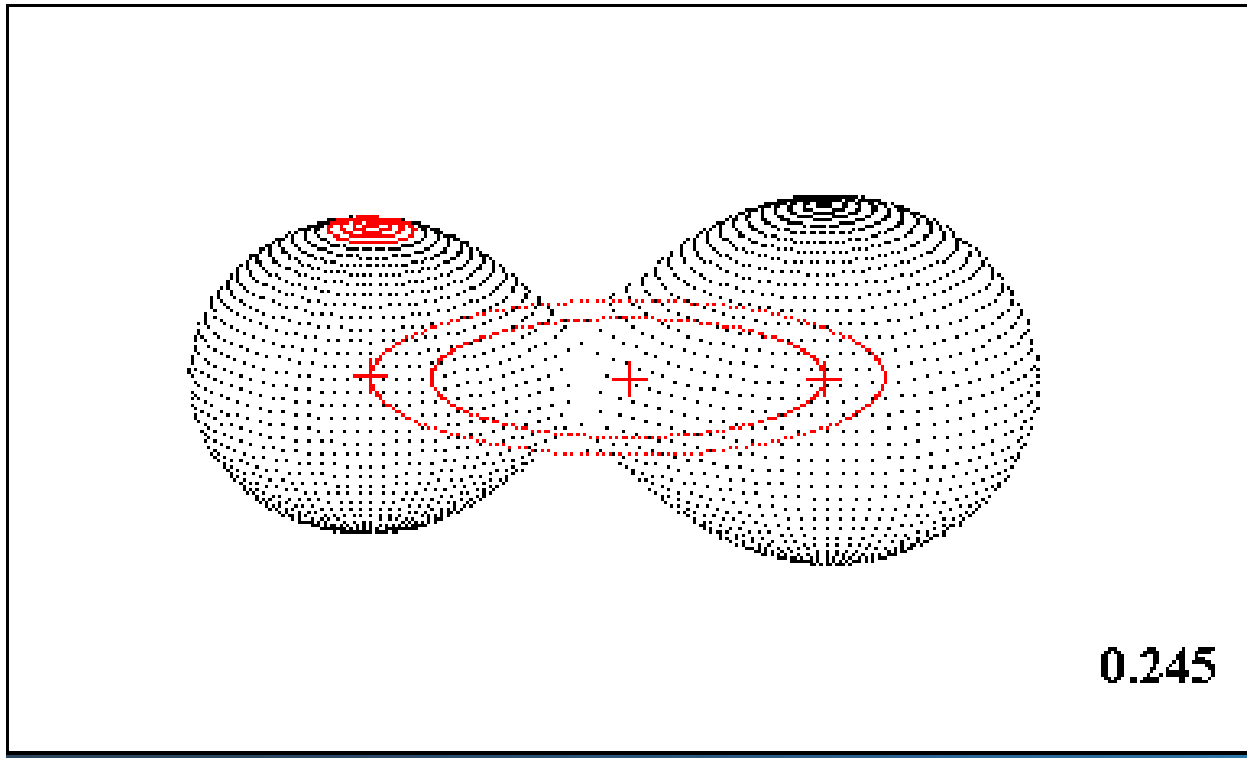
File Edit



Light Curve



Model of PS Vir



Proxima Centauri

https://www.google.com/search?q=proxima+centauri&rlz=1C1GCEU_enUS867US867&source=lnms&tbm=isch&sa=X&ved=2ahUKEwiDqIb9r4L3AhVtkokEHVQjCO4Q_AUoAnoECAIQBA

Conclusions

There is Solar activity on the Secondary Star of PS Vir

Habitability is a possibility due to temperatures and orbit shapes