

# Characterizing and correcting 'salt-and-pepper' noise in CLAAS-3 cloud mask product

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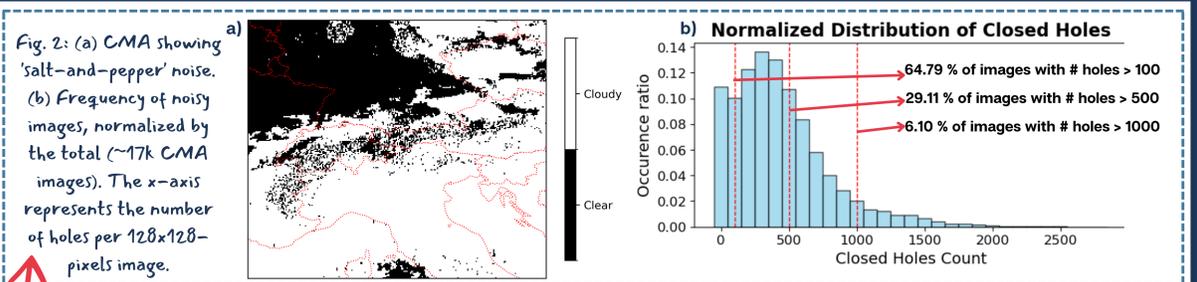
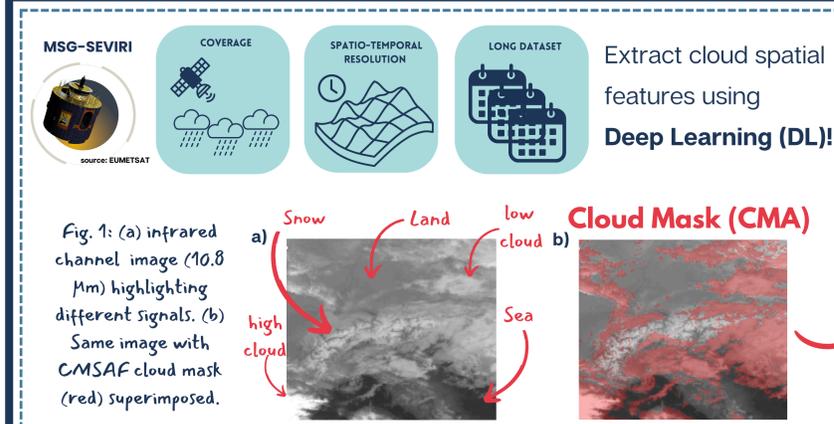
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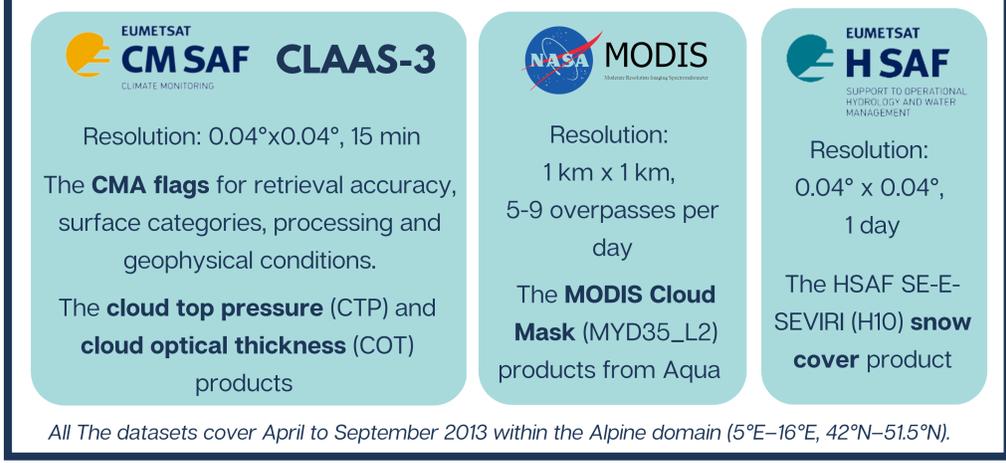
## 1. MOTIVATION AND GOAL



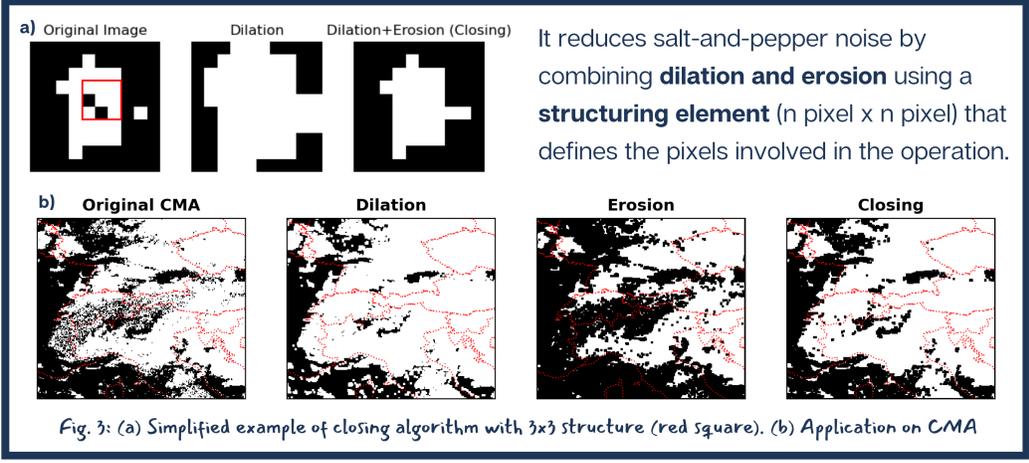
**GOALS**

- 1 Identify and **characterize** the cause of this noisy feature
- 2 Develop a **correction method** to prevent this undesired spatial pattern

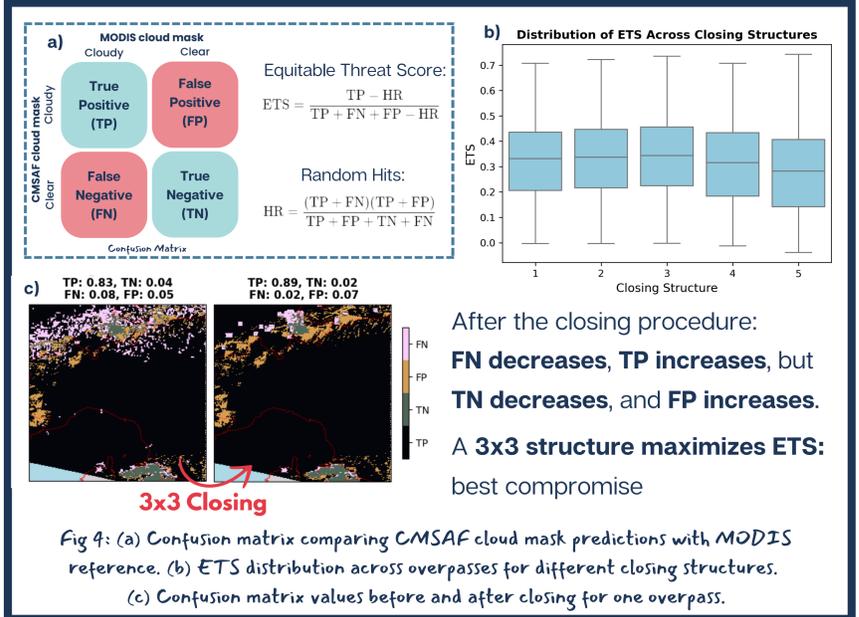
## 2. VALIDATION DATASETS



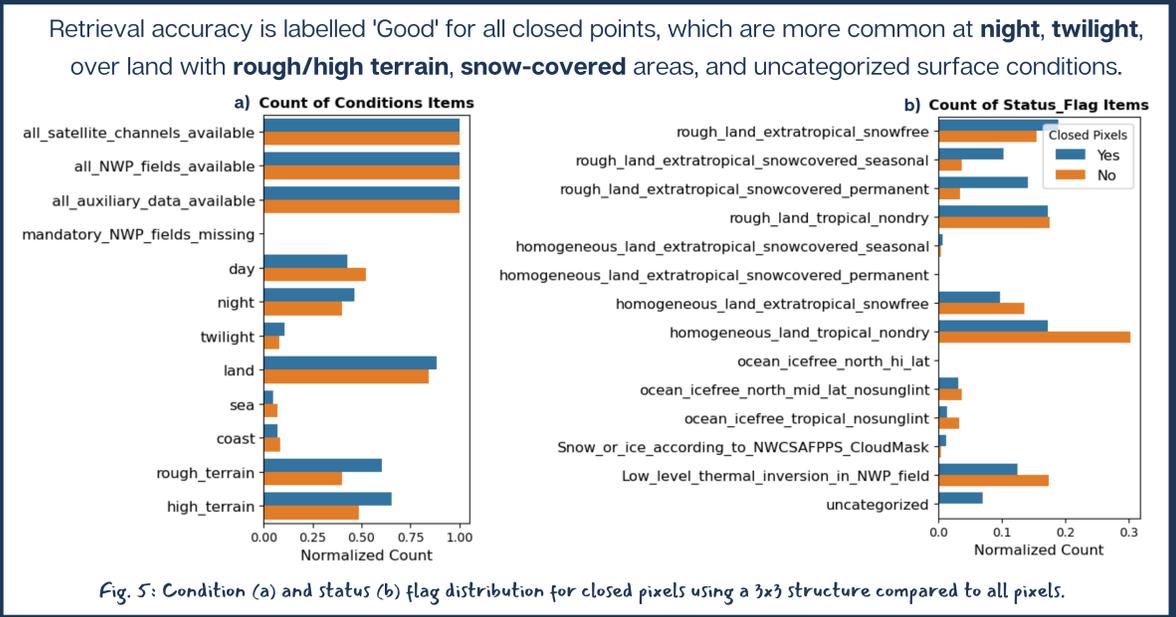
## 3. CLOSING ALGORITHM



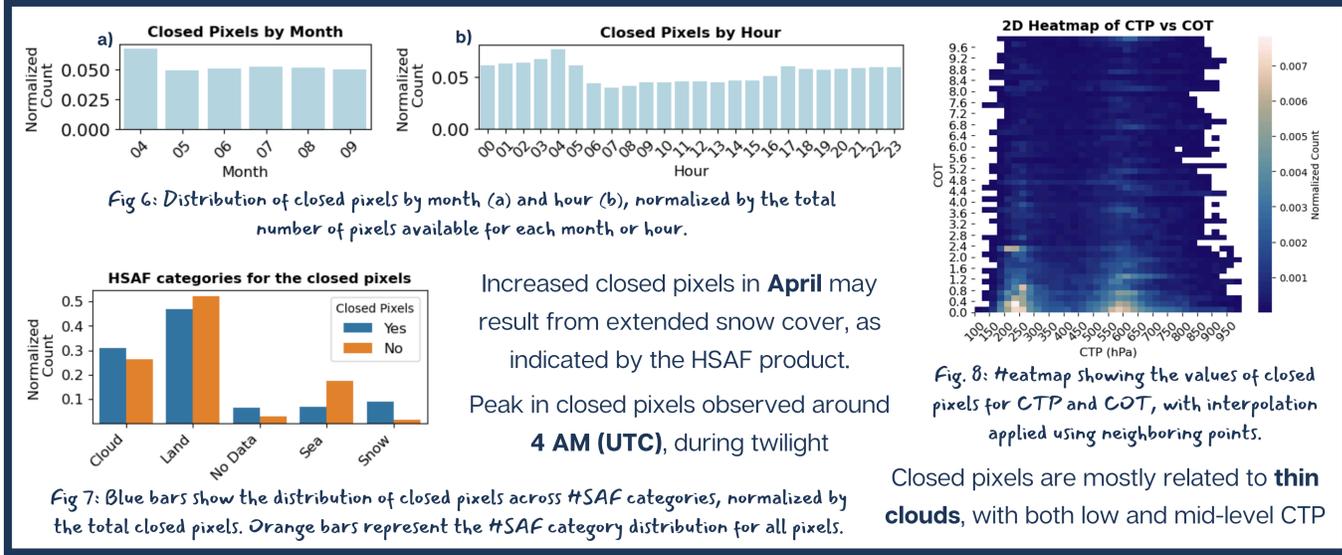
## 4. MODIS COMPARISON



## 5. QUALITY FLAGS



## 6. CLOSED PIXELS CHARACTERIZATION



## 7. CONCLUSION

- CMA frequently exhibits salt-and-pepper noise, **present in ~65%** of the dataset, which may impact DL computer vision model training.
- Noisy pixels are associated with **good quality flags**.
- Slightly correlated with **snow-covered areas** and more common during **nighttime and twilight**.
- Represented by **thin clouds** that are typically harder to detect.
- The closing algorithm, besides reducing the noise, it **closes more points classified as clear** than cloudy, according to MODIS.
- The **3x3 closing structure** provides the best alignment with the MODIS cloud mask since it **maximizes ETS**.

• K.-G. Karlsson & Johansson, Erik & Håkansson, Nina & Sedlar, Joseph & Eliasson, Salomon. (2020). Probabilistic Cloud Masking for the Generation of CM SAF Cloud Climate Data Records from AVHRR and SEVIRI Sensors. Remote Sensing. 12. 713. 10.3390/rs12040713.  
 • Meirink, Jan Fokke; Karlsson, Karl-Göran; Soldovnik, Irina; Hüser, Imke; Benas, Nikos; Johansson, Erik; Håkansson, Nina; Stengel, Martin; Selbach, Nathalie; Schröder, Marc; Hollmann, Rainer (2022): CLAAS-3: CM SAF Cloud property dataset using SEVIRI - Edition 3, Satellite Application Facility on Climate Monitoring, DOI:10.5676/EUM\_SAF\_CM/CLAAS/V003.  
 • Ackerman S. A., and R. Frey, 2015: MODIS Atmosphere L2 Cloud Mask Product (35\_L2). NASA MODIS Adaptive Processing System, Goddard Space Flight Center [http://dx.doi.org/10.5067/MODIS/MYD35\\_L2.006](http://dx.doi.org/10.5067/MODIS/MYD35_L2.006) (Aqua).  
 • EUMETSAT H-SAF. Product User Manual (PUM) for Product H10–SN-OBS-1; Doc. No. SAF/HSAF/PUM-10/1.2; Issue/Revision Index: 1.2; EUMETSAT; Darmstadt, Germany, 2018. Product downloaded from: <https://hsaf.meteoam.it/Products/Detail?prod=H10>  
 • Closing algorithm from the python library scipy: [https://docs.scipy.org/doc/scipy-1.15.0/reference/generated/scipy.ndimage.binary\\_closing.html](https://docs.scipy.org/doc/scipy-1.15.0/reference/generated/scipy.ndimage.binary_closing.html)

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