Helyze
Spectrographic Analysis of the Magnetic Reconnection

INTERNATIONAL SPACE APPS CHALLENGE

Team: EELEFantes
Challenge: Magnetic Reconnection

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image source: https://www.youtube.com/watch?v=i_x3s8ODaKg

Theme Contextualization

What is a solar storm?

- A disturbance in the Sun's outer atmosphere, which can result in the release of a significant amount of energy, particles, and magnetic fields into space. These storms can have various effects on space weather and technological systems.
- The solar Storm causes **magnetic reconnections** while interacting with the **earth magnetic chield** and causing the **Northern Lights**

Solar Storm Destroys 40 New SpaceX Satellites in Orbit

The geomagnetic incident resulted in the Starlink transmitters drifting back into Earth's atmosphere, where they will burn up, potentially costing the company about $100 million.

image source:https://tech.hindustantimes.com/tech/news/solar-storms-and-internet-apocalypse-why-researcher-feels-bad-71688886185600.htmll

Solar storms and Internet apocalypse: Why researcher feels "bad"

Recent discussions about the possibility of an "internet apocalypse" caused by solar storms have captured the attention of everyone, especially those frequenting the various social media platforms.

image source:https://www.nytimes.com/2022/02/09/science/spacex-satellites-storm.html

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The Data Treatment

Data Source

ACE

image source: nasa archives

WIND

DSCOVR

Programming Language

- All the code was made using the python programming language

Libraries Used

- pandas
- plotly
- numpy
- csv
- matplotlib
- pywt
- datetime

To access our Colab:

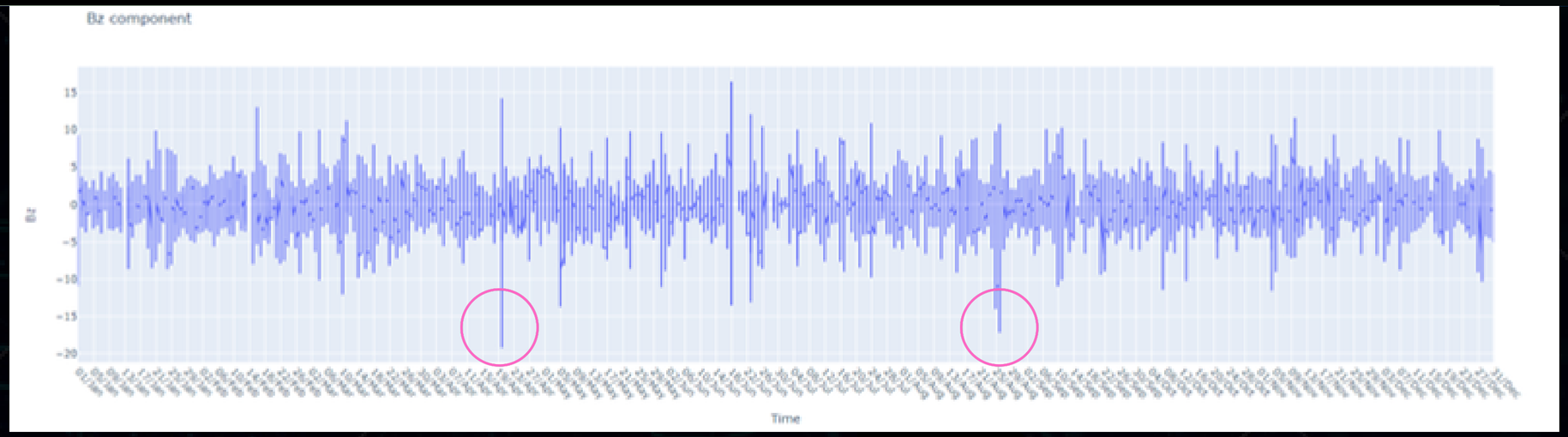
The Resulting Graphs

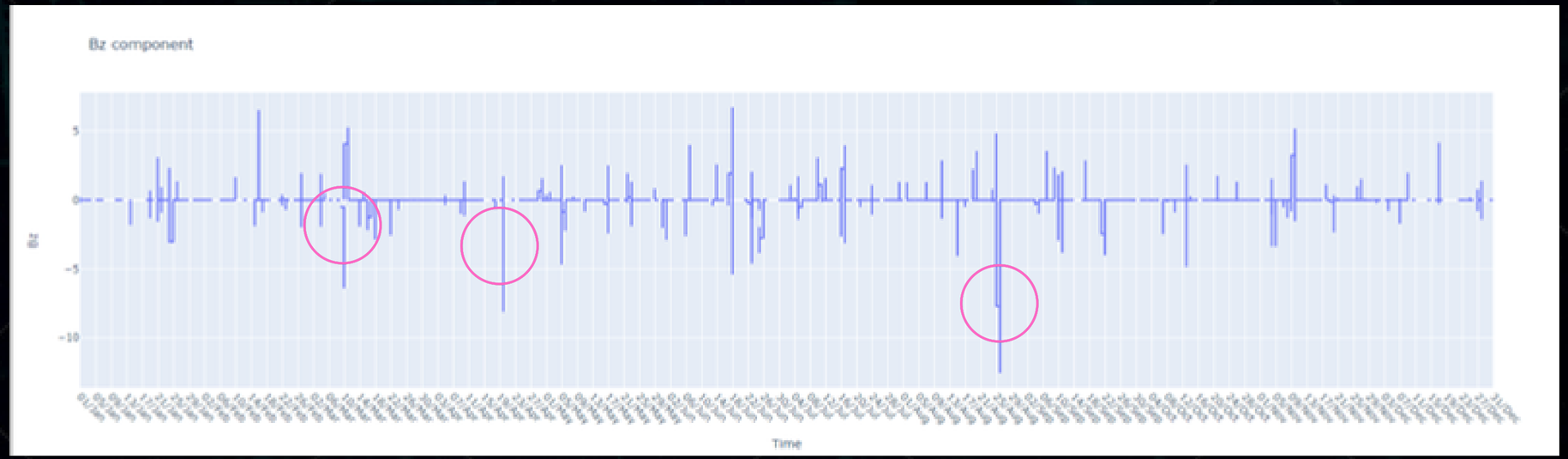
BEFORE Refining

DSCOVR 2018

AFTER Refining

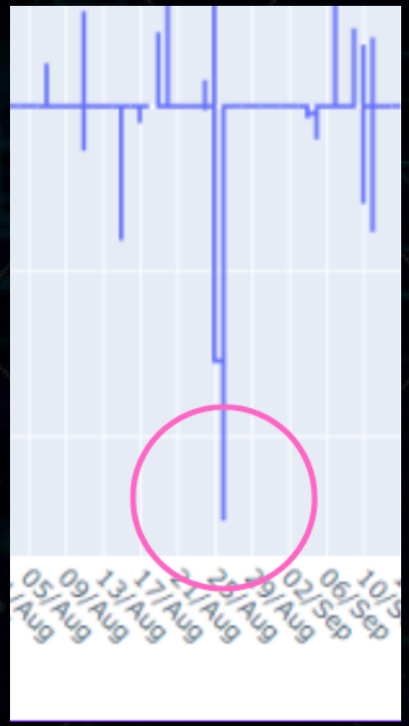
DSCOVR 2018 Wavelet applied





Cooroborating the Graphic in the Space Weather Site

Analyzing the largest negative peak



- 26/08/2018

Other possible peaks from the 2018 data:

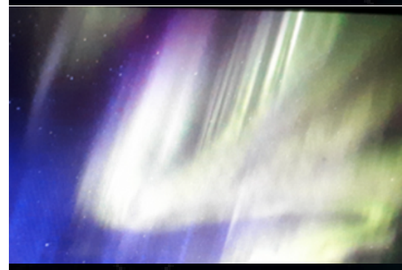
- 20/04/2018

- 10/03/2018

SURPRISE GEOMAGNETIC STORM: Last night, a crack opened in Earth's magnetic field. Solar wind poured in to fuel a strong G3-class geomagnetic storm. John McKinnon photographed the storm's brilliant green glow from Four Mile Lake in Alberta, Canada:

INTERPLANETARY SHOCK WAVE: An interplanetary shock wave hit Earth's magnetic field on **April 19th** around 23:50 UT. When the disturbance arrived, the density of solar wind flowing around our planet abruptly quadrupled and a crack opened in Earth's magnetic field. The resulting G2-class geomagnetic storm sparked unusual "electric blue" auroras.

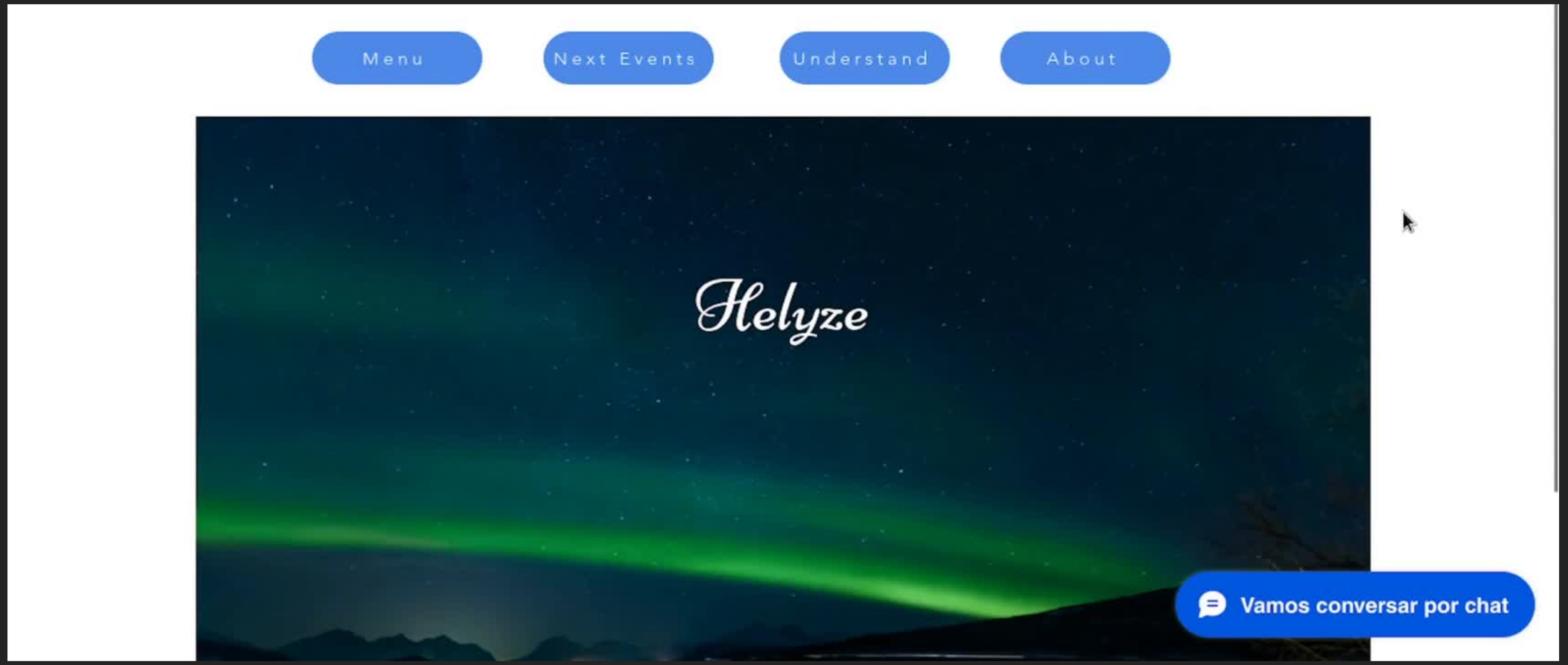
"I've been flying airplanes for 20 years and photographing aurora for 10 years, but I've never seen anything like this before," reports pilot Matt Melnyk who photographed the display from 39,000 feet:



A CRACK IN EARTH'S MAGNETIC FIELD: This morning, during the early hours of March 10th, a crack opened in Earth's magnetic field. Solar wind poured in and "the sky exploded with auroras," reports Kristin Berg who sends this picture from Tromsø, Norway:

image source:https://www.nytimes.com/2022/02/09/science/spacex-satellites-storm.htm

Prototype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The Future We Seek

- Use our computer program to democratize knowledge about what causes magnetic reconnection and its effects on geospace and our lives
- Understand how to relate it with the telecommunication industry to be more customizable
- Use versioning and Oriented Object Programming (OOP) to optimize the code and make it more professional