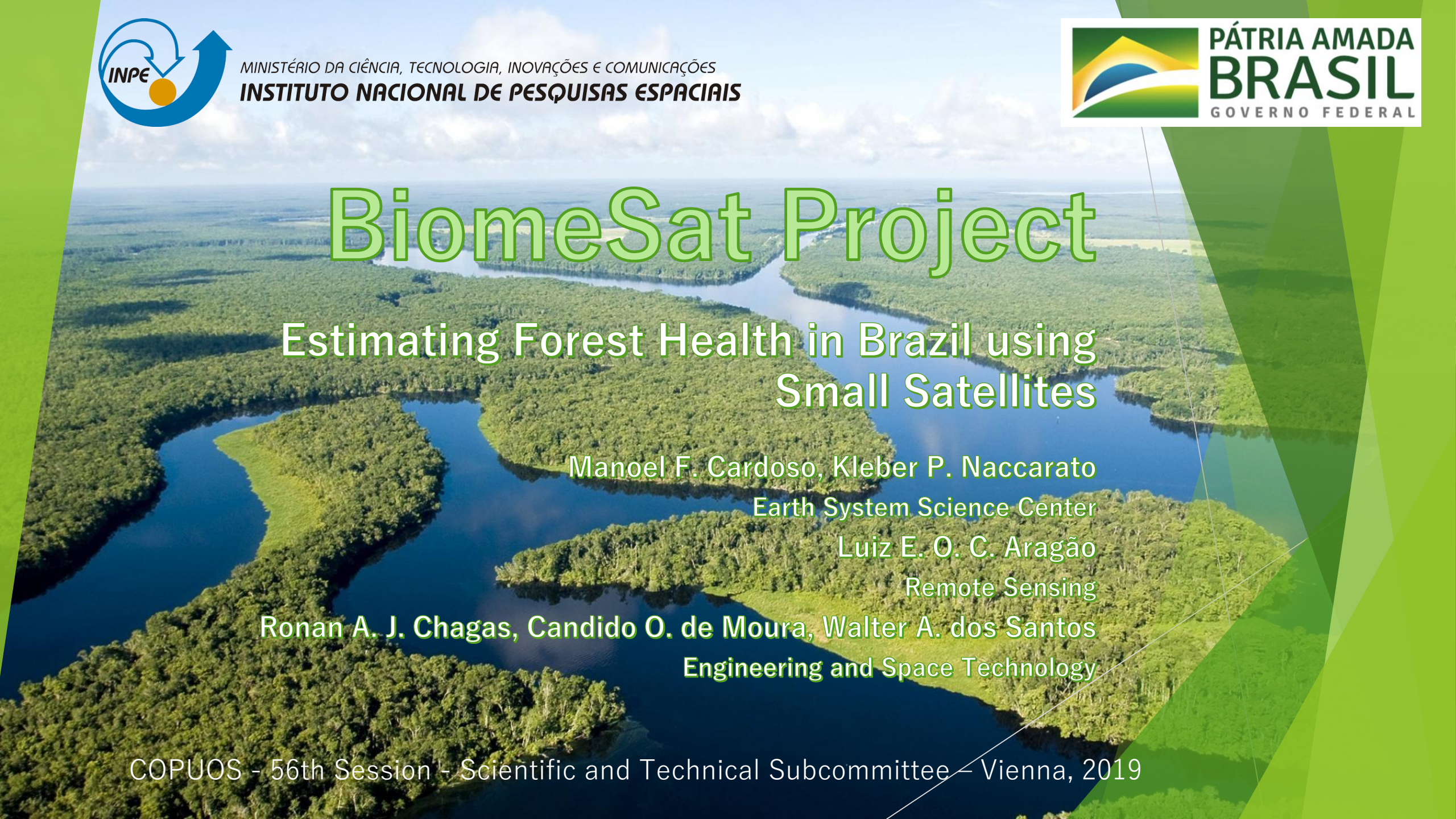


MINISTÉRIO DA CIÊNCIA, TECNOLOGIA, INOVAÇÕES E COMUNICAÇÕES
INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS

PÁTRIA AMADA BRASIL
GOVERNO FEDERAL

BiomeSat Project

Estimating Forest Health in Brazil using Small Satellites

Manoel F. Cardoso, Kleber P. Naccarato
Earth System Science Center
Luiz E. O. C. Aragão
Remote Sensing
Ronan A. J. Chagas, Candido O. de Moura, Walter A. dos Santos
Engineering and Space Technology

COPUOS - 56th Session - Scientific and Technical Subcommittee – Vienna, 2019

Why must we take care of our forests?

- *"Forests are on the front lines of climate change. These ecosystems, rich with biodiversity, are increasingly vulnerable to changes in weather, temperature and rainfall patterns. It is essential, therefore, that we work to preserve and sustainably manage our forests"*
- *"To build a sustainable, climate-resilient future for all, we must invest in our world's forests. That will take political commitment at the highest levels, smart policies, effective law enforcement, innovative partnerships and funding. On this International Day of Forests, let us commit to reducing deforestation, sustaining healthy forests and creating a climate-resilient future for all"*

Mr. Ban Ki-moon
United Nations Secretary-General
Extracted from his message for 2015's International Day of Forests

About the Amazon Forest

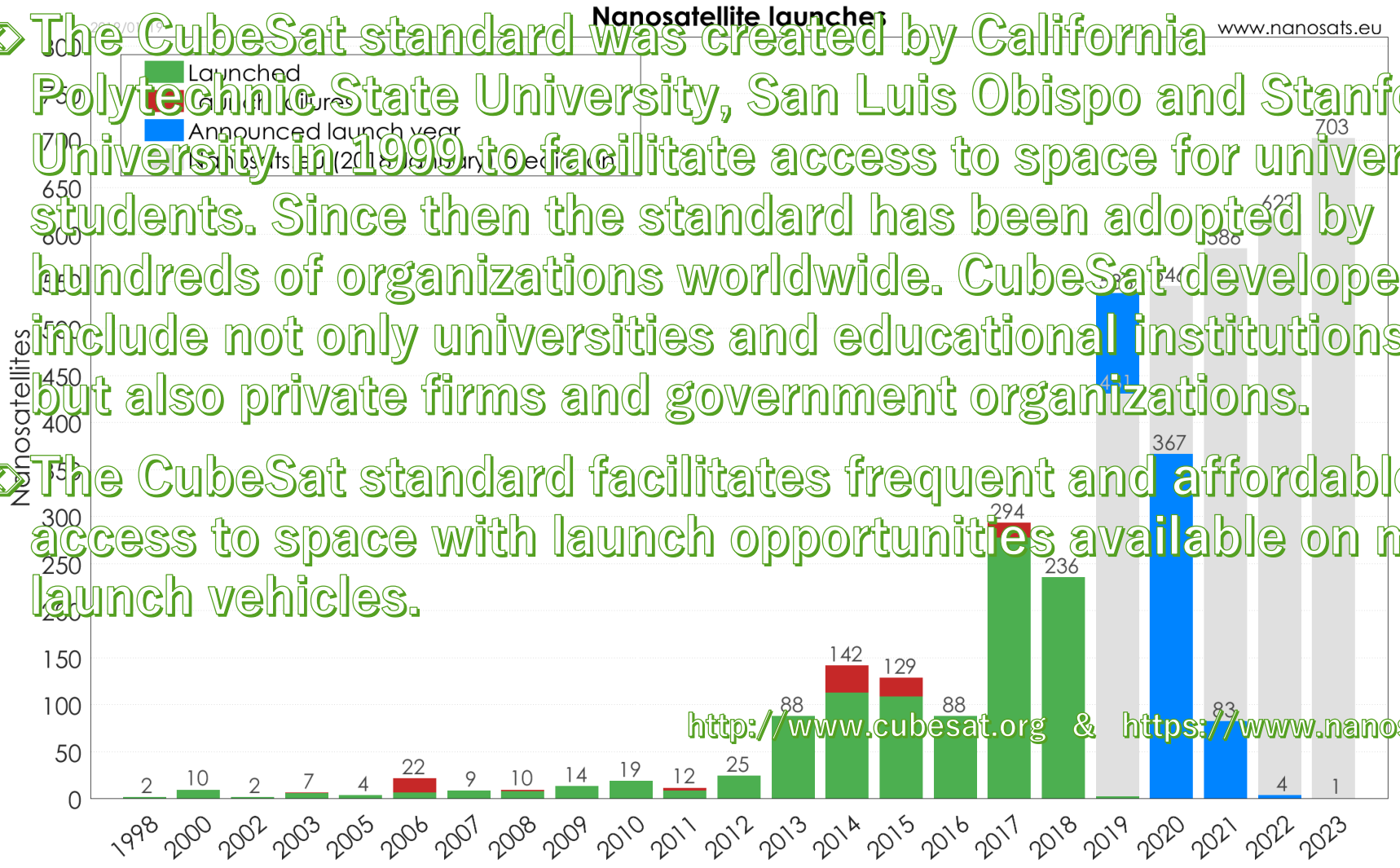
The Amazon Forest is the most popular and well-known of all the forests. It is a broadleaf forest with about 7,000,000 km^2 spread through several countries: Peru, Brazil Colombia, Bolivia, Ecuador, Surinam, Guyana and Venezuela. The Amazon is the biggest collection of biological diverse species. It is said that one out of every ten living species could be found in the Amazon Basin. It also stores and exchanges gigatons of water and CO_2 between the land surface and the atmosphere, thus affecting biodiversity, climate, and the availability of important natural resources.

How we can help in Brazil?

- Today, deforestation and forest degradation are the 2nd most important sources of carbon emissions in a global scale. This has to be decreased significantly other-wise global climate targets will not be met.
- Studying and monitoring the Amazon Forest over Brazil should be continued and supported by the use of remote sensing due to its broad area. In order to extend the ongoing programs for observing forest cover in the country, we plan to use nanosats due to their lower cost and rapid deployment time when compared to larger orbital systems constellations.
- The proposed CubeSat constellation, named BiomeSat Project, is planned to estimate the forest health information based on simple vegetation indexes.

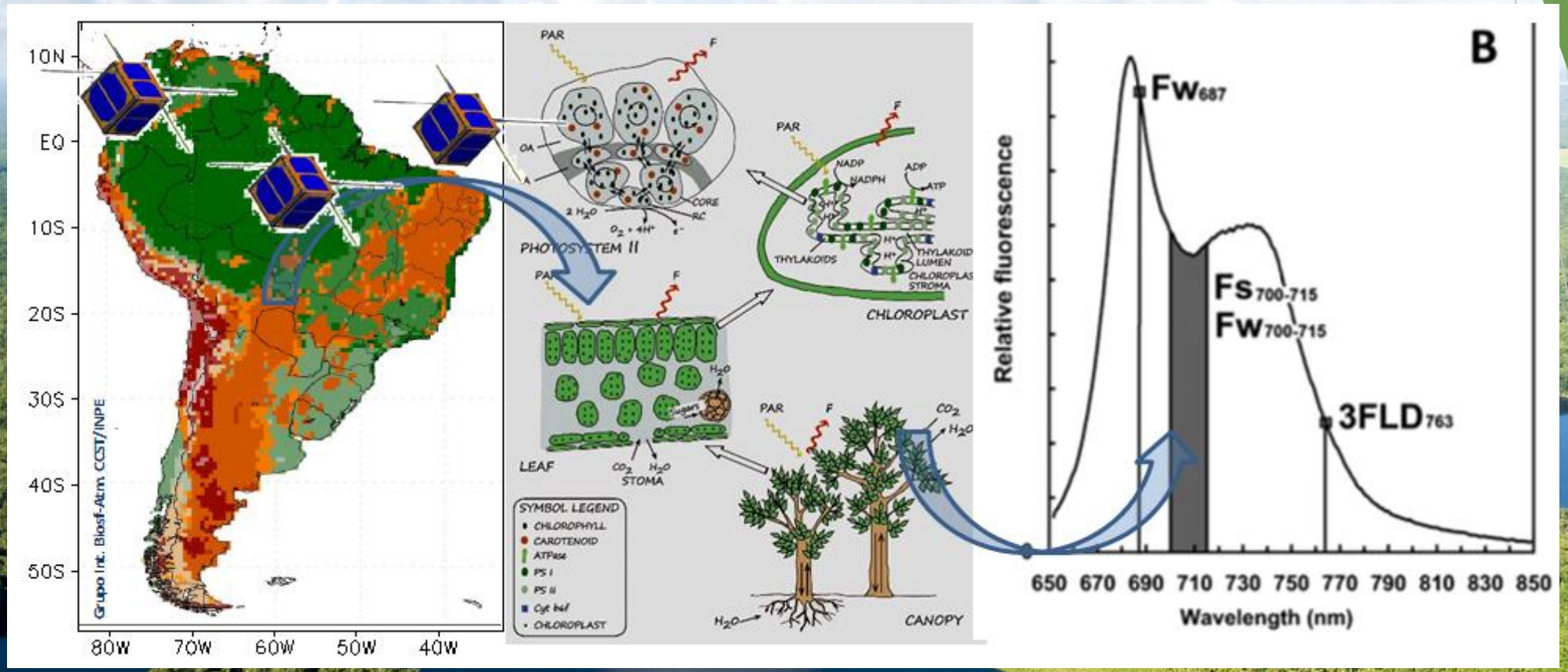
What's a CubeSat?

- The CubeSat standard was created by California Polytechnic State University, San Luis Obispo and Stanford University in 1999 to facilitate access to space for university students. Since then the standard has been adopted by hundreds of organizations worldwide. CubeSat developers include not only universities and educational institutions, but also private firms and government organizations.
- The CubeSat standard facilitates frequent and affordable access to space with launch opportunities available on most launch vehicles.



http://www.cubesat.org & https://www.nanosats.eu

Starring: the BiomeSAT



$$Visual\ NDVI = \frac{(G-R)}{(G+R)} \qquad GLI = \frac{(2G-R-B)}{(2G+R+B)} \qquad VARI = \frac{(G-R)}{(G+R-B)}$$

BiomeSat linked to SDGs

Forests keep air quality, thermal comfort, and are important for protected areas

Forests help sustain water resources and rain formation

BiomeSat Project will promote capacity building on human resources

Forest data can help monitoring protect areas (local communities

Maintain forest coverage and health is essential for climate regulation

Forest coverage and health have strong links with biodiversity

MINISTÉRIO DA CIÊNCIA, TECNOLOGIA, INOVAÇÕES E COMUNICAÇÕES
INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS

PÁTRIA AMADA BRASIL
GOVERNO FEDERAL

BiomeSat Project

Thank you!

Kleber P. Naccarato
Earth System Science Center
kleber.naccarato@inpe.br