IOCN 2025 Conference
The 5th International Online Conference on Nanomaterials
22–24 September 2025 | Online
MDPI

Air Quality Analysis of Aerosols and Clouds based on New Generation CALIPSO LiDAR Technology

Hind Hallabia [1,2]
UMR CNRS 7347 - Materiaux, Microelectronique, Acoustique, Nanotechnologies (GREMAN) 1
Institut National des Sciences Appliquées Centre-Val de Loire (INSA CVL Campus Blois) France 2

INTRODUCTION & AIM

- *We investigate the data collected by LiDAR Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) mission*
- *Aim : Exploring the two-wavelength (532 and 1064 nm) backscatter LiDAR signals for air quality.*
- *We present a workflow for air quality analysis by integrating the CALIPSO VFM product*
- *We classified the aerosols and clouds from the CALIPSO VFM product, a level-2 product, based on the pixel intensities feature differences.*

METHOD

1 *Data acquisition*

04 July 2020

LiDAR data curation

Total 532 nm backscatter signal

Total 1064 nm backscatter signal

2 *Data processing*

Vertical Mask Vector image

3 *Data classification*

Aerosols

Clouds

Figure 1: Workflow of the proposed air quality analysis on LiDAR CALISPO data

RESULTS & DISCUSSION

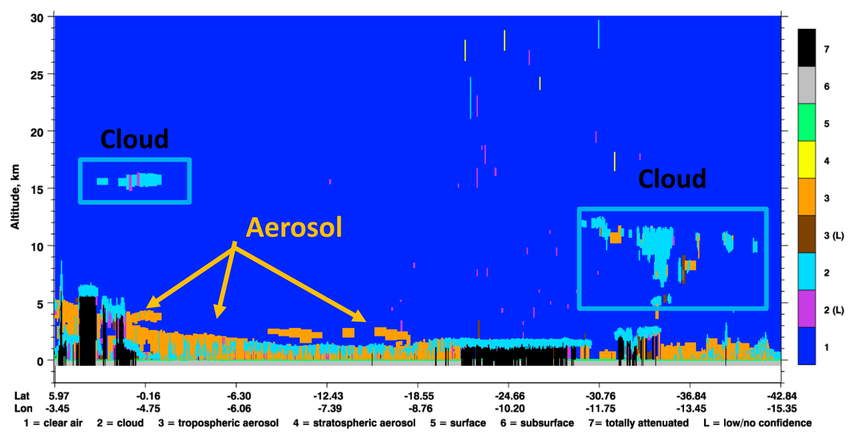

Figure 2: Vertical feature mask obtained from both 532 nm and 1064 nm attenuated bacscatter signals.

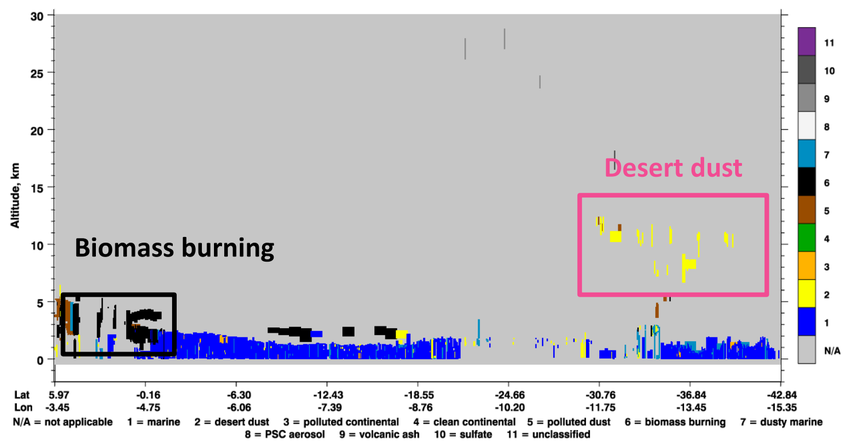

Figure 3: Plot of Aerosol highlighting the desert dust and biomass burning.

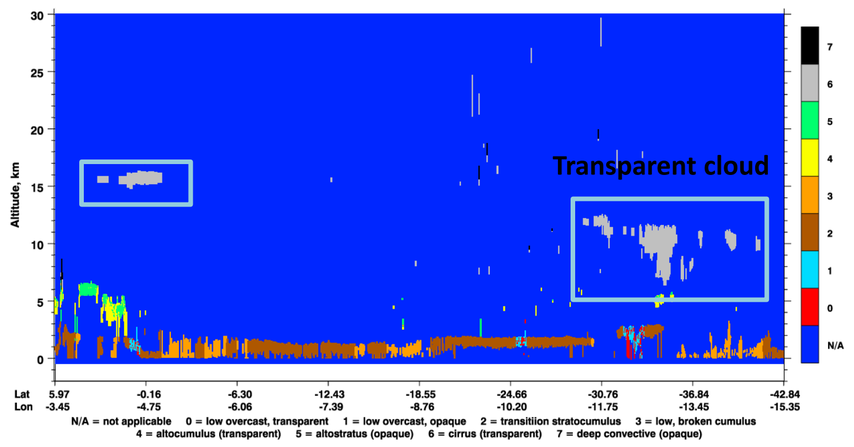

Figure 4: Plot of Cloud highlighting its transparent case.

CONCLUSION & FUTURE WORK

- Classification of aerosol and cloud based on pixel intensities of LiDAR profiles from the vertical mask vector.
- Analysis of the complex LiDAR backscatter signals over one orbit track.
- **Perspective** : Investigation of the interaction of LiDAR light (pulses) with the atmosphere (clouds).

REFERENCES

[1] Nowottnick, E. P.; Colarco, P. R.; Welton, E. J.; and da Silva, A. Use of the CALIOP vertical feature mask for evaluating global aerosol models. Atmospheric Measurement Techniques (AMT), 2015, 8, pp. 3647–3669

[2] Powell et al. CALIPSO LiDAR Calibration Algorithms. Part I: Nighttime 532-nm Parallel Channel and 532-nm Perpendicular Channel. Journal of Atmospheric and Oceanic Technology, 2009, 26, pp. 2015–2033