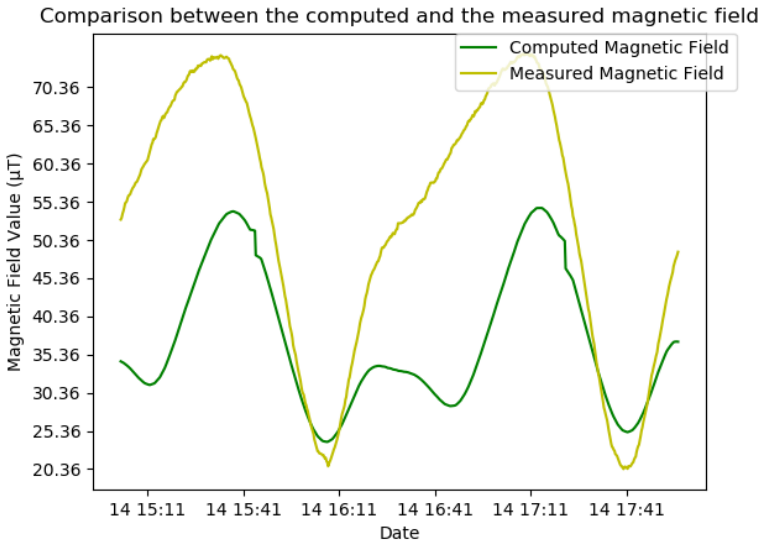
Introduction

Our project was about the Earth magnetic field. We wanted to verify the World Magnetic Model (the last version is the 2015). This is a very interesting interesting scientific goal. Our hypothesis was to find that the WMM2015 and our measures made on the ISS would be roughly the same. We had also planned to use the 8x8 led matrix of the Astro Pi by displaying the overflew country by the ISS in real time.

Method

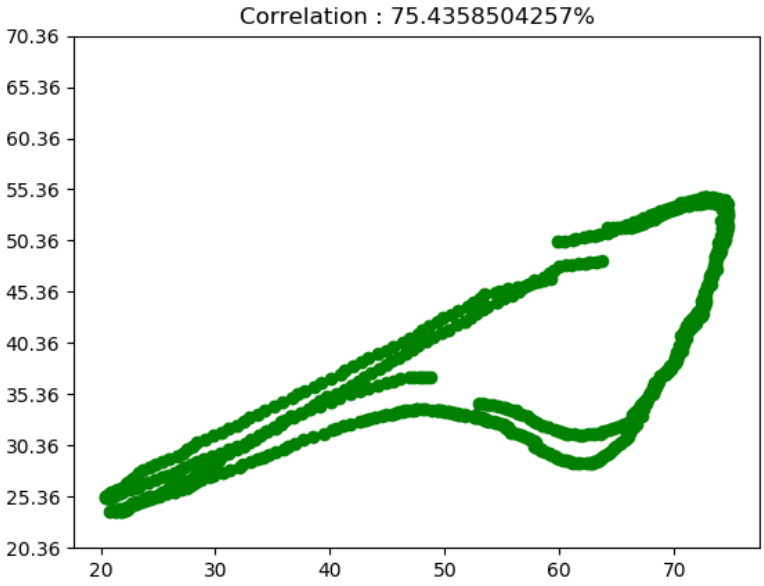
To reach our main objective (the magnetic field model verification), we use the language Python 2 and the magnetic field sensor in the Sense Hat of the Astro Pi. We created a reduced version of the WMM2015 which we could easily and quickly re-used with our program. In our program, we also computed the position of the ISS. Then, in the ISS, during our experiment and every 10 seconds, we registered the position, the value of the measured magnetic field and the value of the computed magnetic field (by using our reduced magnetic model and an interpolation). To achieve our second goal, the real-time country display, we use the previously computed ISS position, a world map and a set of 8x8 pixels 249 flags. Then, in our program, we determined the overflew country by crossing the coordinates and our map, and, finally, we loaded the corresponding flag and display it, with the name of the country, on the Astro Pi display.

Results

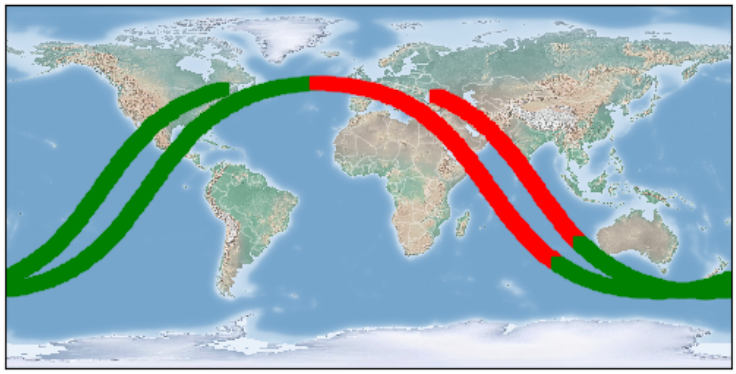


We began our results analysis comparing the measured magnetic field and the computed magnetic field. For that, we drew the graph of the magnetic field value (in µT) by the time of the two data. We remarked that the shapes of the curves are globally the same, but the values differ on some places.

Then, we drew another graph to see how the model computed and the measured are joined. Normally, we should see a straight line with a slope of 1. Once the graph was made, wee saw a straight line but, surprisingly, in fact, the slope is inferior, and there is a part of the graph where the curve don't follow this rule and make a down peak.
We also made a calculation to found the correlation between the model and the real value : it's approximately 75%.



Finally, we put all the measurement on a world map, with a green dot when the model was right, a red dot otherwise. So we can determinate that the model is maybe wrong above the Europe and the Middle Est.



Conclusion

Our result, after analysis, was really surprising because there is a part where we can think that the model is wrong. But we should moderate these words because it's maybe due to the low quality of the magnetic sensor, or possibly to the low accurate of our reduced version of the World Magnetic Model. However, for the majority of the globe, the model prediction are correct. It's approximately right at 75%.

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