

The GHGSat constellation: Land and offshore greenhouse gases detection and quantification

Antoine

Ramier

GHGSat Inc.

Marianne Girard, GHGSat Inc.

Dylan Jervis, GHGSat Inc.

Jean-Philippe W MacLean, GHGSat Inc.

David Marshall, GHGSat Inc.

Jason McKeever, GHGSat Inc.

Joshua Sampson, GHGSat Inc.

Mathias Strupler, GHGSat Inc.

Ewan Tarrant, GHGSat Inc.

Jake Wilson, GHGSat Inc.

David Young, GHGSat Inc.

Oral

GHGSat operates a constellation of small satellites specifically designed and optimized for imaging and quantification of methane plumes down to 25 m resolution and 100 kg/hr source rates. In 2023, the constellation expanded to 12 satellites with the launch of three additional satellites. Here, we provide an update on the status of the constellation and commercial operations, including our ongoing efforts to characterize system performance from several perspectives.

On land, we present a comprehensive analysis of the performance across the constellation, demonstrating consistent column precision levels (interquartile range: 1% to 3%) influenced primarily by ground reflectance. To assess the detection threshold, we performed a series of single-blind controlled releases, both self-organized and through independent third parties. Fitting our results to a probability-of-detection model we obtain a 50% probability of detection at 3 m/s wind of 102 kg/hr.

Offshore, we provide an overview of the constellation's offshore measurement capabilities and performance. By combining an analytical model of the detection threshold with empirical measurements of the column precision (2.1% of the background), we find a detection limit that can vary between (160–600) kg/hr depending on the target latitude and the season.

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