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# How reliable are SEN2 cloud detection algorithms? Global uncertainty estimation using Deep Kernel Learning.

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Erasmus Mundus Joint Master Degree Programme  
Copernicus Master in Digital Earth  
Specialization track GeoData Science

Vannes, France, 2022

# Acknowledge



consortium

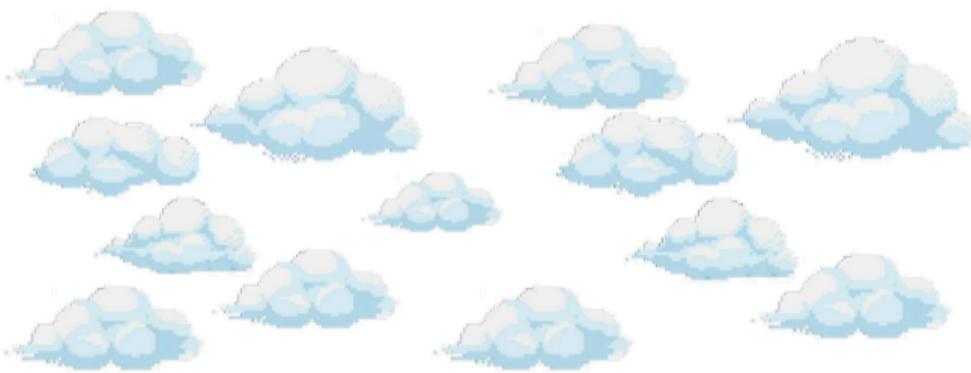


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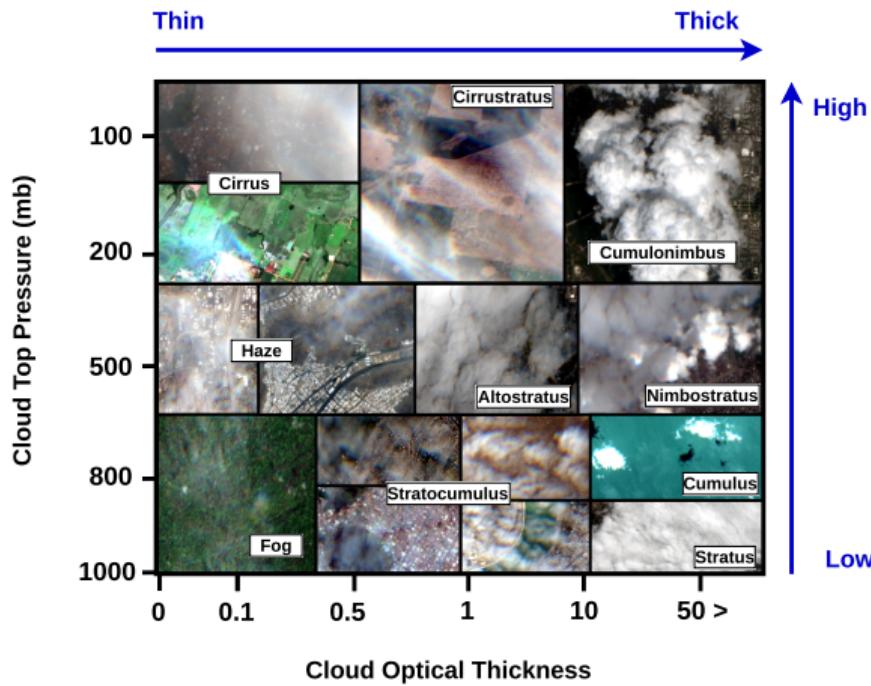


# What is a cloud?



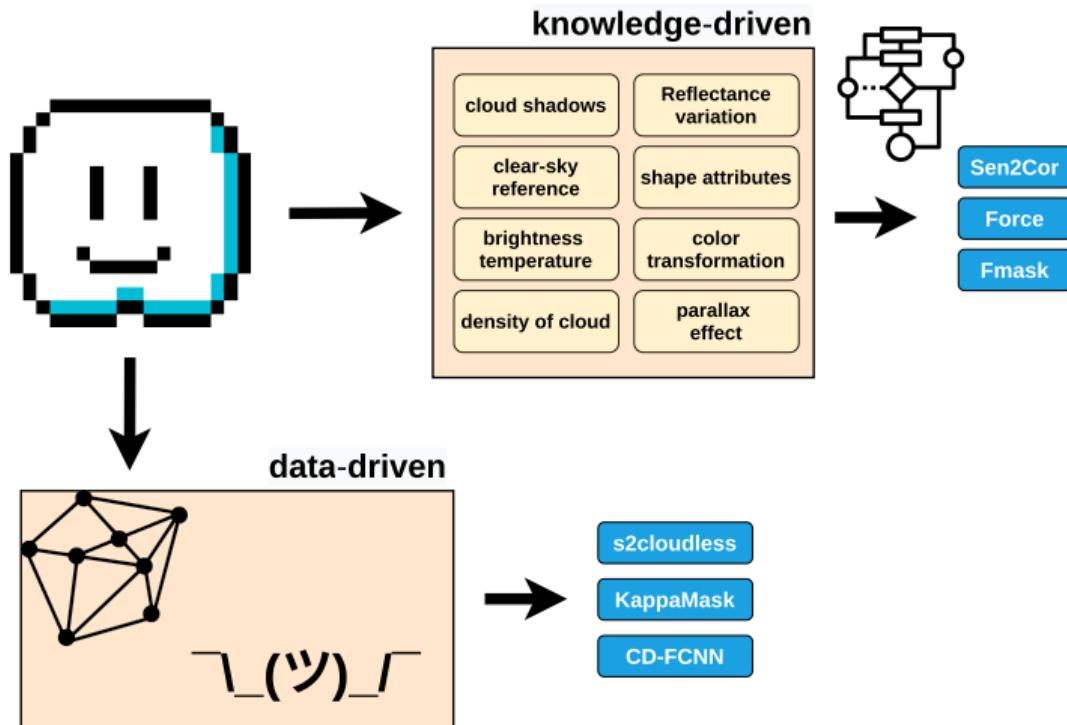
**A cloud is a mass of water drops or ice crystals suspended in the atmosphere.**

# What is a cloud?



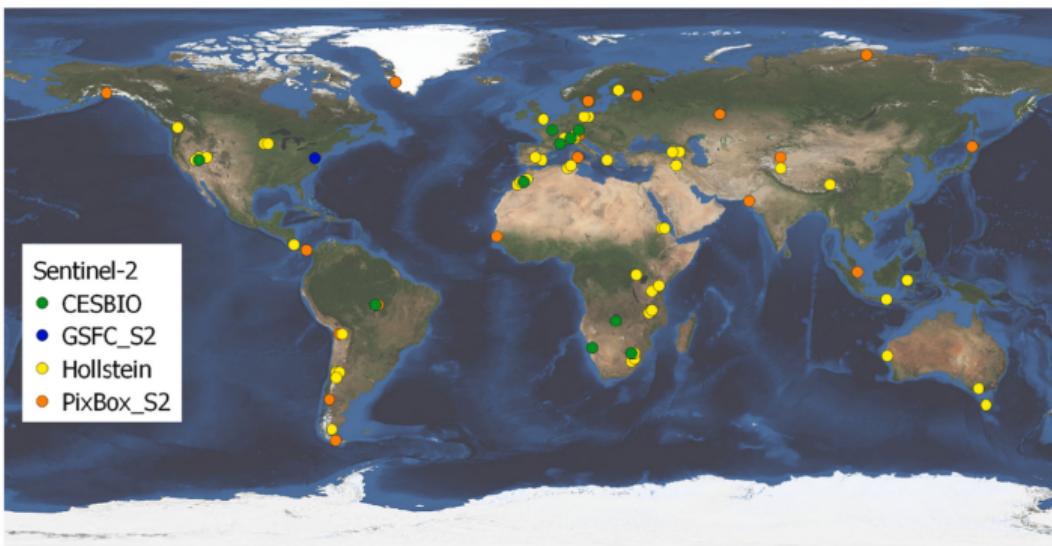
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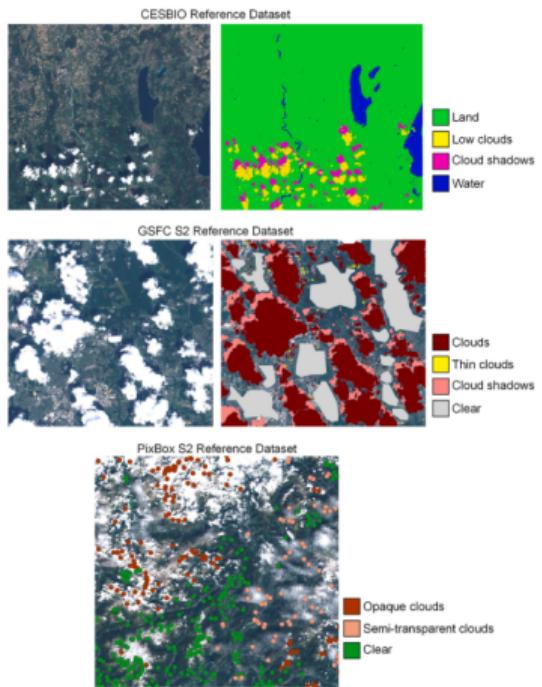
# Context - I

Distribution of Sentinel-2 reference scenes



**Figure: Geographical distribution reference cloud detection datasets for Sentinel-2 (Skakun et al. 2022).**

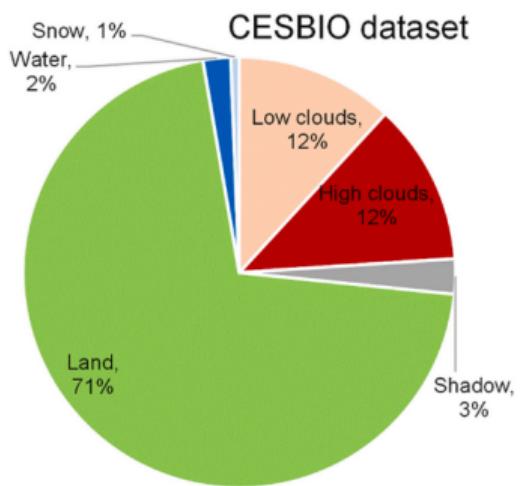
# Context - II



- Cloud labels created by human photo-interpretation and ground-based cameras.

Figure: Skakun et al. 2022

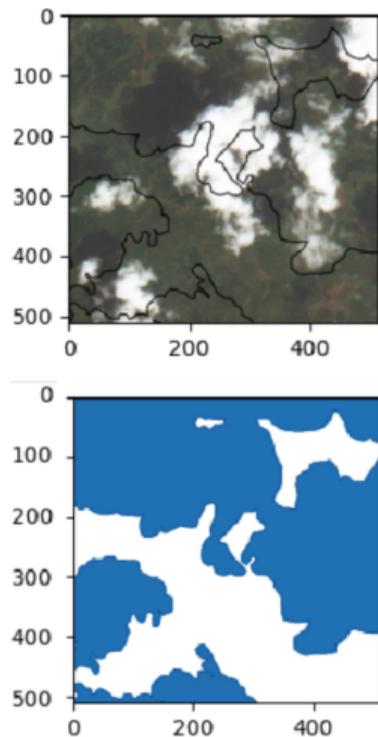
## Context - II



- Cloud labels created by human photo-interpretation and ground-based cameras.
- High class imbalance.

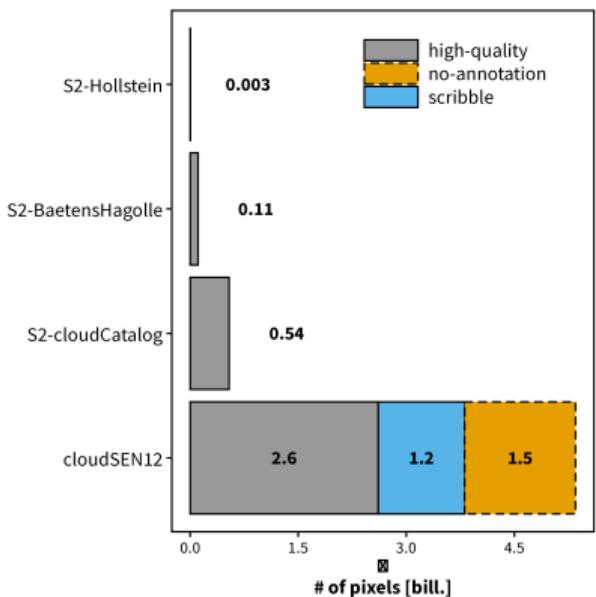
Figure: Skakun et al. 2022

## Context - II



- Cloud labels created by human photo-interpretation, active learning and ground-based cameras.
- High class imbalance.
- **The quality of some datasets is poor.**

## Context - II



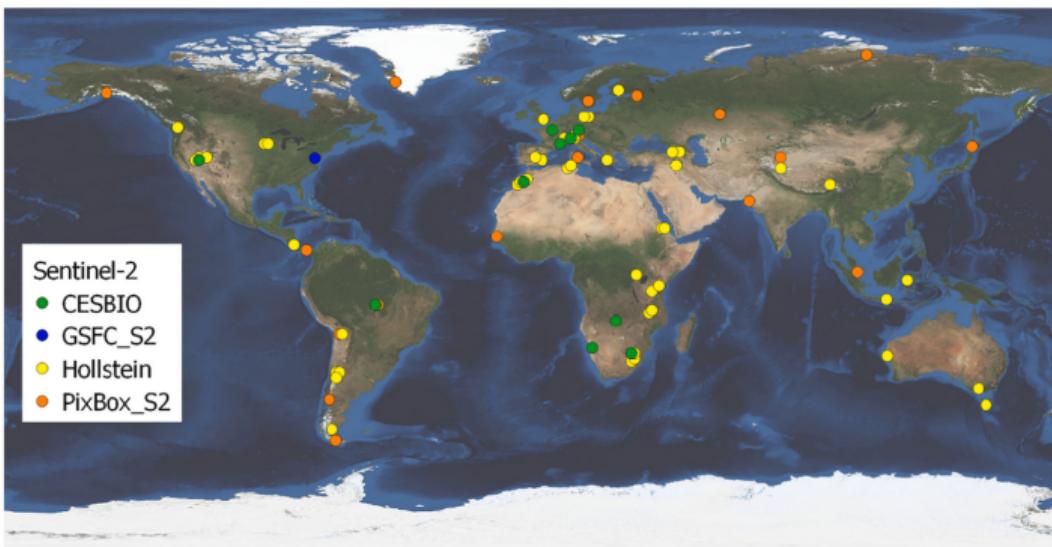
- Cloud labels created by human photo-interpretation and ground-based cameras.
- High class imbalance.
- **The quality of some datasets is poor.**
- Created by ***closed science practices***.
- No temporal features.

# CloudSEN12 - I

<https://cloudsen12.github.io/>

# CloudSEN12 - II

Distribution of Sentinel-2 reference scenes



**Figure: Geographical distribution reference cloud detection datasets for Sentinel-2 (Skakun et al. 2022).**

# CloudSEN12 - III

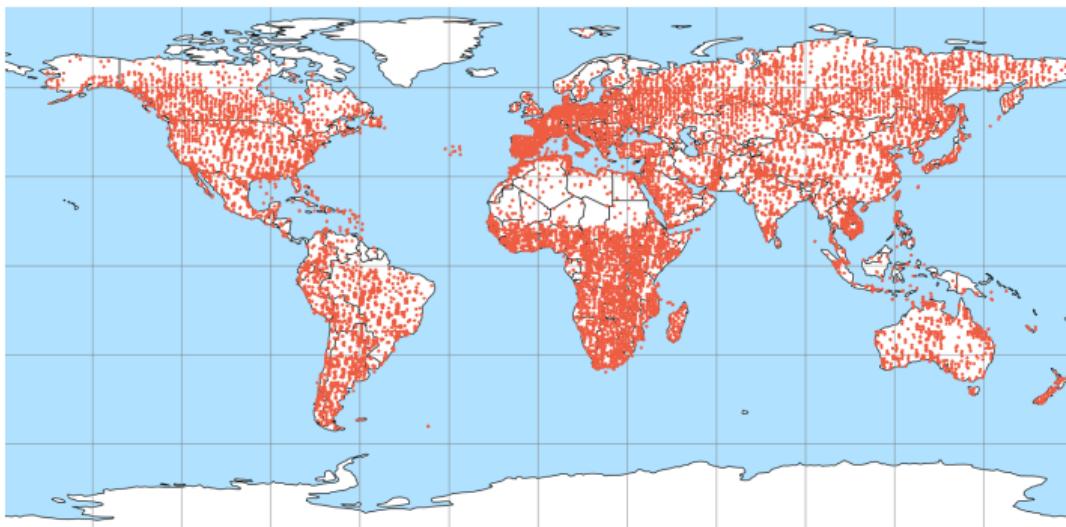


Figure: CloudSEN12 spatial distribution

# Overview

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- The trivial Set Cover algorithm has running time of  $\mathcal{O}(2^n)$ .

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# References

-  Fomin FV, Grandoni F & Kratsch D, 2009, *A note on the complexity of minimum dominating set*, Journal of Discrete Algorithms, **4**(2), pp. 209–214.
-  Grobler PJP & Mynhardt CM, 2009, *Secure domination critical graphs*, Discrete Mathematics, **309**, pp. 5820–5827.
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