MEASUREMENT CAPABILITIES OF THE POLAND-AOD NETWORK

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The Poland-AOD research network was created in November 2011. The main purpose of this project are measurements and analysis of the optical properties of aerosols and radiative balance of the atmosphere. The network is composed of several laboratories such as the EUSAAR Sopot Station in the Institute of Oceanology Polish Academy of Sience, the University of Warsaw Radiative Transfer Laboratory, the Geophysical Obesrvatory in Belsk and the EUSAAR SolarAOT in Strzyzow. In spite of the fact that the network was officially established in November 2011, measurements were carried out under an unwritten cooperation at all four stations. The joint management of measurements gives a number of excellent results but the connection into one nationwide network offers many new opportunities.

The network was established to carry out work and develop climatology of the atmospheric aerosol optical properties and validation of inverse methods to determine the optical thickness and single scattering albedo from satellite data of MSG-9, as well as ground-based observations. Other tasks include modeling and experimental study of aerosol direct effect or transformation of the optical properties of aerosols based on contaminant transport models (NAAPS, GEM-AQ).

At each station measurements are made with the same equipment. The basic measuring devices are Multi-Filter-Rotating Shadowband Radiometer MFR-7 and Microtops photometers. Pyranometers and MFR-7 measure the radiation streams. The radiative balance at the upper boundary of the atmosphere is determined by the SEVIRI detector on satellite MSG-9. As one of the few networks POLAND-AOD makes measurements in the Baltic Sea. It is possible thanks to S/Y Oceania which belongs to IO PAS. During the research cruises measurements of the total scattering and back scattering coefficient are performed with use of the TSI Nephelometer. On S/Y Oceania scientists also uses AE-31/MAGEE Aethalometer to research concentration of soot and laser particle counter CSASP-100 and TSI Condensation Particle Counter for concentration and size distribution of aerosol particles.

Measurements are automatically collected from all stations of the network. Than the data are saved on a server located at the University of Warsaw Radiative Transfer Laboratory. The data are recorded on three levels. Level 1.0 is the raw data, at level 1.5 data are cloud-screened and at level 2.0 the data are quality-assured. All the research results are published on http://www.igf.fuw.edu.pl/meteo/stacja/PolandAODdata.php. The page is updated every minute.

In 2010 the European airspace was closed [1] because of the explosion of the Eyjafjöll volcano in Iceland. That gave an idea to measure optical properties of volcanic ash over Poland in these days. The observations were performed between 16 and 18 April at four Poland-AOD stations and in these case the measurements were not made only with Microtops sunphotometers. Instruments such as ceilometers and aerosol LIDARs also played a very important role. All analyses were supported with satellite data from MODIS, data analyses from AERONET and models such as FLEXOART or HYSPLIT. An indirect effect of volcanic aerosols on climate is through their influence on microphysical cloud properties [2]. That was the reason of combined LIDAR measurements with measurements which was made by the ceilometer.

Due to the presence of high cloud cover over the period between 16 and 18 April 2010 the remote sensing of the atmosphere over the region of central Europe was very difficult, especially on 16 April. AOD value ranged between 0.12 and 0.4 during the considered period and it was the highest on 16 April. Analyses of the optical properties of volcanic ash are difficult because they require knowledge about the particle size distribution, refractive index and particle shape. In order to simplify this problem uses the properties of desert dust particles according to the Optical Properties of Aerosol and Cloud Data Base [3].

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