INDRA: Graphical User Interface for lidar measurement analysis

Bravo-Aranda, J. A.; Pietras, C.; Haeffelin, M.; Lapouge F.
Institut Pierre Simon Laplace
Contact: jbravo@lmd.polytechnique.fr

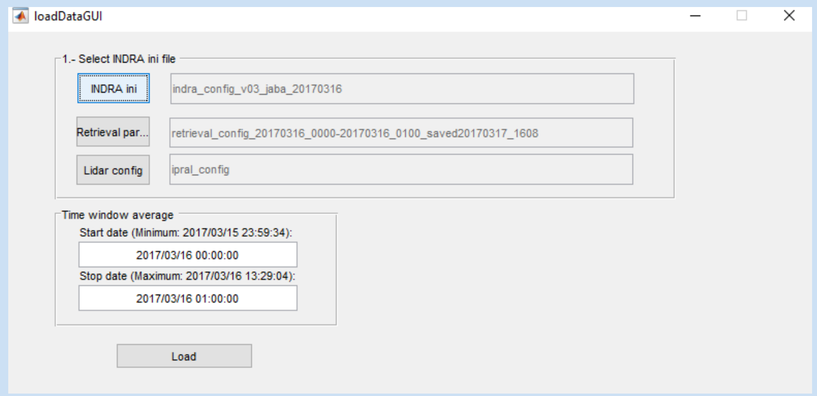
Introduction

- Lidar measurements can provide useful optical and physical properties of atmospheric particles (e.g., aerosol particles).
- To do so, it is required:
  - **Quality control** of the measurements (e.g., Rayleigh fit, telecover, dark current, depolarization, …)
  - **Pre-processing** to optimize lidar measurements (e.g., background substraction)
  - **Inversion algorithms** which needs user-defined parameters (e.g, Klett investion and the assumed lidar ratio)
- Due to the number and complexity of the processes, we have developed INDRA, a Graphical User Interface integrating the quality contro, pre-processing and investions in a user-friendly way (Bravo-Aranda, 2014)

How does INDRA work?

INDRA requires the following files:

- The **configuration file** (*.ndr) contains the information of the lidar to be analyzed (number of telescopes, channels, …)
- The **inversion parameter file** (*.fiz) contains all the inversion parameters required by each lidar invertion for each channel and telescope (e.g., 532nm Far Field) to be defined by the user



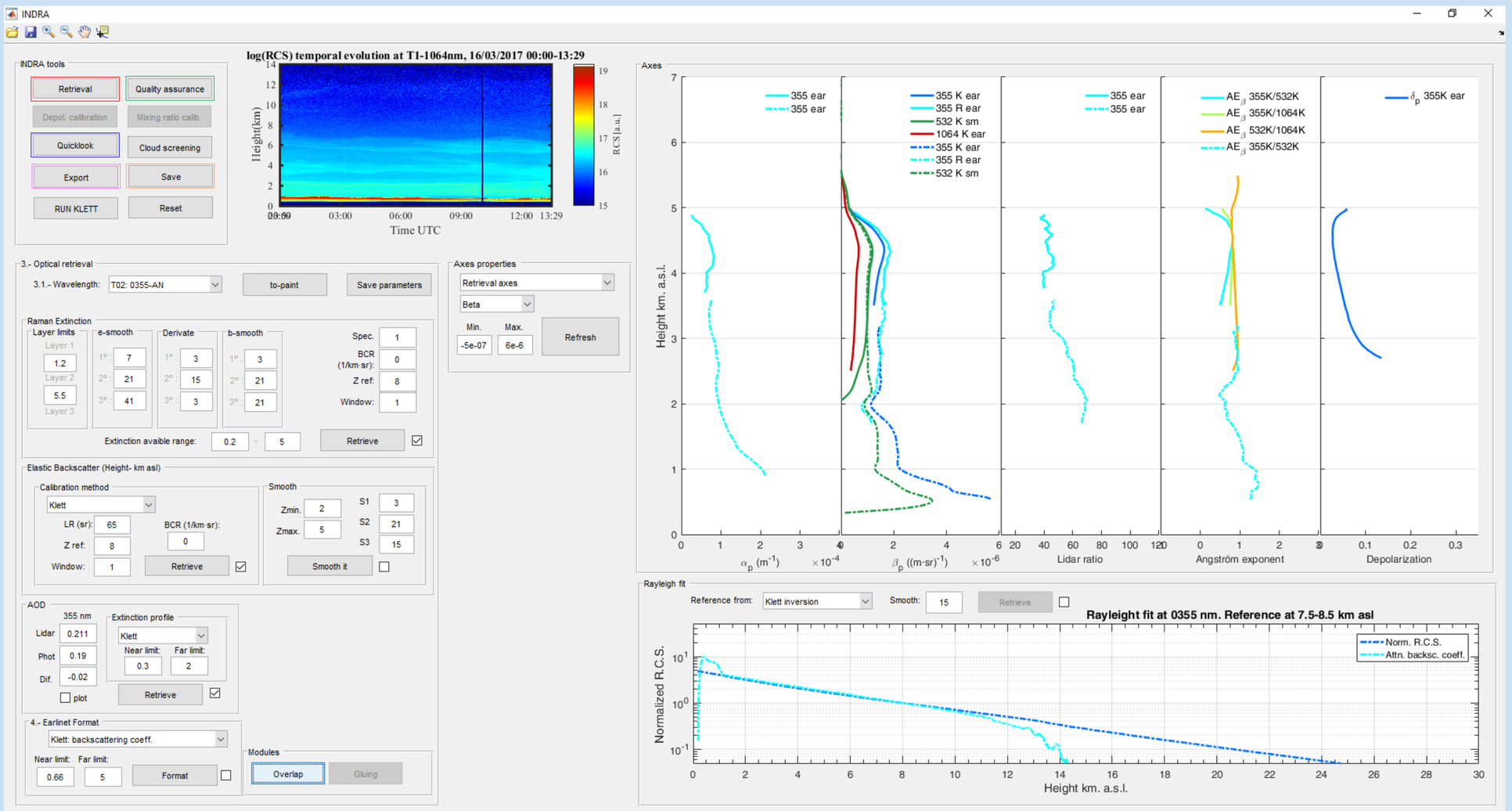
- The **initialization file** (*.ini) gathers the file paths of different measurements (e.g., from lidar, radiosonde, sun-photometer, …) and ancillary information as the date and period to be analyzed

- INDRA has been developed to be able to analyze other **lidar data using raw2l1 as input format** (netCDF) which is a standarized format developed by the SIRTA team in the framework of TOPROF and E-PROFILE.

The INDRA's Interface

Main INDRA tools:

- Retrieval: it activates the Raman, Klett and depolarization retrieval modules in the main interface(→)
- Quality Assurance: it allows the performance of different quality tests (see section below)
- Quicklook: module for setting the quicklook format (height, time window, colorbar limits, …)
- Export: module to save figures of the current status of the lidar products
- Save: module to save lidar products (EARLINET netCDF format) according to the wavelength, the detection mode (e.g., analog), …

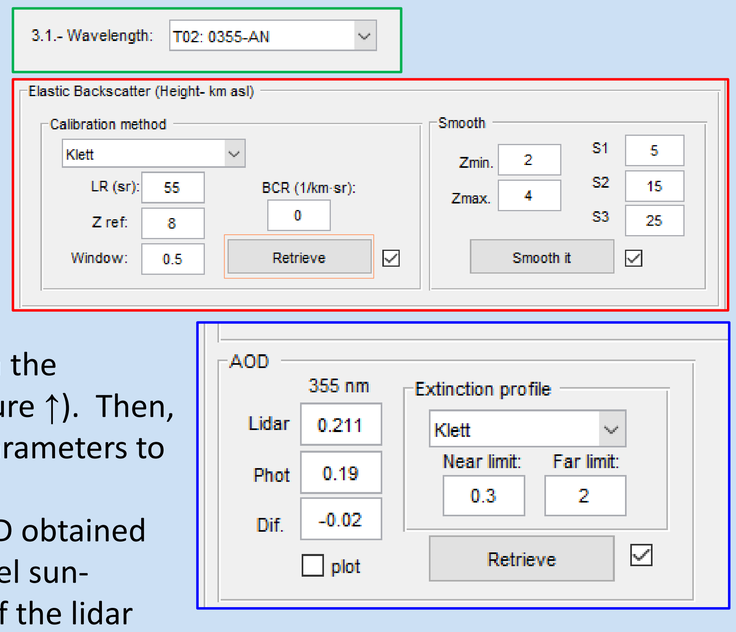


Klett inversion

The Klett module allows to set the Klett parameters (lidar ratio, reference height ...) for a specific channel (e.g., T02: 0355-AN is the channel 355 nm analog of the far-field telescope)

The 'Retrieval' button shows the β_p in the correspond vertical axe (see main figure ↑). Then, the user can iteratively change the parameters to optimize the result.

The AOD module allows to fit the AOD obtained with the lidar and the co-located Cimel sun-photometer for a better hypothesis of the lidar ratio



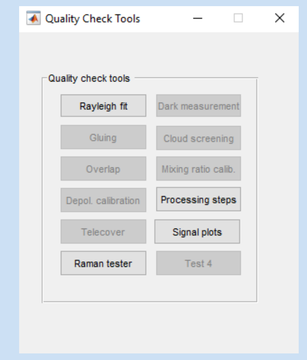
Quality Assurance

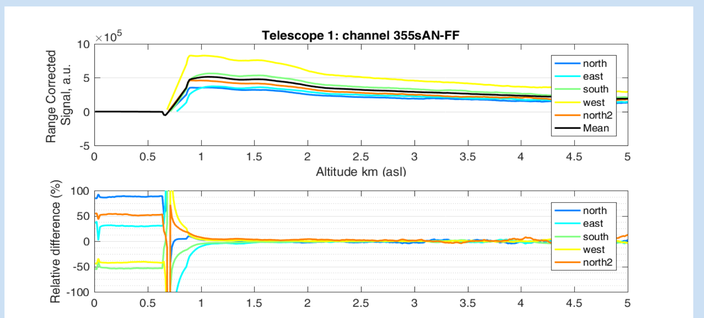
The Quality Assessment of the lidar measurement is crucial for obtaining reproducible and confident results. In the EARLINET network is mandatory to yearly provide several tests (Pappalardo et al., 2014)

INDRA allows the performance of the EARLINET tests (Rayleigh fit, telecover, dark measurement, depolarization calibration test, …)

Quality test results are saved in figures and the asci format established by EARLINET

This figure (→) is an example of the telecover output for the analog channel at 355 nm of the far-field telescope





Concluding remarks

- INDRA is an integrated tool for lidar measurement analysis and quality assurance
- Other lidar measuremenst can be analyzed using INDRA (RAW2L1 netCDF)
- INDRA will be soon available through a BitBucket repository

References

- Bravo-Aranda, 2014: Lidar depolarization technique: Assessment of the hardware polarizing sensitiviy and applications.
- Pappalardo, et al. 2014: EARLINET: towards an advanced sustainable European aerosol lidar network, Atmos. Meas. Tech., 7, 2389-2409.

The development of IPRAL was realized with the support of the following organisms:

This work was supported by: