Data Drought in the Humid Tropics: How to Overcome the Cloud Barrier in Greenhouse Gas Remote Sensing

Christian
Frankenberg
Caltech/JPL
Yinon Moise Bar-On (Caltech)
Yi Yin (NYU)
Paul O. Wenberg (Caltech)
Daniel J. Jacob (Harvard)
Anna M Michalak (Carnegie)

Oral

Diagnosing land-atmosphere fluxes of carbon-dioxide and methane is essential for evaluating carbon-climate feedbacks. Greenhouse gas satellite missions aim to fill data gaps in regions like the humid tropics, but obtain very few valid measurements due to cloud contamination. We examined data yields from the Orbiting Carbon Observatory alongside Sentinel 2 cloud statistics. We find that the main contribution to low data yields are frequent shallow cumulus clouds. In the Amazon, the success rate in obtaining valid measurements vary from 0.1% to 1.0%. By far the lowest yields occur in the wet season, consistent with Sentinel 2 cloud patterns. We find that increasing the spatial resolution of observations to 200m would increase yields by 2-3 orders of magnitude, and allow regular measurements in the wet season. Thus, the key effective tropical greenhouse gas observations lies in regularly acquiring high-spatial resolution data, rather than more frequent low-resolution measurements. We will discuss how this can be achieved in the future.

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