Poster 1.8

Coupling Surface In Situ, Remote Sensing And Vertical Atmospheric Aerosol Observations in Cyprus

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The island of **Cyprus** is strategically located at a crossroads of air streams from Europe, Africa and the Middle East that have contrasting aerosol-related emissions from natural and anthropogenic sources. It is in a Mediterranean region where climate changes (e.g. heat waves and droughts) are expected to be among the highest globally (IPCC, 2014 WG1 report). Also, Cyprus experiences a large number of dust storms originating from Africa, the Gulf region and the Middle East which exhibiting different and poorly characterized aerosol optical properties (Mamouri et al., 2013). Observations have shown that dust particles tend to undergo chemical changes during transport, something that modifies their physical, optical and chemical properties (Levin et al 2005).

Since the late nineties, long term observations of key atmospheric chemistry variables (O_3, NO_x, PM) have been made in Cyprus, at the "Agia Marina Xyliatou" station (Figure 2) operated by the Department of Labor Inspection as a European Monitoring and Evaluation Programme **(EMEP)** station focusing on long-range transboundary air pollution (Kleanthous et al., 2014). As part of the ENVIMED "CyAr" project (component of the French **ChArMEx program**; http://charmex.lsce.ipsl.fr/), this station will be equipped in 2014 with a new set of real-time in-situ aerosol instruments (Q-ACSM, 7-λ aethalometer, 3-λ nephelometer, OPC, SMPS, CCN counter) offering new perspectives on aerosol (PM) sources and their geographical origin downwind of major non–EU countries surrounding the Mediterranean (Figure 2) and of sources of sand and dust in North Africa and the Middle East.

In parallel, the Cyprus Institute (CyI) has developed a fleet of Unmanned Autonomous Vehicles (UAV, Figure 3) equipped with ultra-light aerosol sensors (absorption, number size distribution electrostatic precipitator for ice nuclei) to measure vertical profiles. As part of the EU-FP7 **BACCHUS project** (http://www.bacchus.ethz.ch/) and in conjunction with LIDAR observations performed by the Cyprus University of Technology, the UAVs will be deployed from spring 2015 to investigate ice nuclei (IN) and condensation nuclei (CN) and other aerosol properties.

The coupling between in situ ground based measurements at Agia Marina Xyliatou Station and in situ UAV vertical profiles will constitute a unique new data set to **characterize the representativeness of the surface in situ measurements**. As a proof of concept, new light multi-wavelength absorption sensors are being tested on the CyI UAVs in 2015 and compared with similar sensors at ground level to explore the spectral absorption dependence of African and Middle Eastern dust particles. **These vertical absorption measurements will help to constrain and calibrate aerosol remote sensing instrumentation operated by the ACTRIS community**.

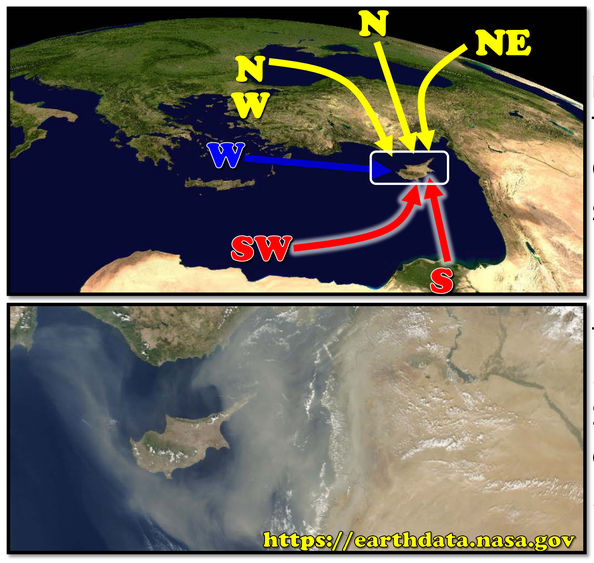

Figure 1
Top panel: Location of Cyprus and main air streams. Bottom panel: Dust from the Arabian Peninsula lingered over the eastern end of the Mediterranean Sea on September 29, 2011 captured from the MODIS instrument.

Figure 2 The regional air chemistry site at Agia Marina Cyprus within the Eastern Mediterranean observing system (see also Poster 1.7)

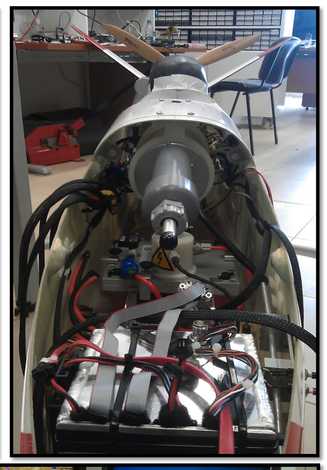

Figure 3: Unmanned Autonomous Vehicles -The Cyprus Institute. Top left: UAV scientific flight. Top right: Instrume ntation (OPC, IN sampler, avionics). Bottom left: mobile c ontrol station. Bottom right (monitoring flight parameters.

References

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