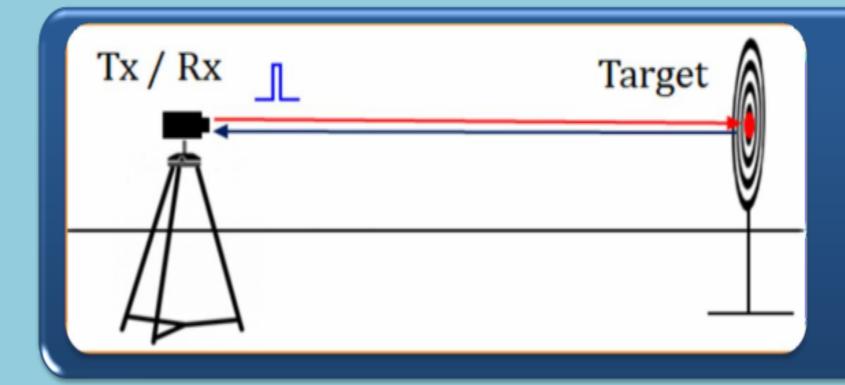




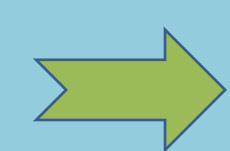




WHAT DO WE RESEARCH? LIDAR SYSTEMS



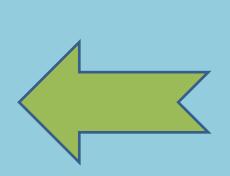
SYSTEMS BASED ON TIME-OF-FLIGHT



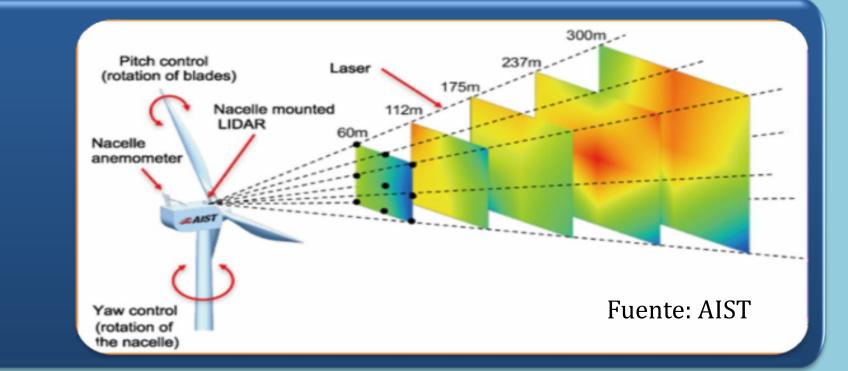
It consists of sending an optical pulse to a target and subsequently detecting the backscattered pulse. The distance is determined from the delay time.

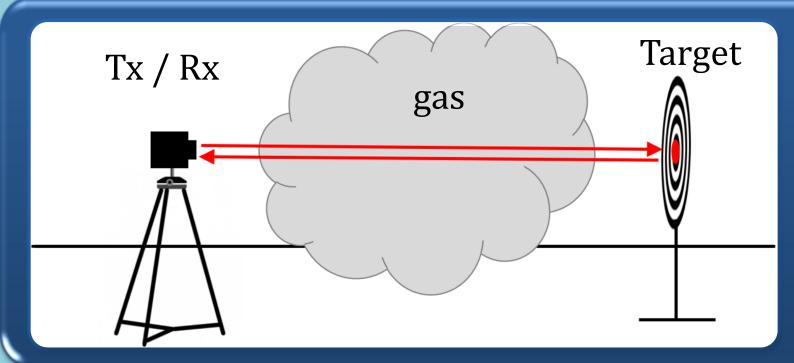
Based on Doppler effect:

The optical signal sent is backscattered by the aerosols that move at the speed of the wind, thus modifying its frequency. The beat of the two signals is analyzed in frequency giving information about the direction and speed of the wind.

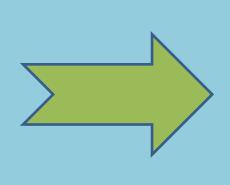


SYSTEMS FOR WIND SPEED MEASUREMENT





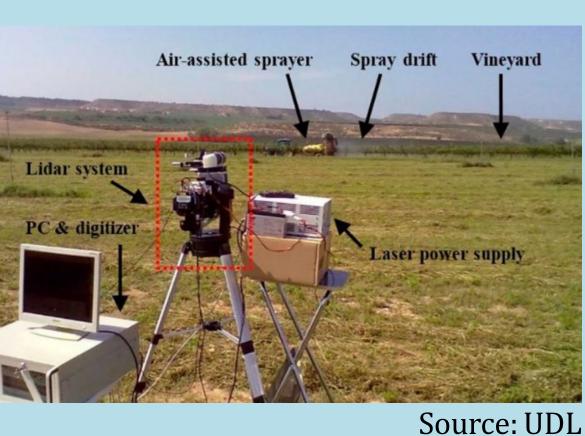
GAS SPECTROSCOPY:
DIFFERENTIAL ABSORPTION LIDAR



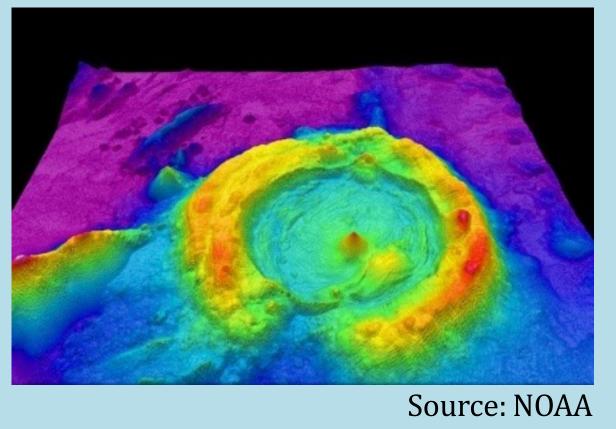
To measure the concentration of a gas, two signals are sent at close wavelengths, one inside and one outside the gas absorption line. From the difference in intensity of the two received signals, the gas concentration is determined.

APPLICATIONS

FARMING



METEOROLOGY



FACIAL RECOGNITION



Source: Apple

AEROSPACE



AUIUMUIIV



Source: Google

RESEARCH LINES

RM-CW LiDAR

In Random-Modulation Continuous-Wave (RM-CW) systems, a pseudo-random sequence of bits is sent, and the cross-correlation of the emitted signal with the received signal is calculated, from which the distance is determined.

Tx / Rx

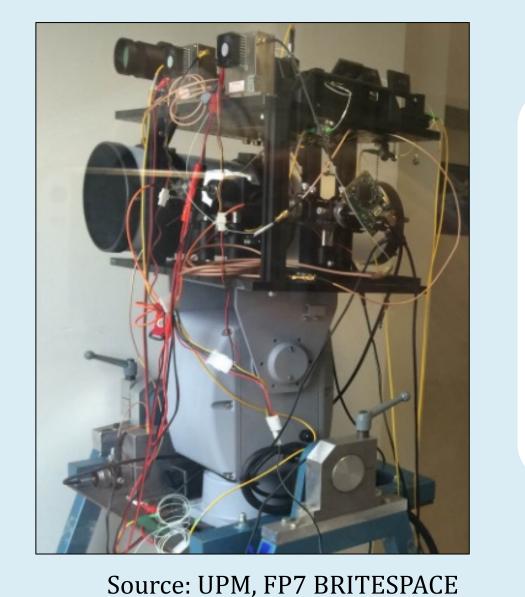
Photodetector Tx lens

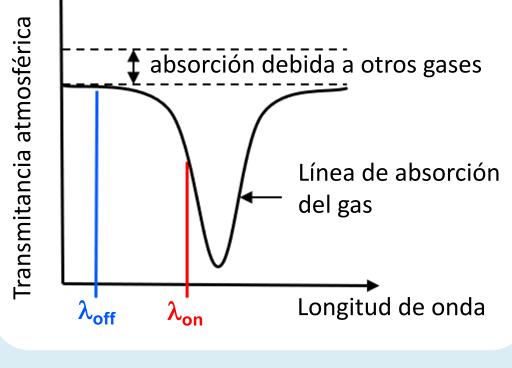
RM-CW LiDAR developed at UPM

Correlación Correlación Tiempo de correlación

RM-CW DIFFERENTIAL ABSORPTION LIDAR

Lasers at different wavelengths modulated with a pseudo-random sequence temporarily delayed between them are used. From the difference in intensity of their correlation, the gas concentration and the distance to the target are determined.





DUAL FREQUENCY COMB SPECTROSCOPY

Two optical frequency combs with slightly different repetition frequencies are used and made to interact with the gas. Its subsequent interference in a photodetector maps the absorption that has taken place at optical frequencies to radio frequencies.

