UT AUSTIN PORTUGAL ANNUAL CONFERENCE 2023
MODELLING THE FUTURE

uPGRADE – Miniaturized Prototype for Gravity field Assessment using Distributed Earth-orbiting assets

Space-Earth Interactions

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Overview

Overall, the uPGRADE project goals were successfully fulfilled, particularly in its innovative characteristics. From a strategic point of view, the uPGRADE project consolidated the capabilities of the different parties of the consortium. We designed and build an innovative concept for distributed monitoring of Earth's gravity field variations and measurement of the neutral thermosphere. It is a sustainable and appealing commercial product that, until now, was destined to large, expensive missions that presented some drawbacks concerning the revisit times and actualization rate of their scientific products.

Additionally, the international partnership with UT Austin, particularly the Centre for Space Research, allowed the transference of knowledge concerning the planning, design and execution of the mission.

Platform

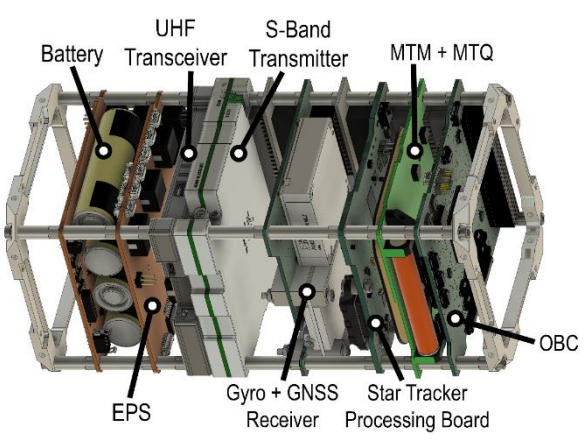

Fig. 1: electronic stack

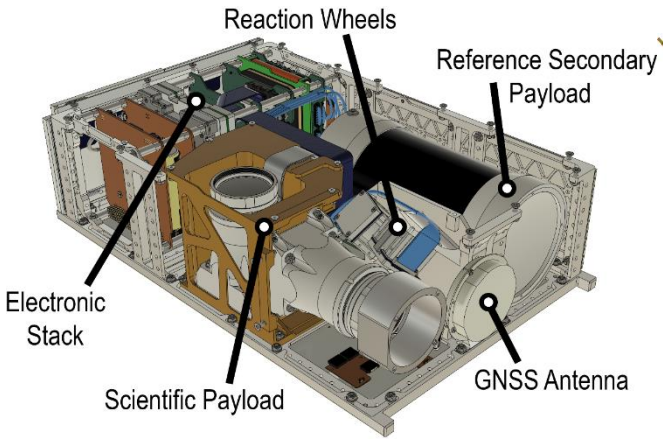

Fig. 2: internal view

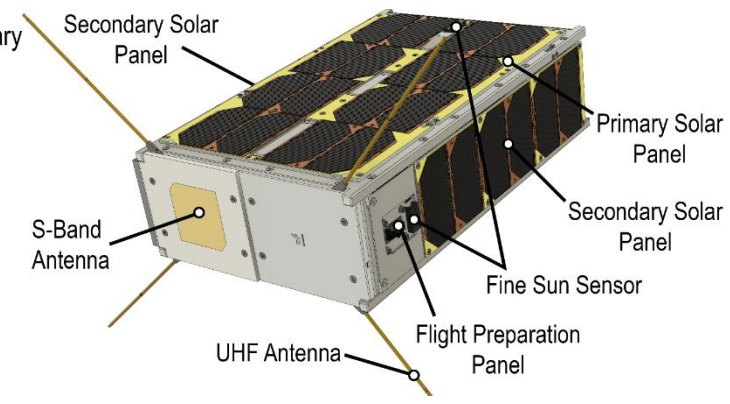

Fig. 3: external view

Monitoring Earth's gravity

Fig. 4 shows the effect of the sampling rate, (10s and 30s) and data gaps (~45%), on the errors represented in the spectral domain, compared with the expected signal. Fig. 5 shows the expected spatial map (bottom, 10s no gaps), smoothed to 1200km, compared with the simulated gravity signal (top).

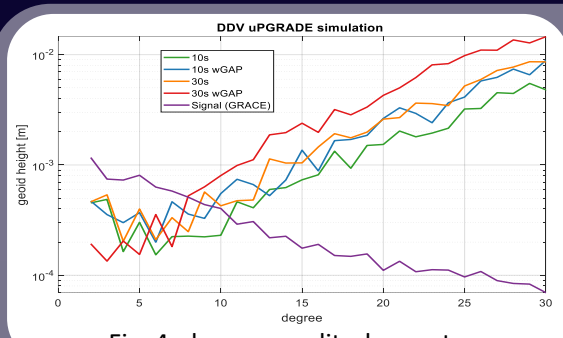

Fig. 4: degree amplitude spectra

Modelled errors	
GPS	$5mm$
Accelerometer	$\sim 60\ nm/s^2$ (correlated)
Star camera	$20\ arcsec$
Ocean tide error	Diff. between FES04 and EOT08
Non-tidal error	Diff. between RL06 and RL07 AOD1B

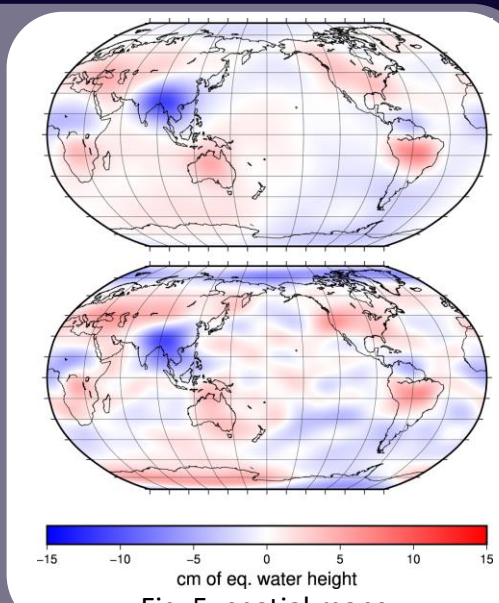

Fig. 5: spatial maps

Future

Spin.Works plans to launch the uPGRADE CubeSat by the end of 2024, seeking funding through the Portugal 2030 program. They aim to enhance its capabilities for orbit control and eventually create a constellation of CubeSats for Earth observation. Spin.Works is also establishing partnerships for data processing and environmental studies.

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