WaVIL: a differential absorption lidar for monitoring water vapor and isotope HDO in the lower troposphere

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➔ **Context and Objective:**

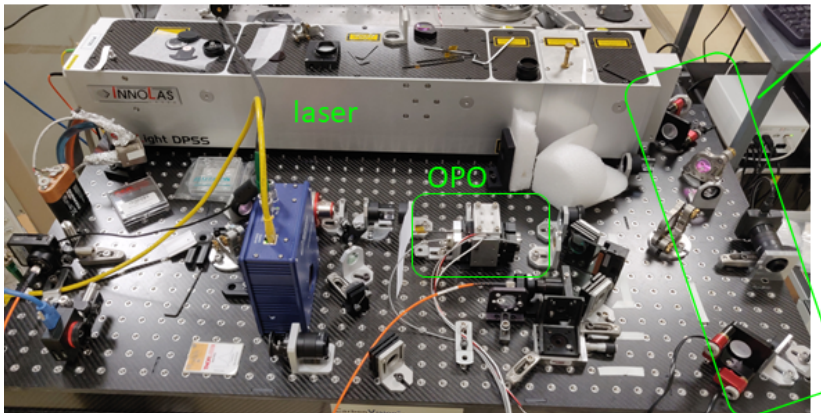
The abundance of stable water isotopologues in the atmosphere (H_2O, HDO and $H^{18}O$ in particlar) depend on many climate factors, such as vapor source conditions, circulation, local precipitation, and ambient temperature.

Humidity observations alone are insufficient to improve our understanding of water cycle processes (evaporation, evapotranspiration, cloud processing, …), while isotope data provide additional relevant constrains.

The overarching objective of the WaVIL project is to develop a compact, transportable DIAL for measuring concentration of water vapor and of its isotope HDO, at high vertical and temporal resolution in the lower troposphere with an unprecedented accuracy.

➔ **Methodology:**

The **ANR-funded** WaVIL system includes a **tunable laser based on an optical parametric oscillator (OPO)** whose emission is positioned precisely upon an absorption line selected in the **near infrared** (1981-1984 nm).

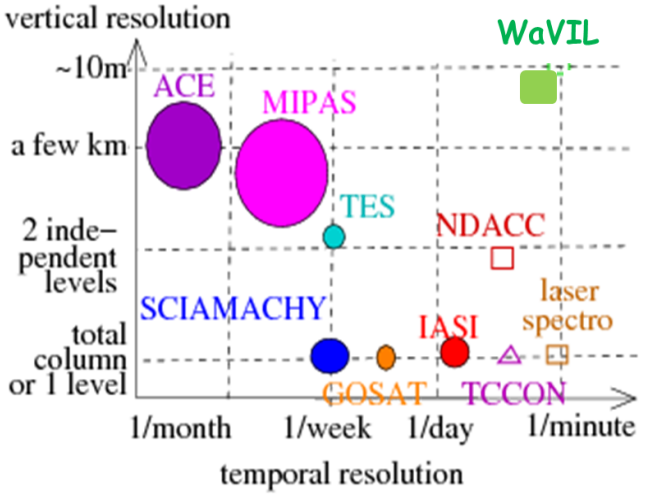


➔ **Expected results:**

WaVIL will fill an **observational gap** beneficial to process oriented studies relevant to improve our understanding of the water cycle.

WaVIL is designed to operate in various climatic regions (mid-latitude and the tropics, possibly the polar regions.

Accurate measurements of $\rho H_2 0$, ρHDO and δD in the lower troposphere (0-3 km) at high temporal (10 min) and vertical (100-300 m). Expected absolute error of δD less than 20‰ below 3 km (less than 10 ‰ in the PBL). Expected accuracy on H_2O and HDO: less than 1% below 3 km.



➔ **Conclusions/Perspective:**

First measurements end of 2019, first deployment in the field summer 2020.

Intégration in the SAFIRE ATR 42 end of 2021 (funded EU LEMON project PIed by ONERA)