GALION
The GAW Aerosol Lidar Observation Network

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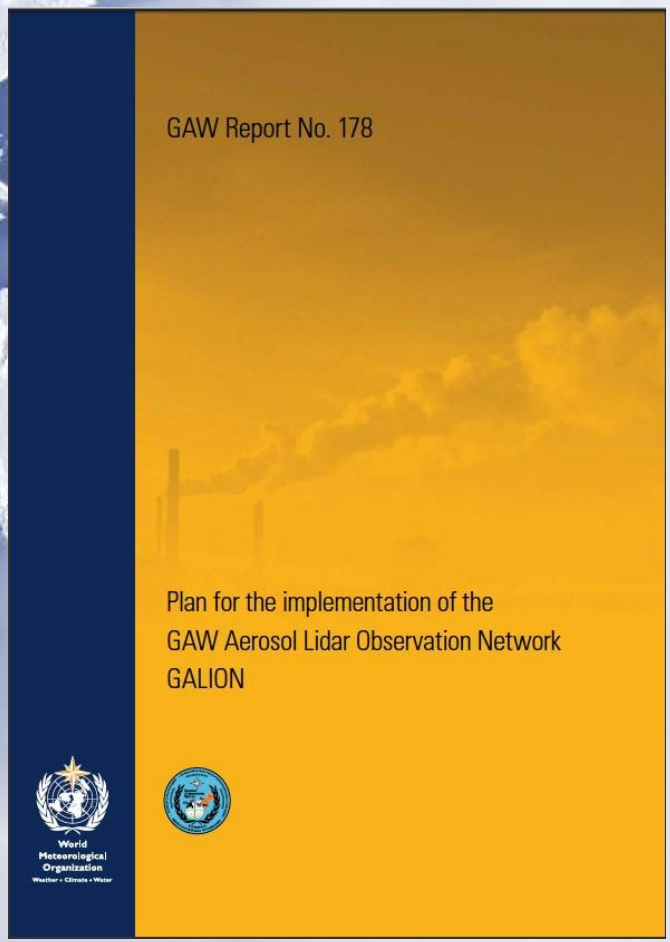
Background

- 2006 GAW Science Advisory Group called for a workshop on the need for a global lidar network
- A workshop was convened in Hamburg in March 2007 under WMO AREP auspices
- The workshop report was published by WMO GAW

GAW Aerosol Lidar Observation Network (GALION)



ftp://ftp.wmo.int/Documents/PublicWeb/arep/gaw/gaw178-galion-27-Oct.pdf

Authors of Report

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First WMO Experts Meeting on the implementation of a GAW Aerosol Lidar Observation Network: GALION

March 27-29, 2007
Max-Planck-Institut für Meteorologie Hamurg, Germany
Bundesstraße 53
D-20146 Hamburg

The following program establishes links to the material presented at the meeting.

Program
Tuesday, March 27, 2007

Welcome
9:00 Welcome and technical announcements

Introduction
9:15 **Slobodan Nickovic:** WMO/GAW and aerosol
9:45 *coffee-break*

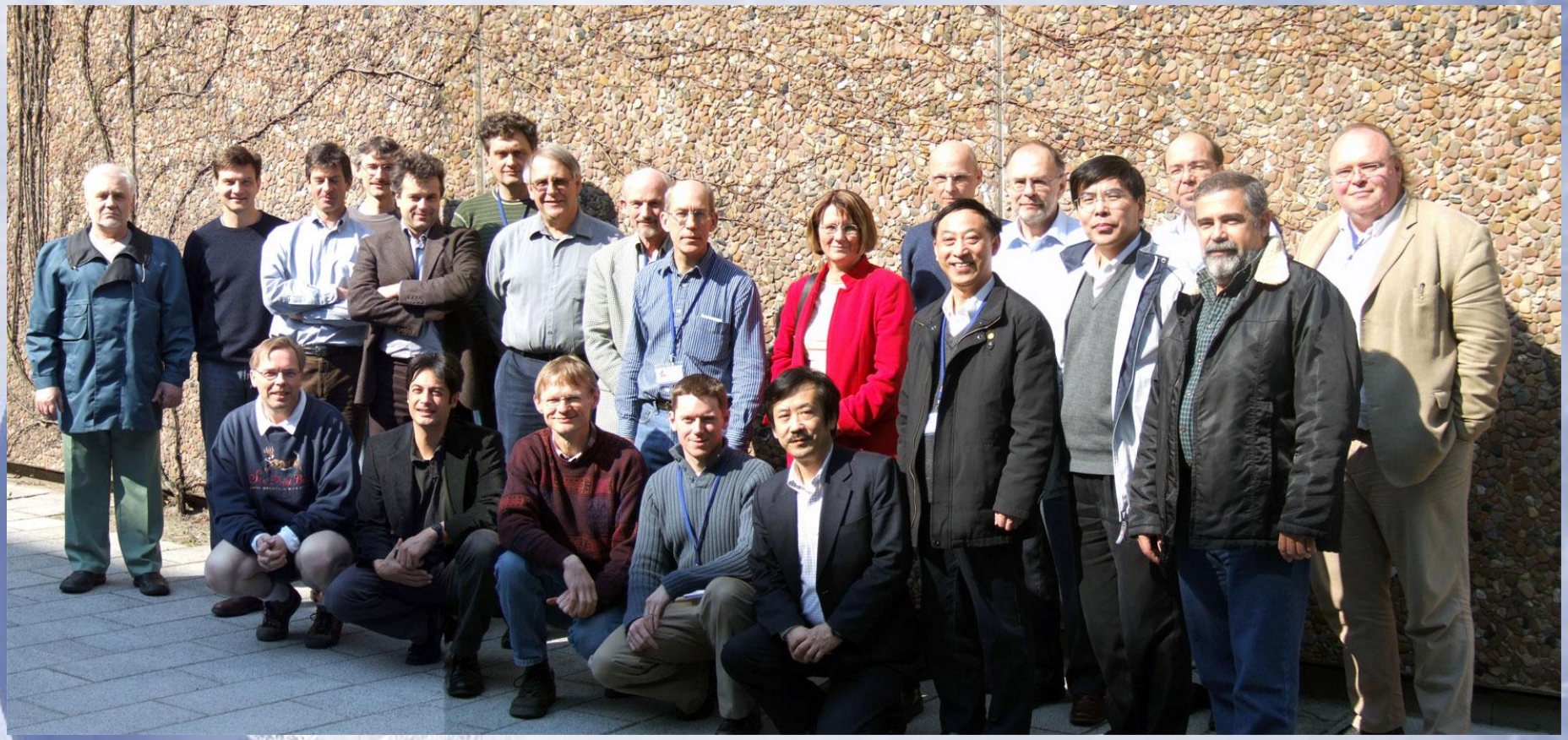
Existing lidar networks I (goals, equipment, stations, operation, data)
10:15 **Nobuo Sugimoto:** AD-Net
10:30 **Juan Carlos Antuna:** ALINE
10:45 **Anatoli Chaikovsky:** CIS-LINET
11:00 **Jens Bösenberg:** EARLINET
11:15 **Judd Welton:** MPLNET
11:30 *short break*

Existing lidar networks II (goals, equipment, stations, operation, data)
11:45 **Sophie Godin-Beekmann:** NDACC
12:00 **Raymond Hoff:** REALM
12:15 **Jun Zhou:** Aerosol Lidar Observation Network perspectives in China
12:30 **Dave Winker:** Groundtruth for CALIOP
12:50 **Cathrine Lund Myhre:** ENAN: The European Networks of Aerosol Networks
13:00 *lunch-break*

Working group presentations I (overview issues, recommendations)
14:00 **Michael Schulz:** WG5 - user needs with respect to a GALION network
14:30 **Albert Ansmann:** WG2 - methodology
15:00 **Arnoud Apituley:** WG1 - technologies
15:30 *coffee-break*

Working group presentations II (overview issues, recommendations)
16:00 **Nobuo Sugimoto:** WG4 - Coordination with satellite observations
16:15 **Teruyuki Nakajima:** WG4 - Aerosol and Cloud Environmental Studies With Combined Active and Passive Sensors
16:30 **J.Bösenberg/R.Hoff:** WG3 - Networking

http://lidar.dkrz.de/galion/



First WMO Experts Meeting on the implementation of the GAW Aerosol Lidar Observation Network: GALION

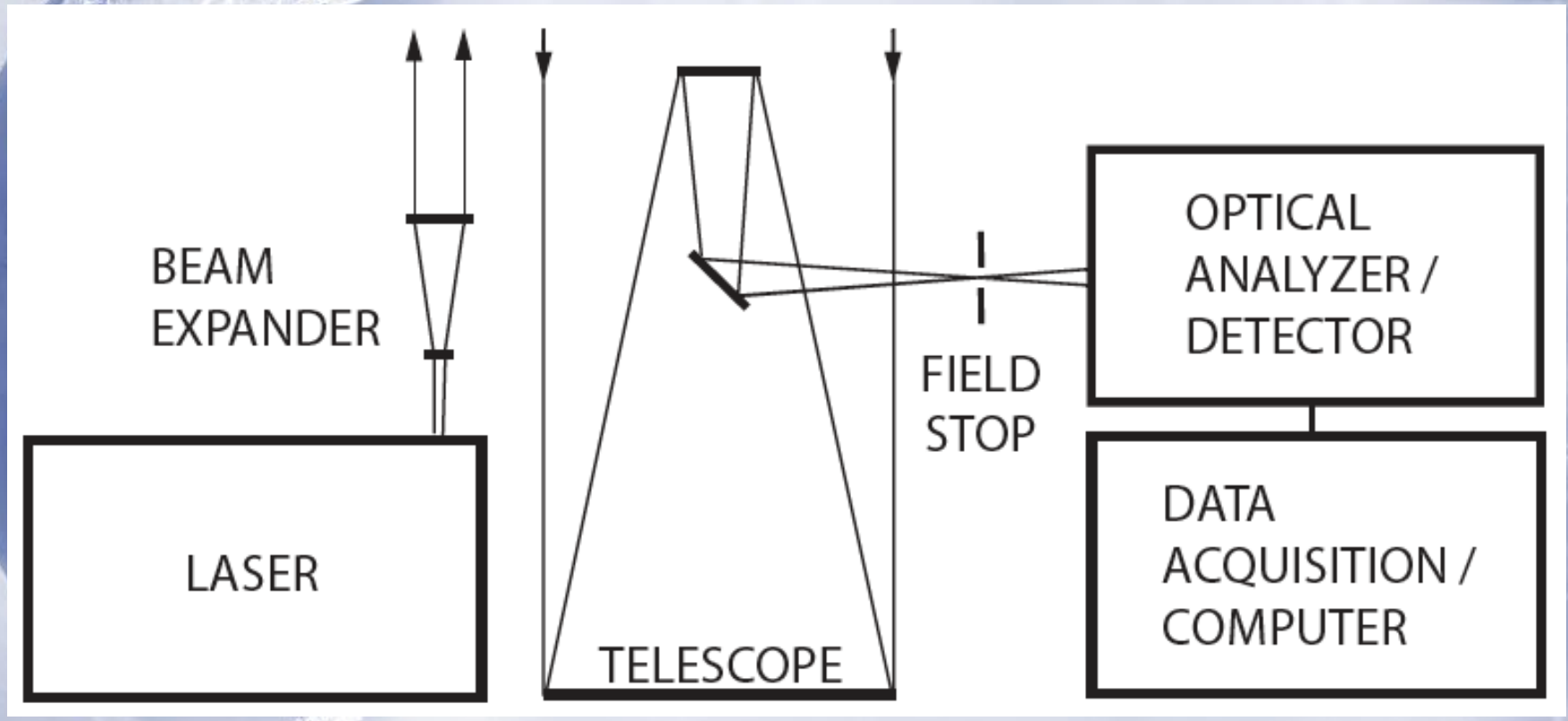
March 27-29, 2007 Hamburg, Germany (>50 participants)

Represented Networks

- SPARC/NDIAC
- EARLINET
- AD-NET
- ALINE
- REALM
- CIS-LINET
- MPL-NET
- AEROCOM
- China
- SKYNET

Conceptually GALION fits GEOSS since it is a Network of Networks and GAW is GEOSS

Partially Tutorial



Objectives for GALION Supports Task 7.84 of GAW IP

- *1.* Detection of long-term man-made trends in the concentration of greenhouse gases and aerosols
- *2.* Better environmental assessments
- *3.* Better quantification of pollution sources and their atmospheric pathways
- *4.* Reliable global concentration fields
- *5.* Better prediction of UV intensities
- *6.* Direct observation of plumes from major events
- *7.* Improved regional forecasts of both weather and air quality

Measurements possible

Observational configuration	Bsc. cf.	Ext cf.	Lidar ratio	Opt. depth	Ang. exp.	Microphys
1-λ standard backscatter lidar	$\beta(z)$					
1-λ standard backscatter lidar + Sun photometer	$\beta(z)$,	$\alpha(z)$ estimate	LR(col)	AOD(λ)	$Å_\delta$(col)	MPP(col)
m-λ standard backscatter lidar	$\beta(\lambda,z)$				$Å_\beta(z)$	
m-λ standard backscatter lidar + Sun photometer	$\beta(\lambda,z)$	$\alpha(\lambda,z)$ estimate	LR(λ,col)	AOD(λ)	$Å_\beta(z)$, $Å_\delta$(col)	MPP(col)
1-λ Raman lidar/HSRL	$\beta(z)$	$\alpha(z)$	LR(z)	AOD		
1-λ Raman lidar/HSRL + Sun photometer	$\beta(z)$,	$\alpha(z)$	LR(z)	AOD(λ)	$Å_\delta$(col)	MPP(col)
m-λ Raman lidar	$\beta(\lambda,z)$	$\alpha(\lambda,z)$	LR(λ,z)	AOD(λ)	$Å_\beta(z)$, $Å_\alpha(z)$	MPP(z)
m-λ Raman lidar + Sun photometer	$\beta(\lambda,z)$	$\alpha(\lambda,z)$	LR(λ,z)	AOD(λ)	$Å_\beta(z)$, $Å_\alpha(z)$, $Å_\delta$(col)	MPP(z), MPP(col)

Which type of lidar is necessary and sufficient to obtain the most important aerosol parameters is described in Table 3.2-2, ordered according to increasing instrument and retrieval complexity. Tables 3.2-1 and 3.2-2 form the basis for the decisions to be made for the selection of instruments for the different purposes of the network operation, from a design perspective. In practicality, level of sophistication in the existing networks and instrument availability will govern the initial network configuration.

Aerosol Properties

Table 3.1-2: Aerosol properties that can be derived from lidar observations. Only the simpliest lidar type that is needed to provide the product is listed. Depolarization channels (DEPOL) are required to identify desert dust.

Parameter (product)	**Basic lidar type**
Range corrected signal (color plots of aerosol and cloud distributions)	BL
Attenuated backscatter coefficient (calibrated range-corrected signal)	BL
PBL depth	BL
Aerosol backscatter coefficient	BL
Aerosol type discrimination (dust, anthropogenic)	BL+DL
Aerosol extinction coefficient (estimate), optical depth, column lidar ratio	BL+SPM
Aerosol extinction coefficient, optical depth, lidar ratio	RL or HSRL
Ångström exponent (backscatter-related)	MBL
Ångström exponent (extinction-related)	MRL
Aerosol type determination (dust, maritime, fire smoke, urban haze)	MRL+DL
Aerosol microphysical properties (volume and surface conc., refractive index)	MRL
Single scattering albedo (aerosol)	MRL

Implementation

- Steering Group (GAW - network heads)
- Technical Workin
  - Operational sche
  - Data qua
  - QA/QC
  - Data colle
- Capacity B
  - Develop
- Integration with AOD/Satellite Meas.

Initially, follow the EARLINET schedule (Mon-Thurs)

Strawperson suggestion:

Base on AOD needs.

Should be able to retrieve AOD of 0.05

Acknowledgements

- WMO GAW Science Advisory Group on Aerosols
- Contributors to the draft report (and host MPI-Hamburg)
- And for the 2nd Workshop Support:
  - Hal Maring, Radiation Sciences Program, NASA HQ
  - Lawrence Friedl, Applied Sciences Program, NASA HQ
  - Judd Welton, NASA GSFC
  - UMBC Goddard Earth Sciences and Technology Center
  - IMAA-CNR
  - Atmospheric Research and Environment Program (AREP) WMO