# Comparisons of Rman- and WALI-derived aerosol optical properties during HyMeX

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Keywords: aerosol, Raman lidar, R-Man$_{510}$, HyMeX
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As to confront the increasing need of more accuracy and continuity in both the surveillance of pollution and the climate forecasting lidars have developed considerably. The Raman lidars have the advantage of giving the extinction and backscatter coefficients without any assumption or synergy with another instrument (e.g. Whiteman et al., 1992). LSCE and LEOSPHERE Company developed a new prototype of portable $N_2$-Raman lidar for the study of the low and middle troposphere (Royer et al., 2010). Such system was used in the framework of the MEGAPOLI European program and for the survey of volcanic ashes (Chazette et al., 2011). It gave rise to the new Raman lidar R-Man$_{510}$ developed and recently commercialized by LEOSPHERE Company and WALI (Water-vapor and Aerosol LIdar) developed by LSCE. The comparison between those two would allow the validation of the first one.

Both lidars were deployed during the HyMeX (Hydrological cycle in Mediterranean EXperiment) campaign, in autumn 2012 in Menorca. This campaign aimed at understanding the climatic phenomena and improving the meteorological forecasts of extreme events over the Western Mediterranean region. This area is particularly interesting for it diversity of aerosols coming from maritime, Saharan dust and/or anthropogenic sources. Hence, the measurements performed during the HyMeX campaign prove to be a good support for the comparison between both lidars. They allow retrieving and comparing aerosol optical properties (extinction coefficient, aerosol optical depth, depolarization ratio) derived from the lidars.

| R-Man$_{510}$ | WALI |
|---|---|
| Reception channels | |
| Elastic // 355 nm<br>Elastic ⊥ 355 nm<br>$N_2$-Raman 387 nm | Elastic total 355 nm<br>Elastic ⊥ 355 nm<br>$N_2$-Raman 387 nm |
| Reception diameters<br>15 cm | |
| Full overlap<br>~300 m | |
| Vertical sampling | |
| 1.5 m<br>7.5 m | 0.75 m (analog)<br>15 m (photon counting) |
| Vertical resolution<br>~30 m | |

*Table 1: R-Man$_{510}$ and WALI technical characteristics*

The main technical characteristics of these two eye-safe lidars are given in Table 1. WALI and R-Man$_{510}$ have different optical designs for the separation of polarizations. The main other differences are the pulse repetition frequency and the emitted energy that are in favor of the reference instrument WALI, mainly during daytime.

Figure 1 illustrates the matching between the extinction coefficients and the volume depolarization ratios (VDR) derived from the lidars. These measurements have been acquired during a dust event coming from Saharan desert. These non-spherical mineral particles are highlighted by high depolarization ratio and can be observed up to 5 km above mean sea level.

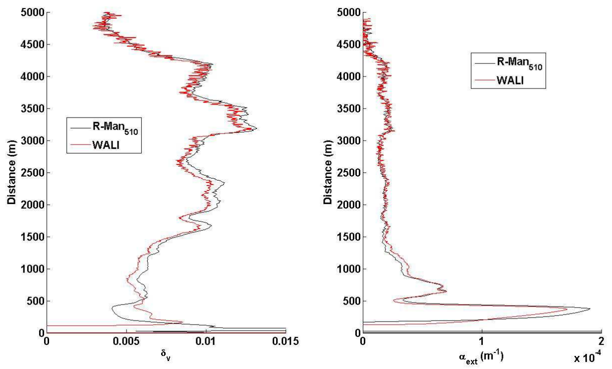


*Figure 1. Vertical profiles of both the volume depolarisation ratio $\delta_v$ (left panel) and the aerosol extinction coefficient $\alpha_{ext}$ (right panel), October 5$^{th}$ 2012 between 0h and 1h.*

Various atmospheric conditions have been observed during the campaign (dust events, clean maritime, cirrus clouds…). This will give the opportunity to evaluate daytime and nighttime performances of the R-Man$_{510}$ compared to the research lidar WALI.

This work was supported by the French Agence Nationale de la Recherche (ANR), the French space agency (CNES) and the Commissariat à l'Energie Atomique (CEA).

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