

iSPEX: First Results of Aerosols Measured by Smartphones in The Netherlands

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Keywords: aerosol characterisation, aerosol instrumentation, citizen science, smartphone, spectropolarimetry, air quality network

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Introduction

An increasing number of people carry a smartphone with internet connection, a camera and considerable computing power in their pocket. **iSPEX**, a spectropolarimetric add-on with complementary App makes use of this opportunity, and instantly turns a smartphone into a scientific instrument to measure dust and other aerosols in our atmosphere. A measurement involves scanning the blue sky (Fig.1a), which yields the angular behavior of the degree of linear polarisation as a function of wavelength, which may be interpreted in terms of size, shape and chemical composition of the aerosols in the sky. The measurements are automatically tagged with location and pointing information, and submitted to a central database where they will be interpreted. Together with observations from other users at random locations (Fig.1b), the data are compiled into a map. Through crowd sourcing, the general public will thus be able to contribute to a better assessment of the presence of different types of aerosols in the atmosphere.

iSPEX technology

iSPEX is based on SPEX technology (Snik, 2009). SPEX (Spectropolarimeter for Planetary Exploration) provides multi-angle, multi-wavelength measurements of the intensity and polarization of sunlight scattered by aerosols in planetary atmospheres. A ground-based SPEX-like instrument was recently deployed at **CESAR**, the Cabauw Experimental Site for Atmospheric Research, which also hosts a comprehensive suite of aerosol measurement equipment (Russchenberg, 2005). A single smartphone iSPEX spectropolarimeter is less accurate than its SPEX counterpart at the aerological site, but we expect that an ensemble of simultaneous measurements suppresses errors through averaging.

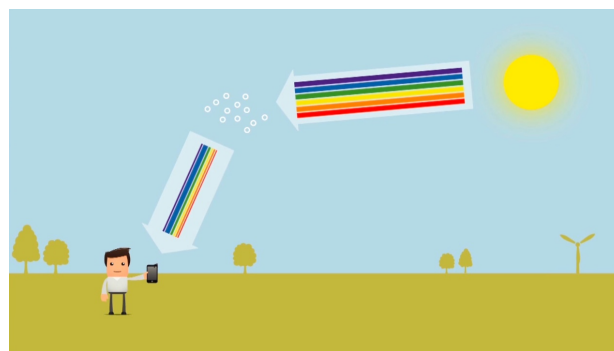
iSPEX measurement day

We¹ are organising a national iSPEX measurement day in the spring or summer of 2013 and will distribute 10,000 iSPEX units throughout the Netherlands. An iSPEX user that performs a valid measurement with the assistance of the App will be presented with a qualitative feedback of the local presence of aerosols. The full dataset is transmitted to the central database for off-line analysis.

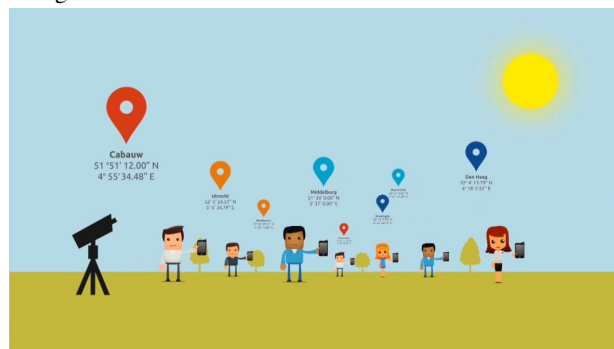
By analyzing not only the measured results, but –

just as importantly – the motivation of the general public to participate, we learn about the possibilities to create a totally new kind of air quality measurement network. Such a network of smartphone users has the potential both for global coverage and for detecting localised effects.

At the conference we will present a first look on the results of the measurement day, and demonstrate iSPEX. We hope to convince you that iSPEX is not only a great outreach tool to engage the public in issues pertaining to atmospheric aerosols, but that it may also contribute to the solution of several urgent societal and scientific problems.



(a) A schematic of an iSPEX participant measuring the scattered sunlight.



(b) On the iSPEX measurement day, many participants will submit data from various locations to the central processing facility.

Figure 1: iSPEX measurement day schematics.

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