



Mission Space Lab Phase 4 Report

Team Name: Urano Team

Chosen Theme: Life on Earth

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Introduction

Our experiment aims to determine how much the anthropic intervention, which has endured over the decades, has influenced the global environment, by observing the alteration of nature due to the construction of artificial lakes, the shrinking of natural ones, and the exploitation of forests. We believe that it is an interesting project not only because it allows us to see the health of vegetation today and in the past, but also because we can make predictions about the health of the future Earth. We expect to see a progressive deterioration and decrease in plant health and forests that were previously remote and immaculate. Also, today we can reach and exploit remote areas thanks to the technological progress in the last 35 years. Furthermore, we expect to see a decline in vegetation where an environmental disaster has occurred, both human and natural. We hope for sporadic reforestation in areas corresponding to the presence of artificial lakes.

Method

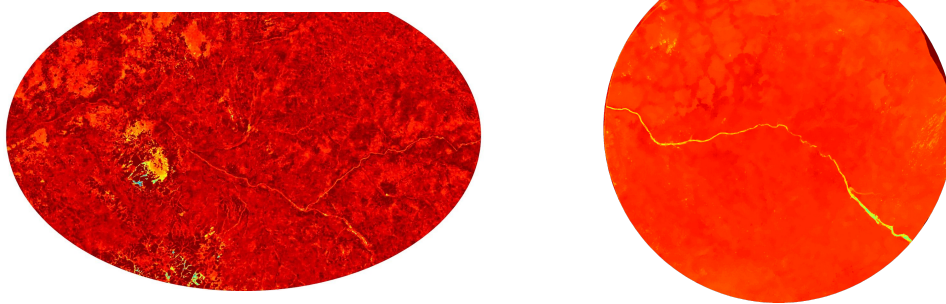
For our project, it was sufficient to use the camera, the position of the ISS, and its altitude. For possible usefulness, we also collected data from other sensors, but we ended up not using them. Once we received the data, we made a selection of images to find the best ones for our purpose. We had problems with the clouds, which very often hindered the view and made the images unusable. After the selection, we have collected the Google Earth photos corresponding to ours, with the same coordinates and altitude, but taken up to 35 years before and in the same season to avoid contamination of data due to regular climate disturbances. We have had a program apply the NDVI (Normalized Difference Vegetation Index, which indicates the health level of the vegetation) to the photos, to be able to make a comparison with the photos of Google Earth, always with the NDVI applied, and observe the variation in the amount of colour in the individual photos. One disadvantage we found is that we didn't have enough good pictures and so we also used data from GretaInTheSpace team.

Code and data are [on Github](#). We placed ISS route [on Umap](#).



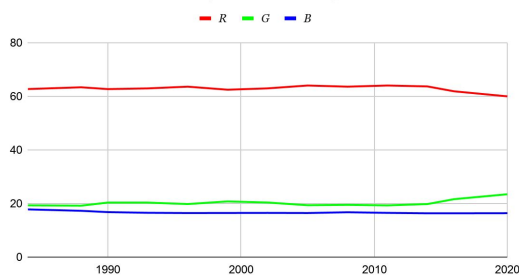
Results

As you can see from the next pictures our photos have a lower quality than the Google Earth satellite, due to the quality of the camera.

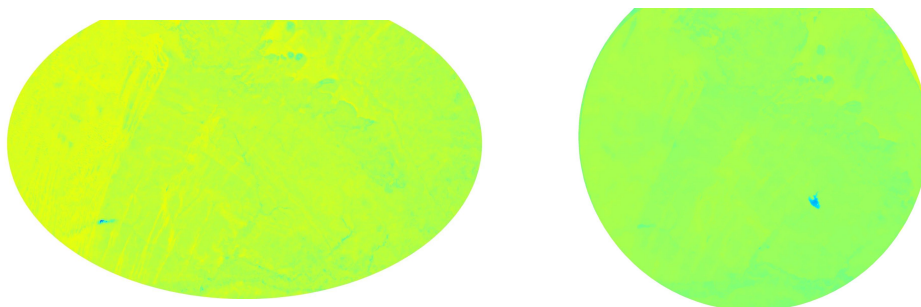


On the left there is the photo of Lualaba river (Democratic Republic of the Congo) took from Google Earth (1984), on the right the one took by the ISS in 2020. As you can see, the red colour has faded.

Lualaba river RGB Graphic over the years

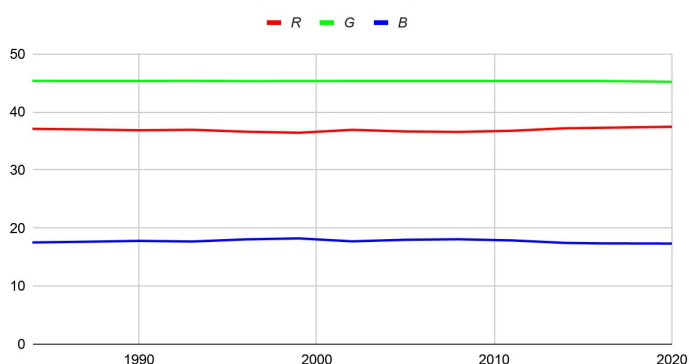


Looking at the chart we can see that over the decades the quantity of colours has remained constant and then there has been an increase in green and a decrease in red.

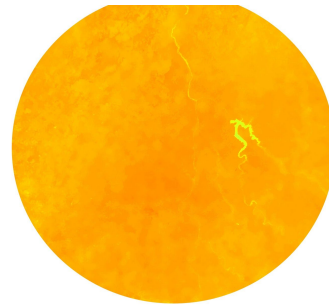
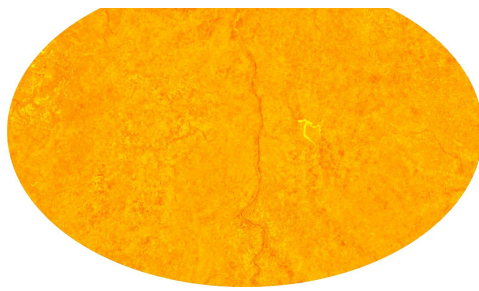


On the left there is the photo of lake M'Bout (Mauritania) from Google Earth (1984), on the right the one took by the ISS in 2020. As you can see, the yellow colour has modified to green, in addition, an artificial lake has appeared on the right.

Lake M'Bout RGB Graphic over the years

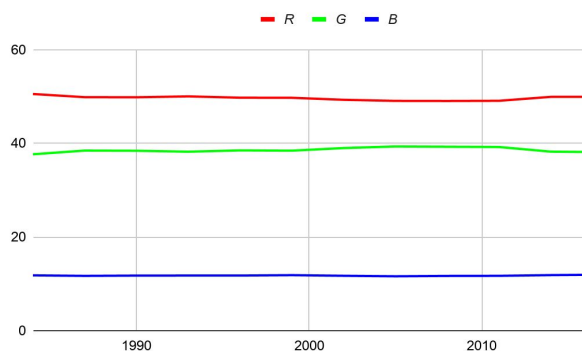


If you look at the graph, you can see a minimal change in color percentages over the decades.

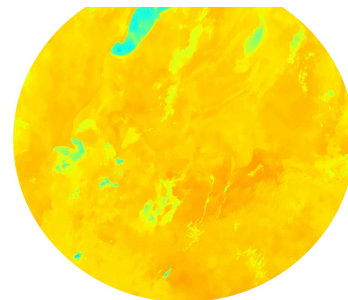
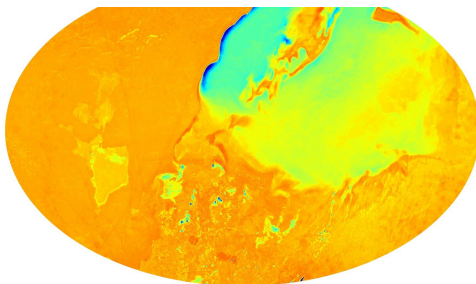


On the left there is the photo of the river Sankarani (Mali) took from Google Earth (1984), on the right the one took by the ISS in 2020.

River Sankarani RGB Graphic over the years

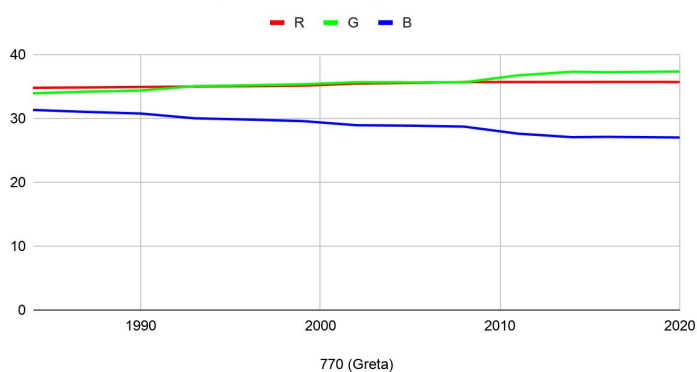


If you look at the graph, you can see a minimal change in color percentages over the decades. In addition you can see the growth of the Sankarani lake.



Looking at the photos you can see the narrowing of the Aral Lake (Kazakhstan).

Lake Aral RGB Graphic over the years



Observing the graph you can ascertain a considerable decrease in the blue color and an increase in the green colour while the red colour remain the same.



Conclusion

In the first photos we saw a decrease in the health of the vegetation. In the second photo an artificial lake was built, but it was not enough to bring a noticeable change in the surrounding environment. In the third photo, after the construction of the reservoir, we can see an minimal increase in healthy forests (red) and a decrease in desert areas (green). The Aral Lake has been the victim of one of the biggest environmental disasters man-made, losing 90% of its surface in 40 years, changing the climate significantly. Moreover, because of the drying up of the lake, many cultivated areas have become dry and inhospitable, in fact our chart shows a drastic increase in green and a decisive decrease in blue.

The results obtained are close to our expectations: by analyzing the graphs we can deduce that the forests of Congo will tend to desertify, just like the Aral Lake. For the other photos in which there hasn't been any change in 35 years we don't think there will be any in the future.

We imagine that may have been some experimental errors that could have caused some errors in the results.