

Preventing forests from becoming carbon sources with VLEO platforms complementarity

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Field of application

Carbon dioxide is the main cause of the increase in the Earth's temperature. The need for action is evident.

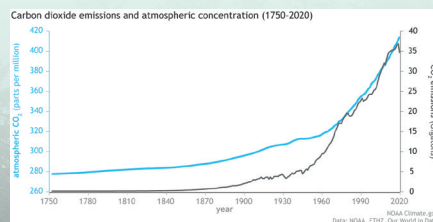


Figure 1. Evolution of CO₂ concentration in the atmosphere from 1750 to 2020. [1]

Approximately 2.6 billion tons of carbon dioxide, one-third of the CO₂ released from burning fossil fuels, is absorbed by forests every year. [2] Thus, forests play an essential role into the fight against climate change.

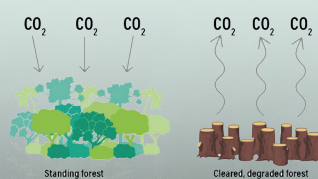


Figure 2. [3]

An analysis of the business opportunities offered by EO platforms, including VLEO, in the forest monitoring market

Target segment

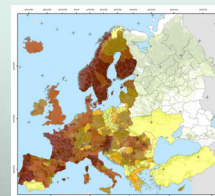


Figure 3. Distribution of private and public forest ownership across Europe (red-strong private, yellow-strong public) [4]



Figure 4. Amount of forest area (%) in each European country. [5]

Figure 4 reveals that Northern Europe forests would significantly contribute to reduce carbon emissions, as they cover an important area. Therefore, it results in a B2B¹ customer.

¹Business to Business

Sector common problems

Ground measurements	Aerial platforms	Space platforms
Not large areas	High cost and availability	Not enough precision and accuracy

Sector needs

- Suitable precision and accuracy
- Covering large areas
- Not very expensive
- Constant monitoring

Proposal

Cause	Benefits	Drawbacks
SAR sensor	Reliability Availability with all weather conditions and both day and night	Saturation at high biomass levels Difficulty in data interpretation
Optical sensor	Wide information	
Data integration complementarity	Flexibility Adaptability	
VLEO	Precision and resolution Accessibility Costs reduction	

Will the proposal be well received by the market?

Services	Jobs	Gain creators	Gains	Affinity	Pain relievers	Pains	Affinity
Precision, accuracy and resolution	Monitor and control CO ₂ emissions with updated remote sensing data	Better precision, accuracy and resolution compared to other space platforms services due to VLEO implementation	Good resolution, precision and accuracy data	High	Increased space platforms performance in terms of precision, accuracy and resolution thanks to VLEO implementation	Lack of accuracy, precision and resolution for the customer needs	High
Reliability	Find a compromise between market and environment	Good availability	Offer to the customer the capacity of anticipation through the analysis of continuous data	Medium	Reliable data obtained through experienced technology in this field	Space platforms provide erroneous data	High
Flexibility and adaptability	Improve traditional methods with the collaboration of space remote sensing services	Cost reduction compared to other forest degradation monitoring applications	Data at an affordable price	Medium	Scalable space multiplatforms that allow adaptability and flexibility	Service not flexible nor adaptable to the customer's needs	High
Availability		Large coverage with multiplatform scalable observations	Cover large areas with high resolution time	High	Suitable compatibility with in situ methods	Lack of complementarity with traditional methods	Medium
Competitive price		Capacity of obtaining a wide range of information			Great accessibility	Complexity in accessing and interpreting data	Low

Analysis of the results

Aspects with a medium or low affinity	Problem	Proposed solution or/and problem reduction
Availability	SAR sensors saturate with high biomass levels	Forests from Northern Europe do not present high biomass levels
Costs	Expensive technology	VLEO allows a cost reduction
Complementarity with other non-spatial platforms	Only considers complementarity between space platforms	Ground-based and space platforms can also work together complementing each other
Data interpretation	SAR data not easy to analyse and interpret	Value Added Services (VAS)

Conclusions

- CSODI proposal fits well with the customer expectations.
- Feasible solutions can be found for requirements not fully meet that aim to reduce or eliminate their limitations.
- VLEO technologies would bring several advantages when considering them into the complementarity between EO space platforms, adding value to EO services.
- The implementation of VLEO technologies would significantly reduce one of the most common problems affecting the forest monitoring field: monitoring large areas with precise data.

[1] Rebecca Lindsey and Ed Diugokensky. Climate Change: Atmospheric Carbon Dioxide. <https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide>. Oct. 2021.

[2] Forests and climate change. <https://www.iucn.org/resources/issue-briefs/forests-and-climate-change>. Feb. 2020.

[3] Nancy Harris and David Gibbs. Forests: Carbon Sinks or Carbon Sources? <https://www.globeearth.org/blog/climate/forests-carbon-emissions-sink-flux/>. Jan. 2020.

[4] Gerhard Weiss, Bernhard Woldner, and Viera Zivkovic. Who owns the forests and how are they managed? <https://efl.int/forestsquestions/q2>.

[5] Kalle Karttunen. "European forest owners and SFM perspectives from Confederation of European Forest Owners CEFF and Finland". In: Earth Observation for European Sustainable Forest Management. Sept. 2020.