


Remote aerosol, cloud and radiation observations over Poland - holistic and integrative research initiatives.



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Motivation

- so often we claim that our research aims at improvement of understanding of aerosols and clouds effects on climate
- just to obtain any amount of funding to study narrow subjects in fields related to any available instruments or models
- but we must face the fact our funding agencies are not anymore interested in fulfilling our private narrow research dreams
- they want to see us going ways beyond our present knowledge and capacities

Poland in networking Europe

- our problem => not enough of general interest in aerosol, cloud and radiation research at national level
- effect => rare participation in any remote and/or in-situ networking activities
 - dr. Aleksander Pieruczuk (IGF PAS) - EARLINET Site in Belsk
 - dr. Bogdan Chojnicki (Agricultural University) - ICOS Site near Poznan
 - dr. hab. Tymon Zielinski (IO PAS) - AERONET Site in Sopot
- possible improvement => via holistic and integrative research approaches of many various entities

Active means attractive

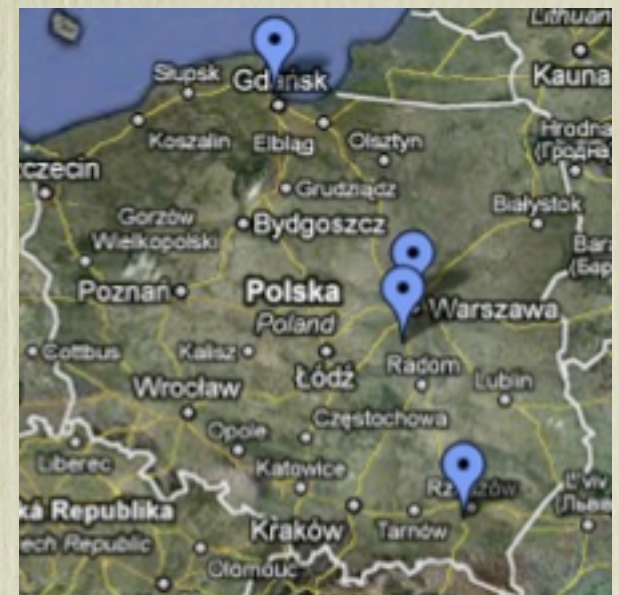
- vigorous improvement of polish research sites
 - expanding the range of instrumentation (general trend!)
 - performing regular measurements next to dedicated campaigns
- integrating research initiatives in both public and private sectors
- enabling man power by involving all levels students into vital research tasks
- effect => we can conduct holistic research approach at many integrated levels which is attracting national research funding agencies

From theory to practice

- private grant => temporal and spatial variability of radiative forcing over Poland
- written as a vision of tackling important climate issues on regional scale
- with main goal of providing quantitative deliveries for national level decision makers
- however not by forming a strict monitoring network
- submitted against all sceptic for amount of 140keuro (regarded extremely high for a private grant)

Multi-research over Poland

- starting point => integration of 3 sites which have experience of joint research and which are based along North-South line over Poland
 - northern costal semi-urban site based at IOPAS in Sopot (dr.hab. Tymon Zielinski)
 - central urban site RTLab at IGF UW in Warsaw (myself)
 - southern rural mountain site private observatory SolarAOT in Strzyzow (dr. Krzysztof Markowicz)
- forming a joint research consortium Poland AOD



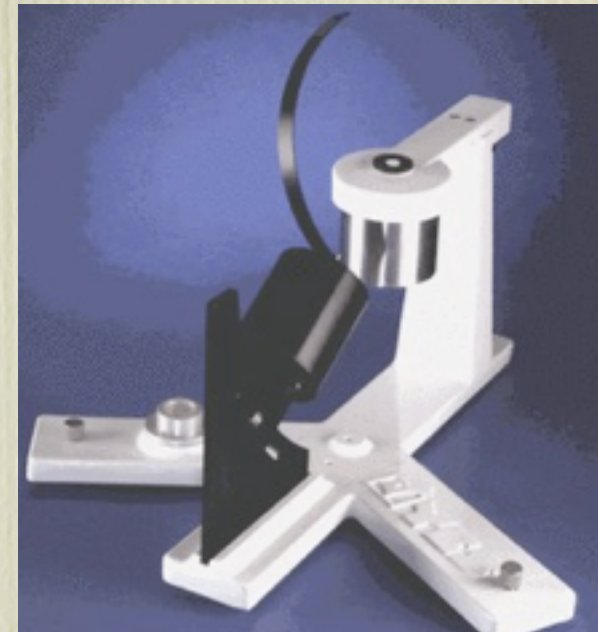
Radiative forcing over Poland

- our sites are similarly equipped but focusing research topics on slightly different areas, hence, forming interest triangle around 'aerosols-clouds-radiation'
- we integrate ground-based and satellite measurements, long term passive and active remote sensing, in-situ and meteorological observations, and model studies
- we focus on boundary layer processes, tropospheric aerosol and clouds optical properties and their radiative characteristics to estimate the direct aerosol radiative forcing in a yearly cycle for the 3 regions and interpret it with respect to pollution sources, air-mass advection and Earth's albedo

Some of our instruments



Some of our instruments

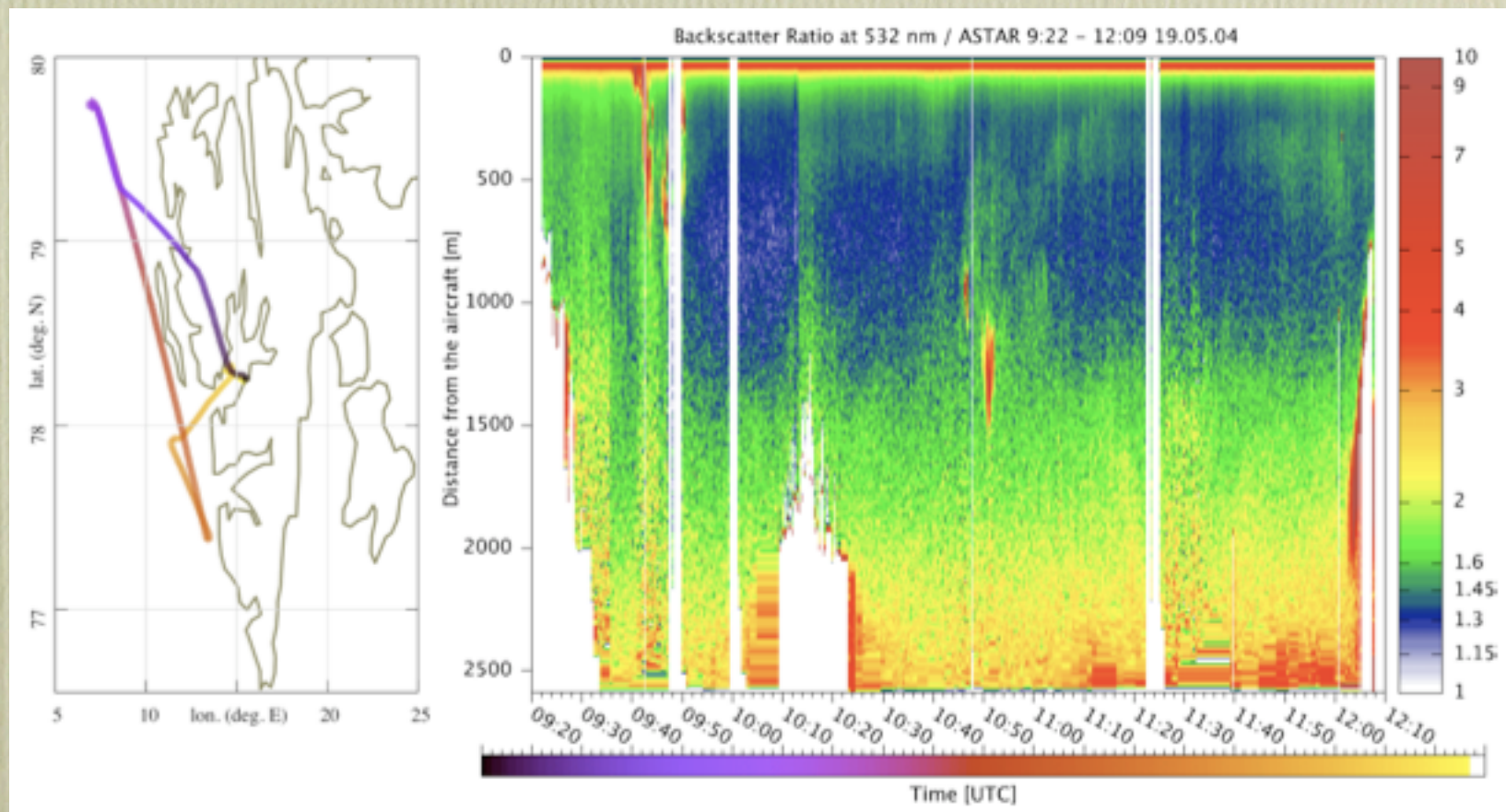


Open data base and interactive Website

- integration of available data at all stations into the common format
- 3 levels of data - raw, calibrated and quality checked, final high level product with error
- at the moment <http://www.igf.fuw.edu.pl/meteo/stacja>
- in the future => free access on registration principle to interactive website with links to multilevel data, archived quick-looks, on-line data plotting routines with retrieval error calculation

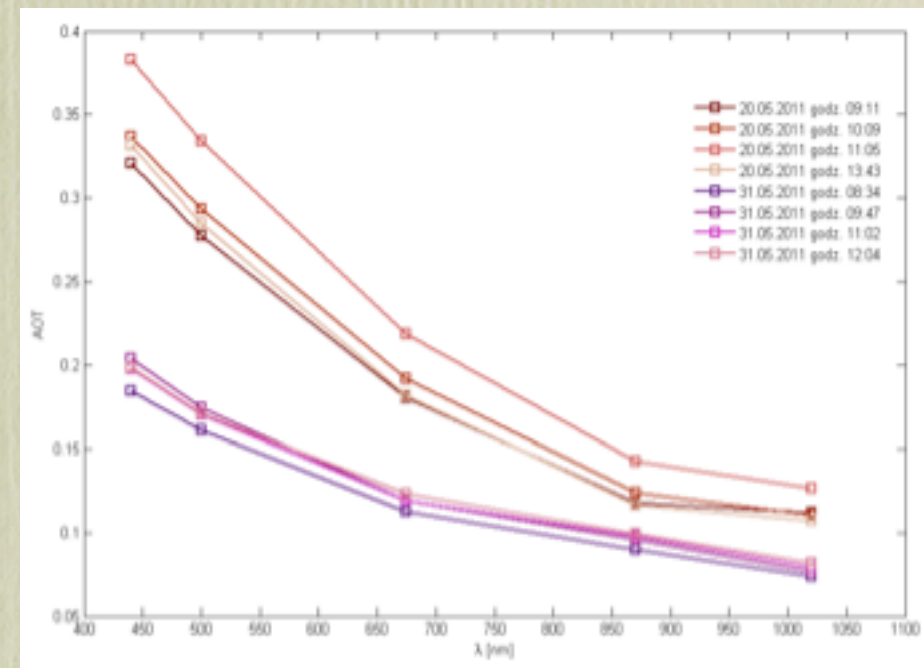
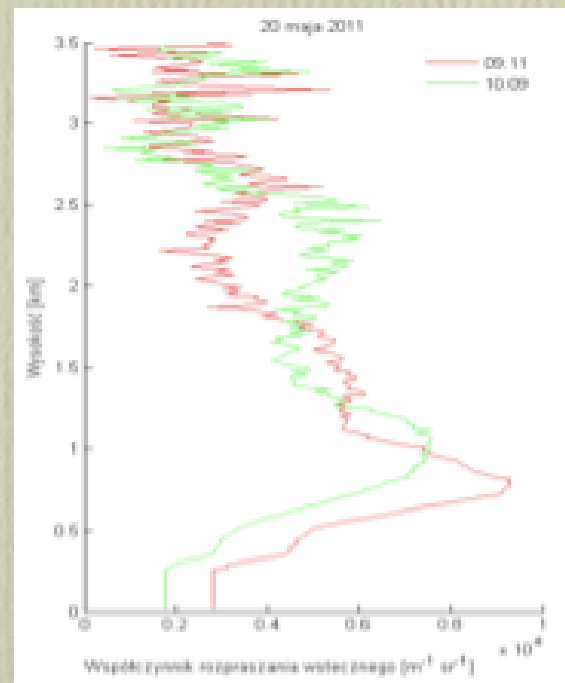
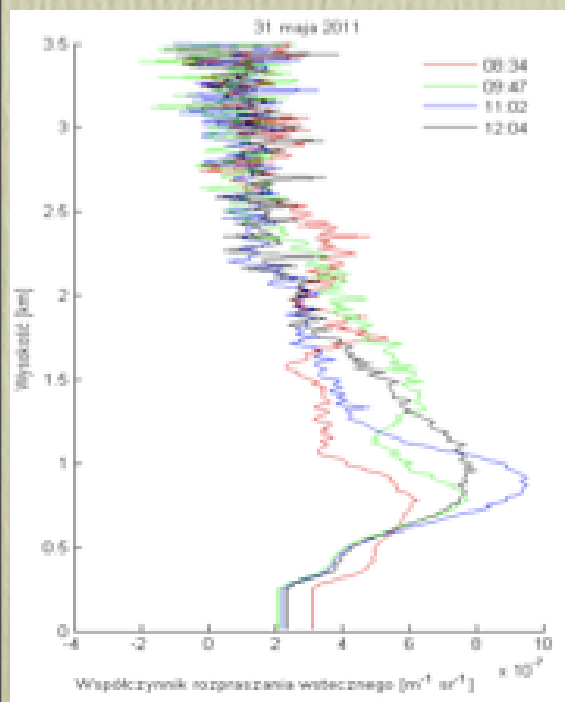
Airborne lidar challenging quantitative retrieval

- Stachlewska et al., ACP 2010



Ceilometer airborne retrieval utilization

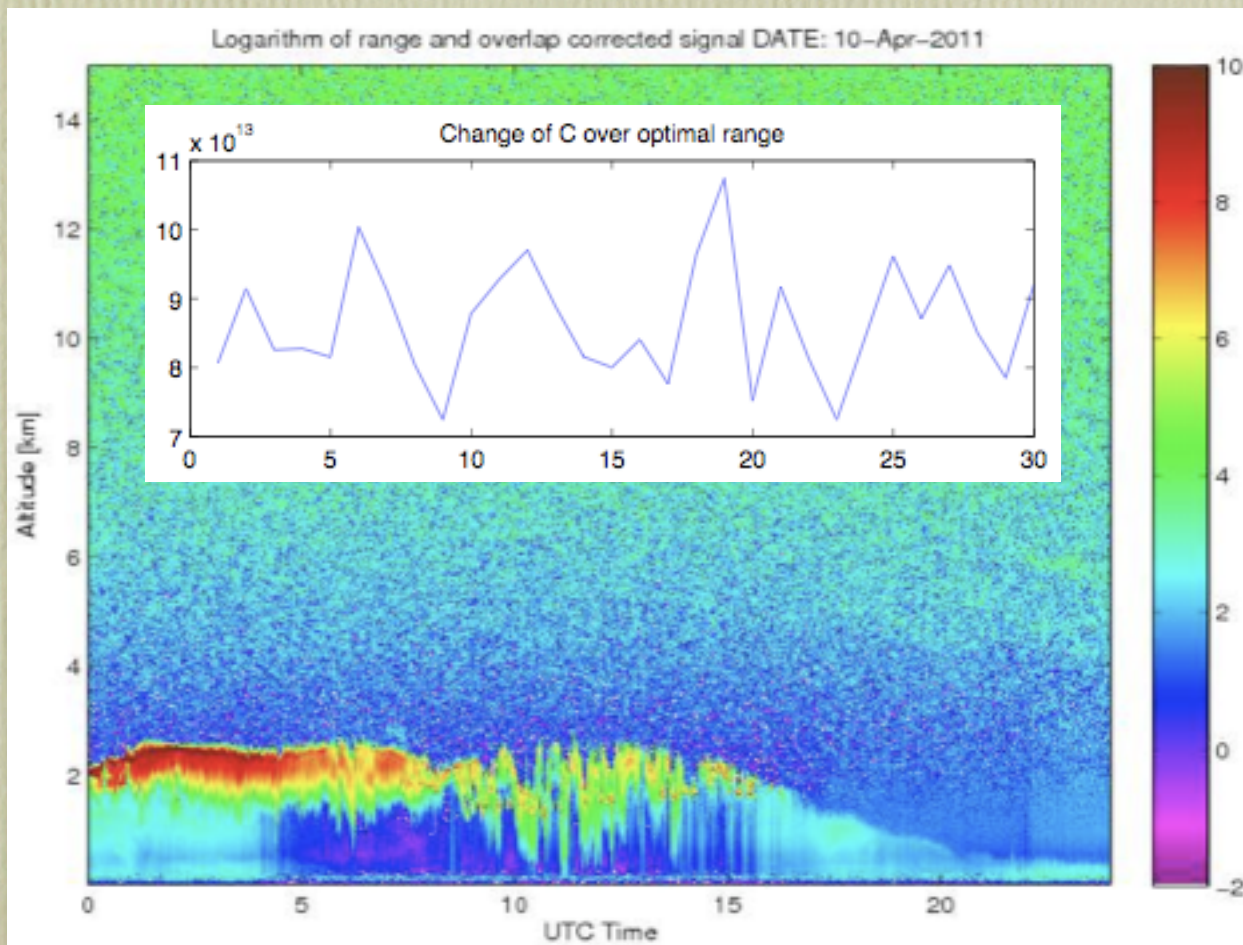
- Stachlewska and Gorska, sub. AMTD 2011



Lidar constant

direct retrieval vs theoretic value

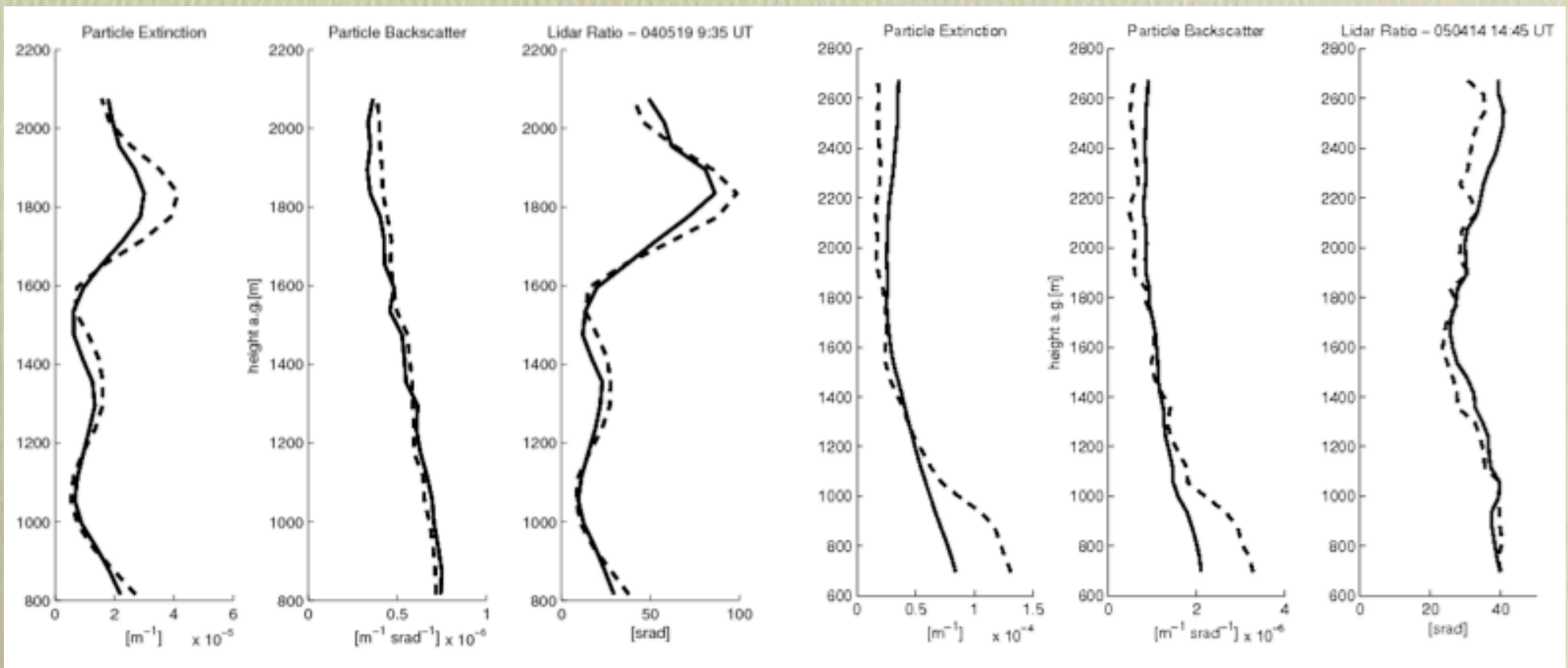
- Stachlewska and Migacz, sub. AMTD 2011



- calibration in Cumulus and horizontal approach:
 - $2.8 \text{ e}13$ Oct 2008
 - $8.7 \text{ e}13$ Oct 2011
- theoretical value for brand new system:
 - $2.5 \text{ e}13$

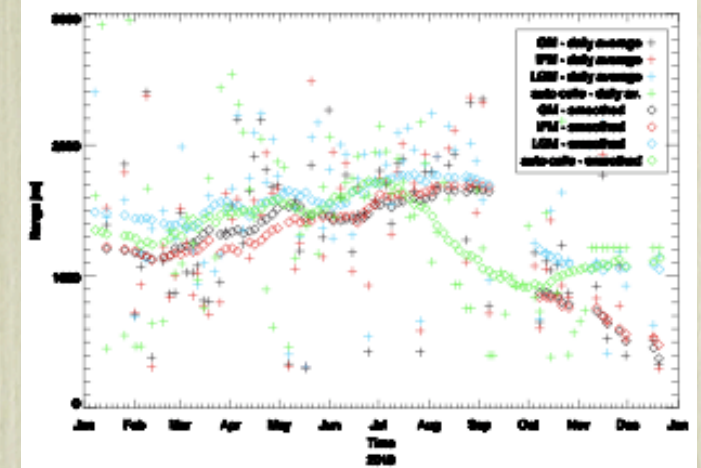
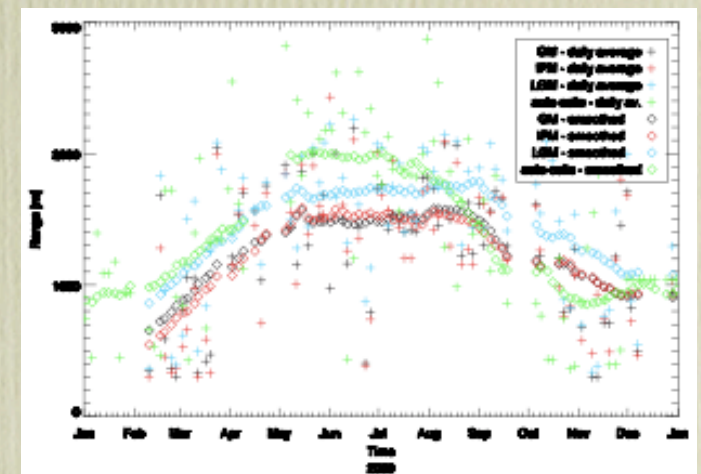
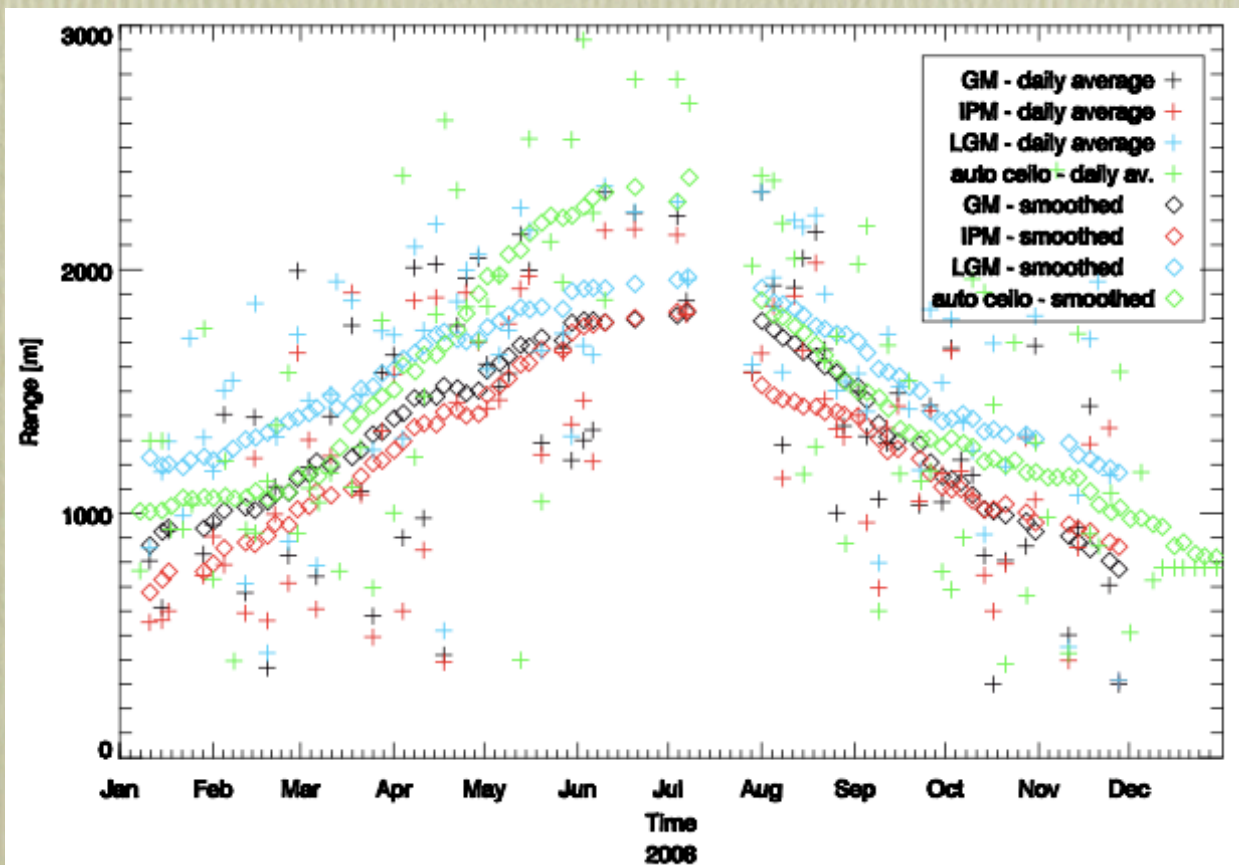
Space borne and ground lidar direct extinction retrieval

- Stachlewska and Ritter, ACP 2010
- approach to be validated with the new version of Polly XT



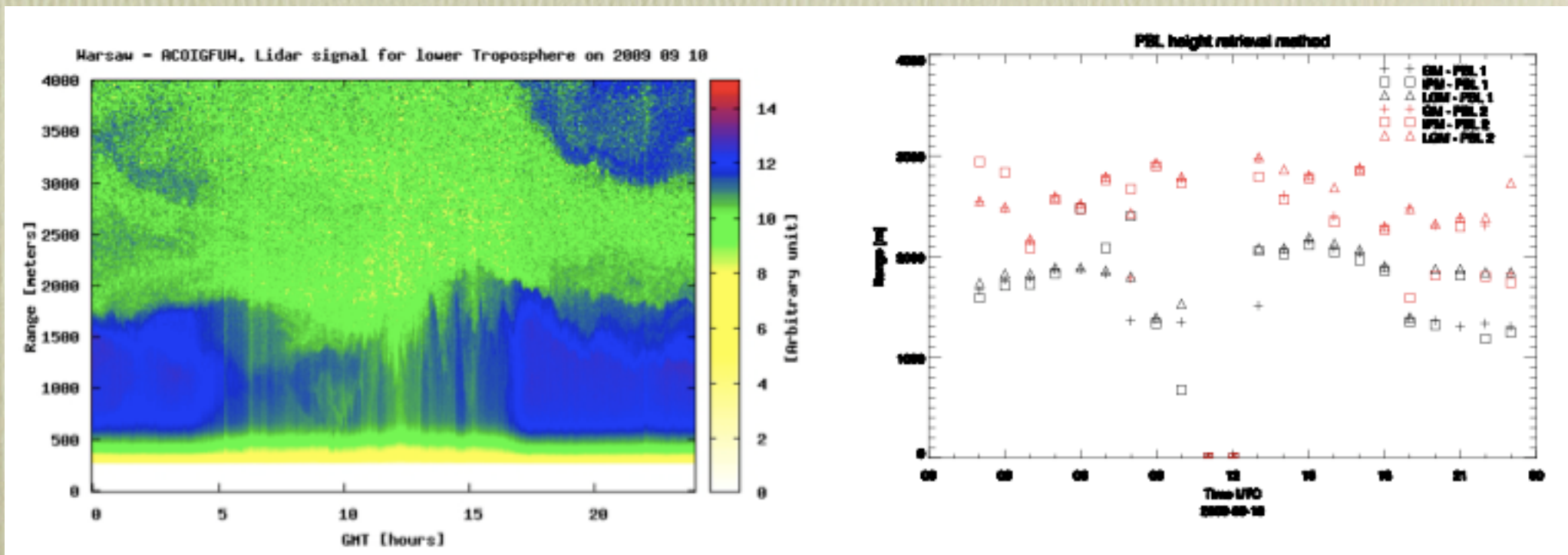
Boundary layer height in Warsaw

- Stachlewska and Piadlowski, accepted Acta Geophysica 2011



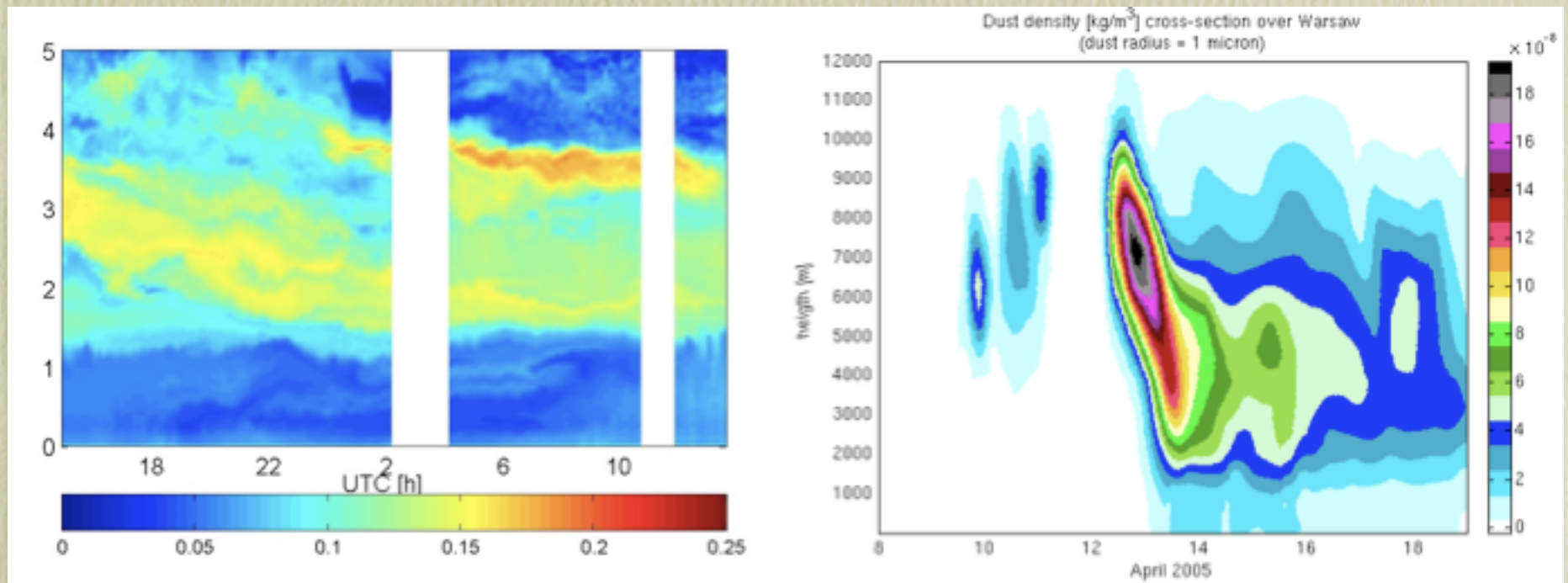
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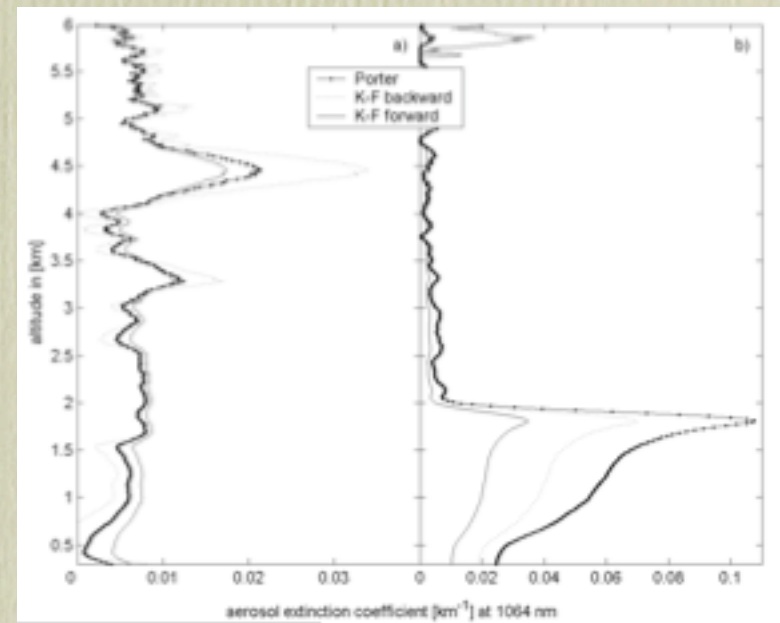
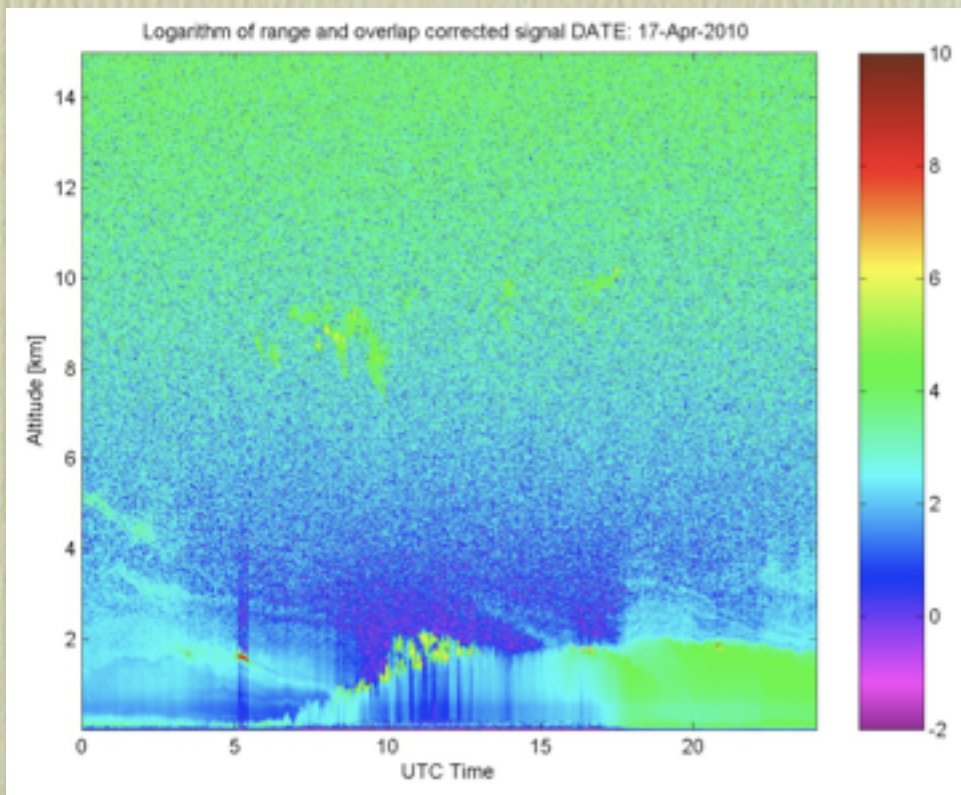
Saharan Dust over Warsaw

- Kardas et al., Optica Applicata 2010



Volcanic ash over Warsaw

- Markowicz et al., Atmospheric Environment 2011



Potential joint publication with INOE

- Forest fires from Russia and mineral dust from Sahara over Warsaw and Bukarest in August 2010

