

Responses to RC1:

This manuscript presents the calibration algorithms used for the ACDL lidar onboard the DQ-1 satellite, with the analysis of the 532 nm nighttime polarization and high-spectral-resolution channels. The study is of significant interest to the lidar community, particularly as the launch of the EarthCARE ATLID lidar in May 2024 presents opportunities for comparative analyses between these two advanced lidar systems. This paper was originally submitted in May 2024, and my previous reviewer comments, along with the authors' responses, are available at: <https://egusphere.copernicus.org/preprints/2024/egusphere-2024-588/> under Anonymous Referee #1.

AR: Thanks for investing your valuable time in thoroughly reviewing our manuscript and providing us with constructive feedback and suggestions.

The authors have made substantial improvements to the manuscript in response to earlier feedback. I now have the following minor comments and grammatical suggestions to further refine the manuscript:

Minor:

Line 36: please be more specific on the high accuracy, temporal or spatial.

AR: Thanks for your kind reminder. We have revised the manuscript as follow:

L36: "One is the aerosol-measurement module which measures profiles of clouds and aerosols with high accuracy and high spatiotemporal resolution globally, and another is the CO₂ measurement module for atmospheric column CO₂ observations (Liu et al., 2019; Wang et al., 2020)."

Line 83-86: please update the status accordingly, as EarthCARE is already in orbit.

AR: Thank you for raising the issue. We have revised the manuscript as follow:

L83: "The ATmospheric LIDAR (Light Detection and Ranging) lidar system, ATLID, is part of the payload of Earth Cloud, Aerosol and Radiation Explorer (EarthCARE) mission launched on 28 May 2024, and the in-orbit calibration is currently underway (Wehr et al., 2023)."

Grammar:

Line 41: "To enable ACDL quantitative measurement..." -> "To enable ACDL's quantitative measurement..."

AR: Thanks, revised. L41: "To enable ACDL quantitative measurement..." ➔ "To enable ACDL's

quantitative measurement...”.

Line 44: include -> including

AR: Thanks, we have removed this sentence in the revised manuscript.

Line 47: hereafter referred to as "the" HSRL channel

AR: Thanks, revised. L47: “hereafter referred to as the HSRL channel”.

Line 71: ... detecting clouds and aerosols

AR: Thanks, revised. L71: “...detecting cloud and aerosol” → “...detecting clouds and aerosols”.

Line 74: duplicated 'the'

AR: Thanks, revised.

Line 74: 'aerosol stratospheric scattering ratio' -> 'stratospheric aerosol scattering ratio'

AR: Thanks, revised. L74: “aerosol stratospheric scattering ratio” → “stratospheric aerosol scattering ratio”.

Line 91: a verb is missing, possible correction "...with a portion (70%) of the signal passing through an iodine vapor absorption filter to block Mie scattering..."

AR: Thanks, revised. L105: “...with a portion (70%) of the signal passing through an iodine vapor absorption filter to block Mie scattering...”

Line 124: add a space between 2km

AR: Thanks, revised.

Line 129: consisting -> consists

AR: Thanks, revised. L131: “consisting” → “consists”.

Line 131: Remove

AR: Thanks, revised. L131: “Removes” → “Remove”.

Line 139: 'the' calibration range

AR: Thanks, revised.

Line 140: for 'the' calibration procedure

AR: Thanks, revised.

Line 143: by 'applying' sliding averages

AR: Thanks, revised. L131: “by sliding averages” → “by applying sliding averages”.

Line 183: to be consistent: (polarization gain ratio) PGR

AR: Thanks, revised. L197: “PGR (polarization gain ratio)” → “(polarization gain ratio) PGR”.

Line 188: verb is missing. '...are determined using the...' ?

AR: Thanks, revised. L202: “...are determined using the...”

Line 188: molecular normalization technique?

AR: Thanks, revised. L203: “normalized” → “normalization”.

Line 304: ...underlying terrain on the signals...

AR: Thanks, revised.

Line 315: '..., an additional sliding average of 500 km in the direction of adjacent-track distances is applied.'

AR: Thanks, revised. L329: “..., an additional sliding average of 500 km in the direction of adjacent-track distances is applied.”

Line 337: The Eq.(26) are -> Eq.(26) is

AR: Thanks, revised. L350: “are” → “is”.

Line 401: as shown in Figure 10. 'as' -> 'is'

AR: Thanks, revised. L414: “as” → “is”.

Line 419: It's not clear from the sentence "...estimations of the error terms contributing will be revised".

Does the author mean "the estimations of the contributing error terms will be revised"?

AR: Thanks, revised. L350: “estimations of the error terms contributing will be revised” → “the estimations of the contributing error terms will be revised”.

Line 440: Standard -> standard

AR: Thanks, revised.

Line 465: assessed -> assess

AR: Thanks, revised.