AEROSOLS DETECTION AND RANGING: FAST LASER IMAGING OPTICAL EMISSION SPECTROSCOPY (DARLIOES)

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Depending on the space-time chemical composition, sources type activity or process, meteorological conditions, air pollutants (both organic and inorganic compounds), generally the air pollution causes significant damage to human health and environment and dramatically influencing the climate changes. These pollutants may include some of the following well known chemical compounds: sulphur dioxide, ozone, carbon dioxide, volatile organic compounds, hydrogen sulphide, particulate matter, carbon monoxide, toxic air contaminants (mercury, lead, etc) but their contributions in the time-scale atmosphere dynamics are far from fully understood as following discussed details.

As a complementary approach to the satellite measurement spectral data, ground based instruments as Sunphotometer, Radiometer, DOAS, LIDAR & DIAL, mass-spectroscopy & shadowgraphy - laser matter desorption, in a variety of configurations are extensively developed and some of these must be improved even to obtain UV-IR image – remote investigated ice nucleation layer-atmospheric pattern, as following will be proposed in this paper.

Moreover, in order to better understanding the fundamental of some critical physico-chemical transformation of the atmosphere compounds but also for applications point of view, we propose a new LIDAR power instrument DARLIOES as is shown in Fig. 1.

This instrument is able to capture fast plume airborne image (2ns gate time) and may used to investigate in real time several chemical compound behaviour at a given point of the free atmosphere. Some advantahge of the proposed instrument may summarized as following: time-space resolved temperature and humidity profiles (Raman scattering of oxygen 353 nm & 354 nm; real-time monitoring tool to measure concentration of sulphur dioxide injected in the troposphere from the volcanic eruption ash, water profiles and their dynamics, acid rain, chemical transformation/physical properties; DIAL H_2O and SO_2; UV fluorescence using the two stronger absorption emission lines of 218.9 nm and 220.8 nm, respectively; water vibrational Raman scattering at 407 nm; ice nucleation variability, physical and chemical impact, the influence upon the mixed-phase cloud; dust mineralogical composition dynamics influences upon the ice nucleation; Raman scattering of oxygen - 353 nm & 354nm; fast ICCD imagery (IR spectrum) of ice nucleation pattern clouds; studies of the ice nucleation and propagation in plants; detection and characterization of carcinogenic BaP or PAH compounds adsorbed on the soot in a given smoke plume, bacterial and fungal spores, biogenic aerosols generally that have the potential to fluorescence; UV fluorescence of PAH {Benzo(ghi)perylene Excitation (Ex-301 nm/ Emission Em-420 nm); Naphthalene (Ex-275 nm/ Em-325 nm); Anthracene (Ex-255 nm/Em-375 nm); Pyrene (Ex-270 nm/ Em-420 nm), etc).

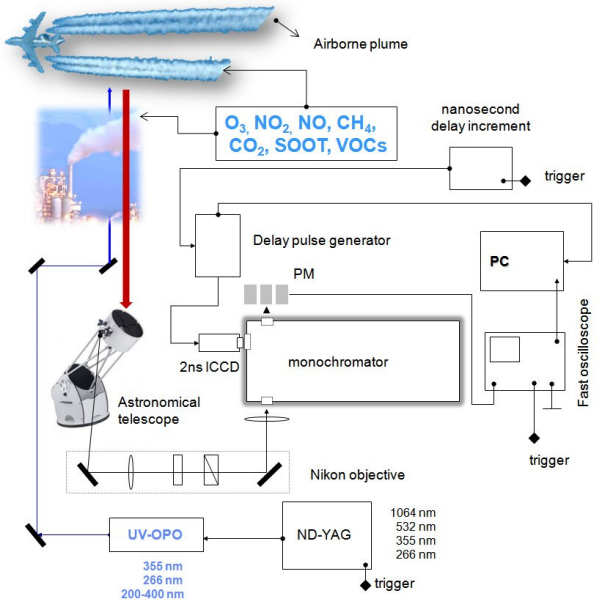

Fig. 1. DARLIOES equipment, experimental set-up. UV-OPO pulsed laser combined with high resolution spectroscopy and fast ICCD camera make available different spectroscopy real time diagnosis tools.

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