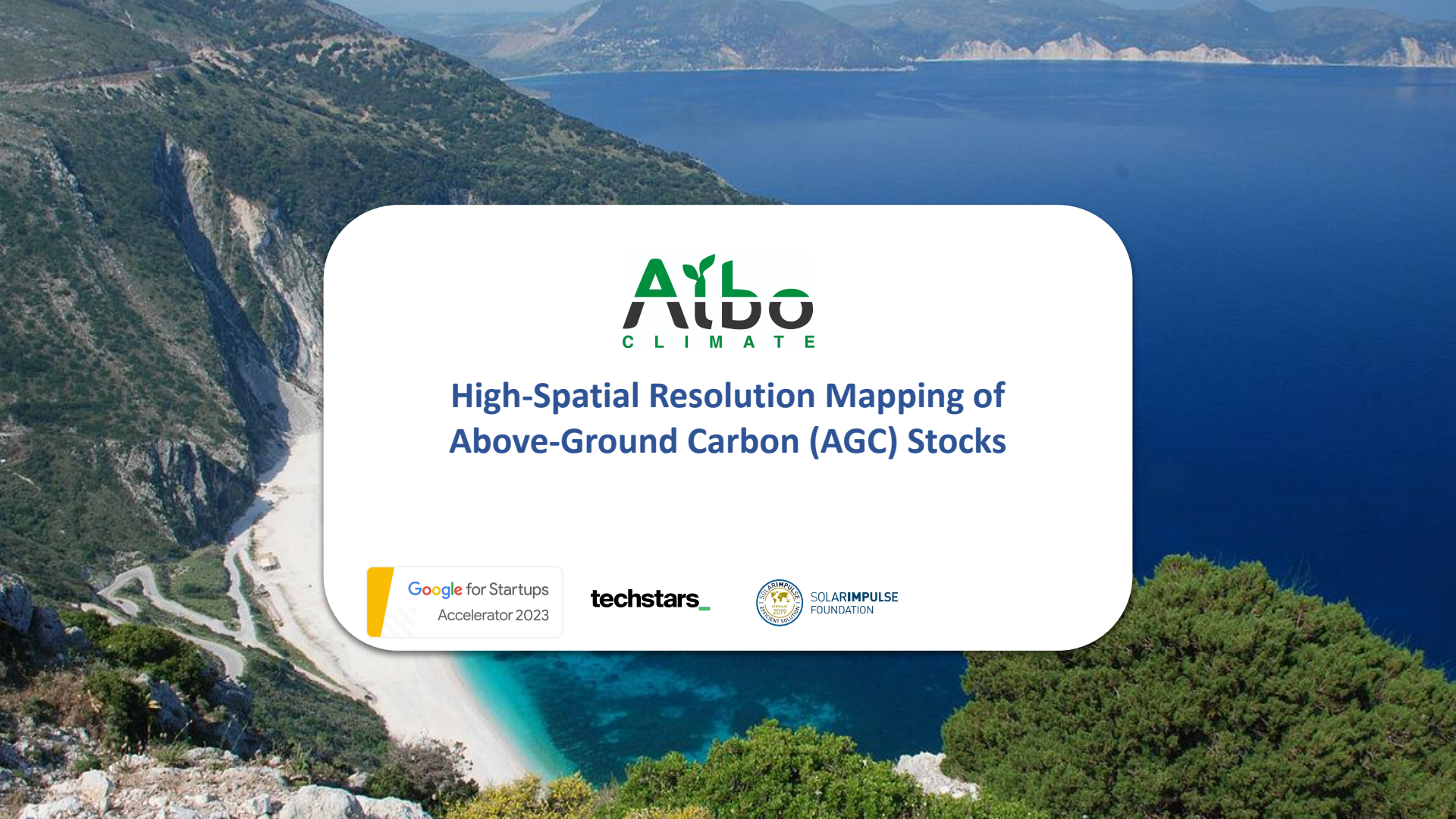


High-Spatial Resolution Mapping of Above-Ground Carbon (AGC) Stocks

Google for Startups Accelerator 2023

techstars_

SOLARIMPULSE FOUNDATION

Company Introduction

- **Albo-Climate combines geospatial modeling and AI expertise to provide a state-of-the-art remote sensing solution for carbon stocks and ecosystem monitoring**
- **Albo's Technology reduces the number of samples that need to be taken on the ground**
- **Our vision is to create new paradigm of transparency and scalability in nature-based Climate projects.**
- **Albo's solution enables project developers in the carbon credits market to monitor their project development and detect major threats affecting the project site**
- **Albo's solution received the Solar Impulse Prize and Official Concept Note Approval from Verra, AI for the planet, google for startups**
- **Albo's solution was awarded the Solar Impulse Prize, recognized by AI for the Planet and Google for Startups, and also received Official Concept Note Approval from Verra**

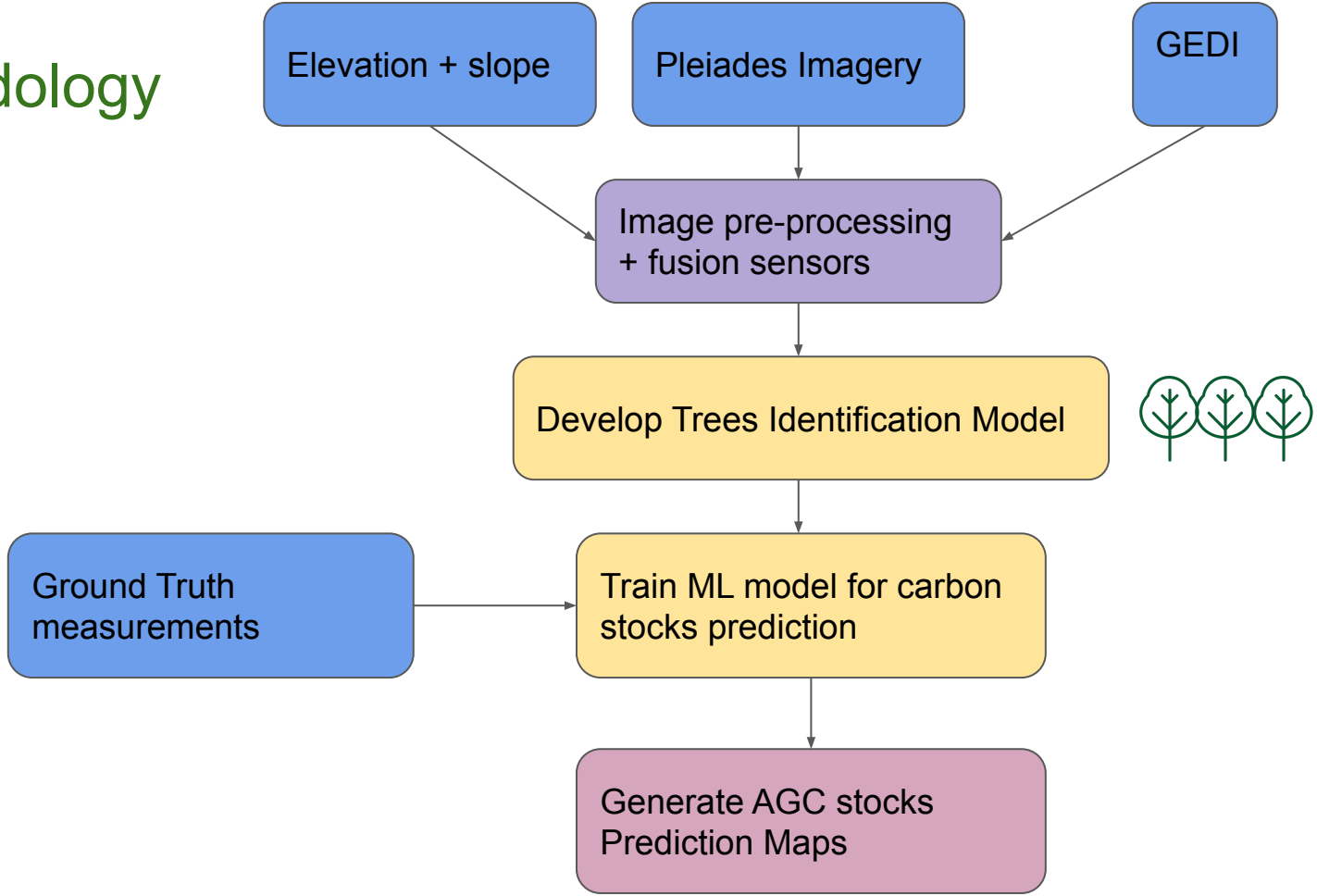
Project Introduction

- **Albo has extensive experience in aboveground carbon (AGC) stock estimation using remote sensing techniques and AI modelling**
- **Albo has built AI models on dense tropical and conifer forest, using high spatial resolution satellite imageries such as Sentinel-1 and Sentinel-2**
- **In this project Albo aimed to provide AGC stocks for relatively young and sparse plots managed by private owners in Canada.**
- **High resolution satellite images are therefore needed in order to capture the young trees in the small plots**

Project Goal

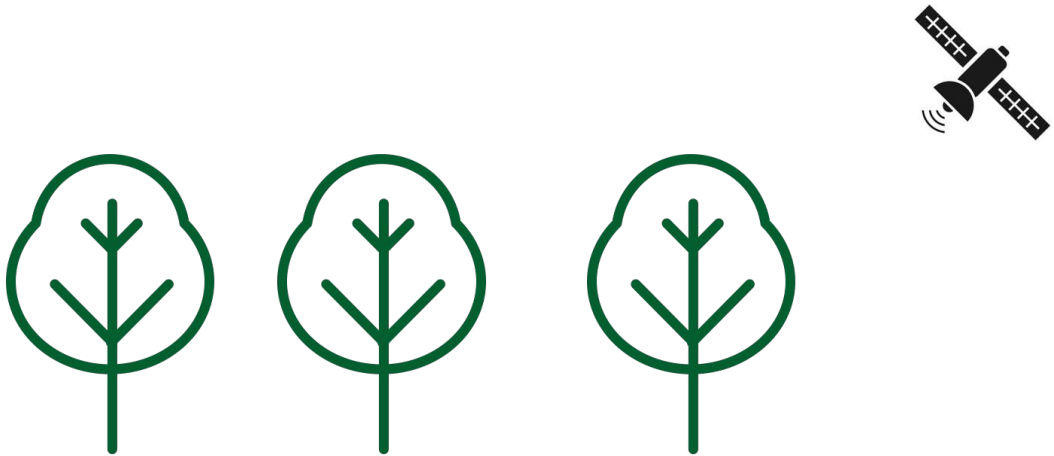
- **Develop an AI-based model at very-high spatial resolution for mapping AGC in young trees plantations in farmland**
- **Provide carbon stock estimates at the project level in Canada**

Methodology

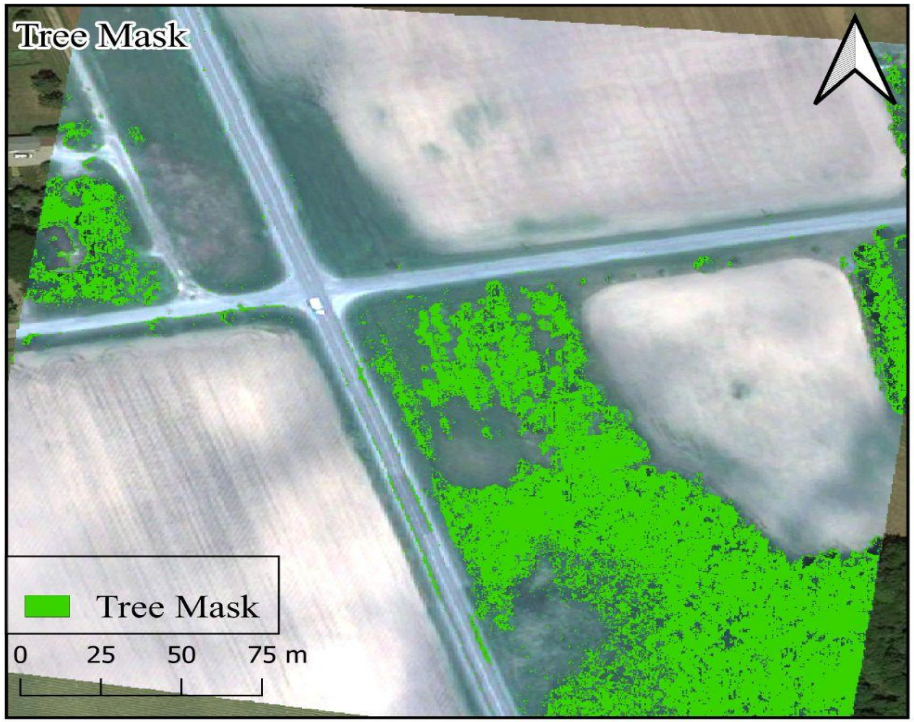


Tree Detection

- **In order to make the carbon predictions more accurate, a tree detection model was developed**
- **The goal was to make the carbon predictions only for trees**
- **The Tree Classification model has been validated on out-of-sample data (~93% accuracy)**



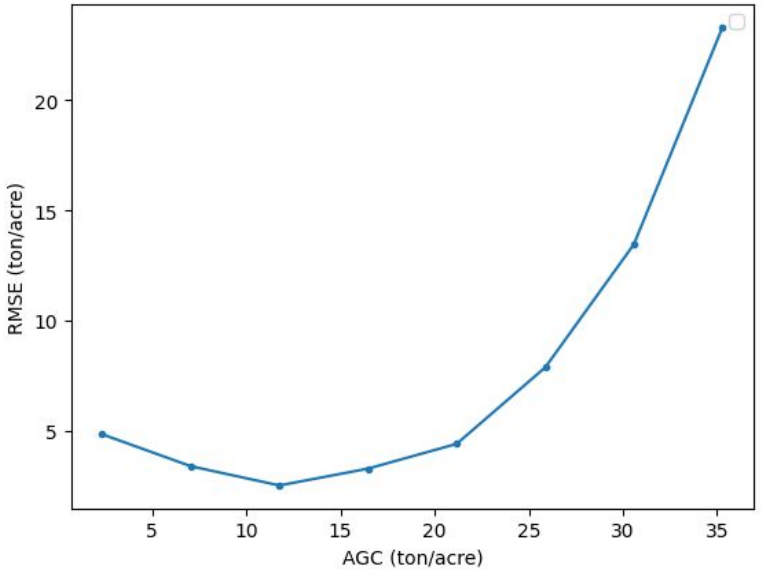
Visual Results - Tree Mask



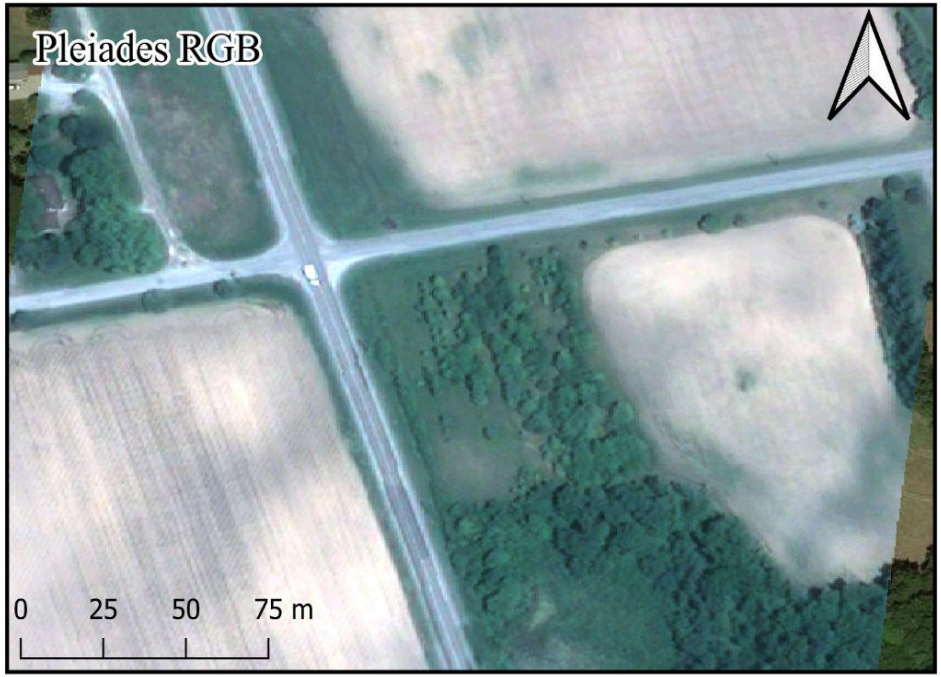
Visual Results - Tree Mask

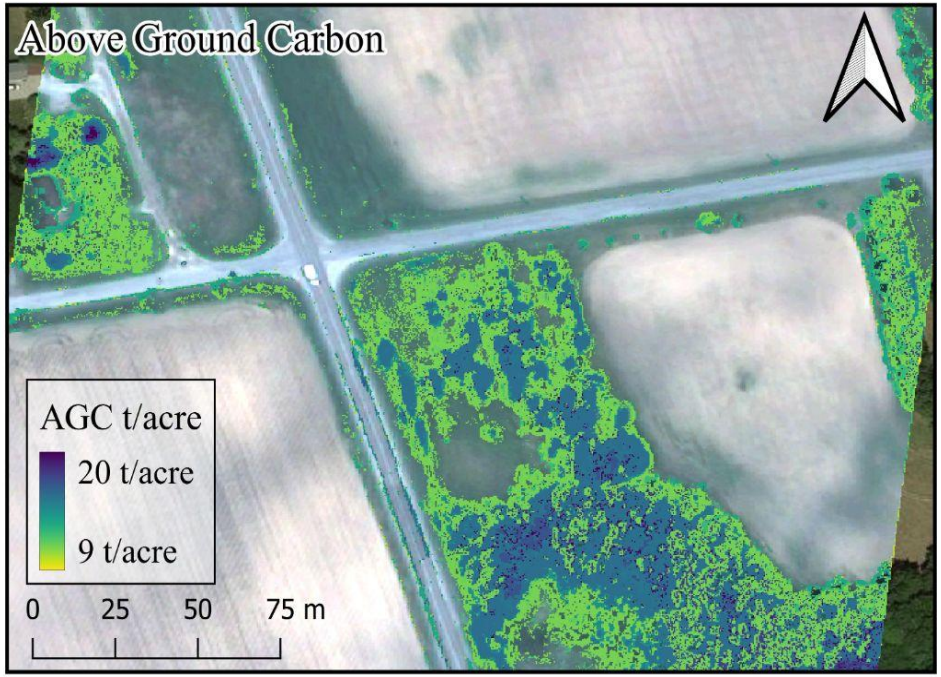
Above Ground Carbon Predictions -Accuracy Results

- **The AGC model has been validated on both external and ground-truth datasets, and the prediction RMSE reached 3 ton/acre in the AGC range of 10-15 ton/acre**
- **The model RMSE increases significantly with increasing AGC range**
- **This performance is expected due to the low AGC values in most of the training dataset and less training data in higher AGC range.**

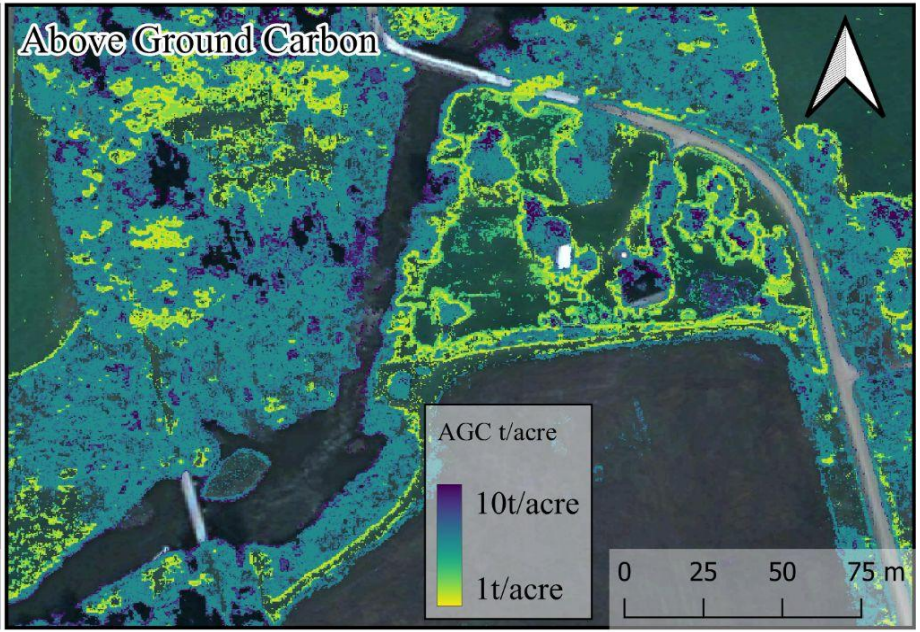


Visual Results - Above Ground Biomass





Visual Results - Above Ground Biomass



Conclusion

- **Using a combination of Ground Truth, GEDI and Pleiades imagery allow high-resolution AGC stock predictions**
- **High-resolution images from Pleiades, combined with GEDI data and elevation information, enable the prediction of AGC stocks with a Root Mean Square Error (RMSE) of 10-15 ton/acre.**
- **RMSE/Accuracy of the AGC model**
- **Tree detection is possible using 4-bands Pleiades imagery, with an accuracy of 93%**
- **The methodological approach employed in this study can be replicated and applied to other ecosystems and geographical regions.**

References

Akhtar, A. M., Qazi, W. A., Ahmad, S. R., Gilani, H., Mahmood, S. A., & Rasool, A. (2020). Integration of high-resolution optical and SAR satellite remote sensing datasets for aboveground biomass estimation in subtropical pine forest, Pakistan. *Environmental Monitoring and Assessment*, *192*(9), 1-17.

Asner, G. P., Powell, G. V. N., Mascaro, J., Knapp, D. E., Clark, J. K., Jacobson, J., Kennedy-Bowdoin, T., Balaji, A., Paez-Acosta, G., & Victoria, E. (2010). High-resolution forest carbon stocks and emissions in the Amazon. *Proceedings of the National Academy of Sciences*, *107*(38), 16738–16742.

Asner, G. P., Brodrick, P. G., Philipson, C., Vaughn, N. R., Martin, R. E., Knapp, D. E., Heckler, J., Evans, L. J., Jucker, T., & Goossens, B. (2018). Mapped aboveground carbon stocks to advance forest conservation and recovery in Malaysian Borneo. *Biological Conservation*, *217*, 289–310.

Fassnacht, F. E., Hartig, F., Latifi, H., Berger, C., Hernández, J., Corvalán, P., & Koch, B. (2014). Importance of sample size, data type and prediction method for remote sensing-based estimations of aboveground forest biomass. *Remote Sensing of Environment*, *154*(1), 102–114. https://doi.org/10.1016/J.RSE.2014.07.028

Klochkova, V. G., Panchuk, V. E., & Tavolzhanskaya, N. S. (2015). Peculiarities of the atmosphere and envelope of a post-AGB star, the optical counterpart of IRAS 23304+ 6347. *Astronomy Letters*, *41*(1), 14-22.

Mascaro, J., Asner, G. P., Muller-Landau, H. C., van Breugel, M., Hall, J., & Dahlin, K. (2011). Controls over aboveground forest carbon density on Barro Colorado Island, Panama. *Biogeosciences*, *8*(6), 1615–1629. https://doi.org/10.5194/bg-8-1615-2011

Zhang, Y., Liang, S., & Yang, L. (2019). A Review of Regional and Global Gridded Forest Biomass Datasets. In *Remote Sensing* (Vol. 11, Issue 23). https://doi.org/10.3390/rs11232744

Thank you for your attention!