



ESA-MOST Dragon Cooperation

中国科技部-欧洲空间局“龙计划”合作

2017 DRAGON 4 SYMPOSIUM

2017年“龙计划”四期学术研讨会

26-30 June 2017 | Copenhagen, Denmark

2017年6月26-30日, 丹麦 哥本哈根

FRI. 30 JUNE 2017

DRAGON 4 ID. 32296 PROJECT

SUMMARY

LIs: Oliver REITEBUCH (DLR-IPA, GERMANY), WU Songhua (OUC, CHINA)
PIs: Oliver Reitebuch (DLR), CHEN Weibiao (CAS-SIOM), Dietrich
ALTHAUSEN (TROPOS), WU Songhua (OUC)

Lidar Observations from ADM-Aeolus and EarthCARE-Validation, Study of Long-range Transport of Aerosol and Preparation of a Future Chinese CO₂ Lidar Mission

Topic Nr.	PIs	Title
32296_1	O. Reitebuch, DLR W. Chen, CAS-SIOM	Preparation of Cal/Val of spaceborne Aerosol and Carbon dioxide Detection Lidar (ACDL) by ground-based and airborne sounding instruments observations
32296_2	O. Reitebuch, DLR S. Wu, OUC	Validation of ADM-Aeolus by airborne and ground-based wind lidar observations
32296_3	D. Althausen, TROPOS S. Wu, OUC	Long-range dust transport and validation using ground-based and satellite lidar observations

Participants from 8 institutes from EU & China:

DLR-IPA: O. Reitebuch, G. Ehret, A. Fix, B. Witschas, U. Marksteiner, C. Lemmerz, S. Groß, O. Lux

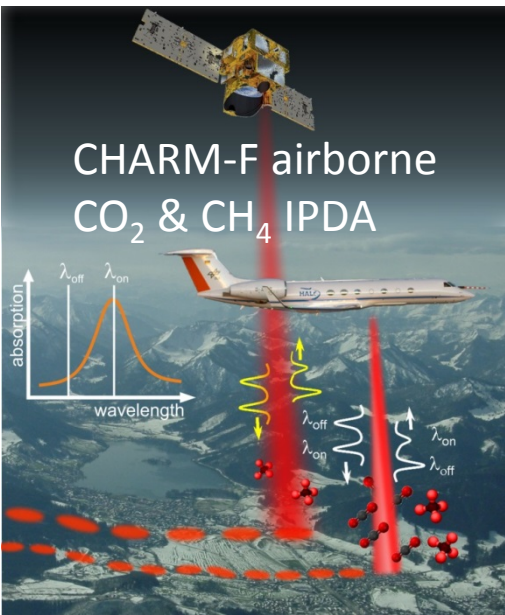
OUC-ORSI: S. WU, X. Song, B. Liu, G. Dai, X. Zhai,

TROPOS: D. Althausen, U. Wandinger,

CAS-SIOM: W. Chen, J. Liu; **CAS-AIOFM:** D. Liu; **USTC:** D. Sun, W.Xu; **LZU:** J. Huang, Z. Huang

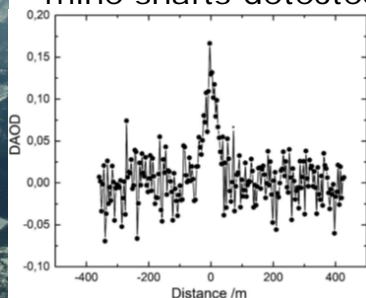
CMA: J. ShangAn

PIs	Title
O. Reitebuch, DLR W. Chen, CAS-SIOM	Preparation of Cal/Val of spaceborne Aerosol and Carbon dioxide Detection Lidar (ACDL) by ground-based and airborne sounding instruments observations



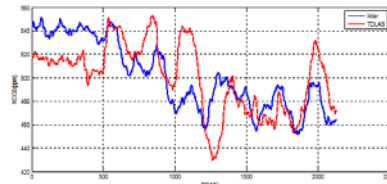
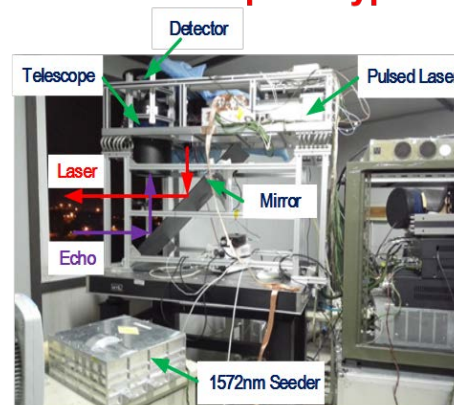
First airborne measurements of CO₂ & CH₄ @ DLR

CH₄ - emission from ventilation of coal mine shafts detected

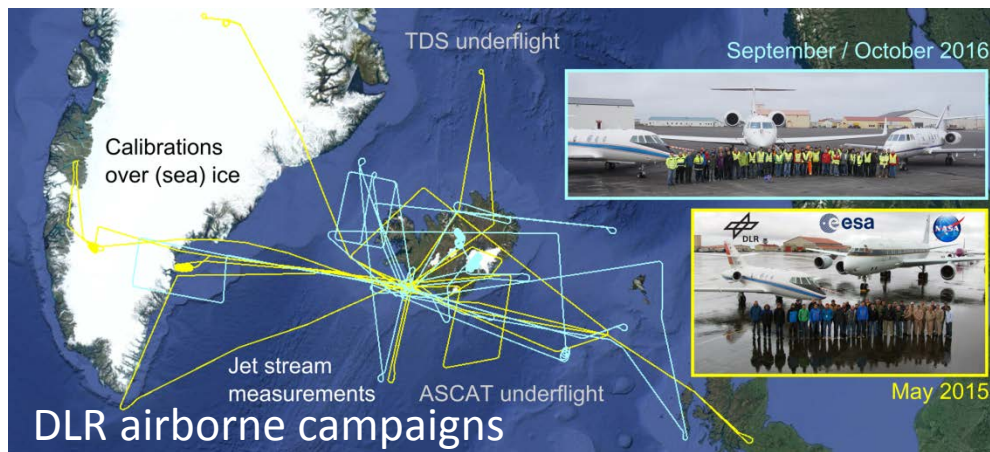


First ground measurements of CO₂ with engineering models of ACDL laser @ SIOM

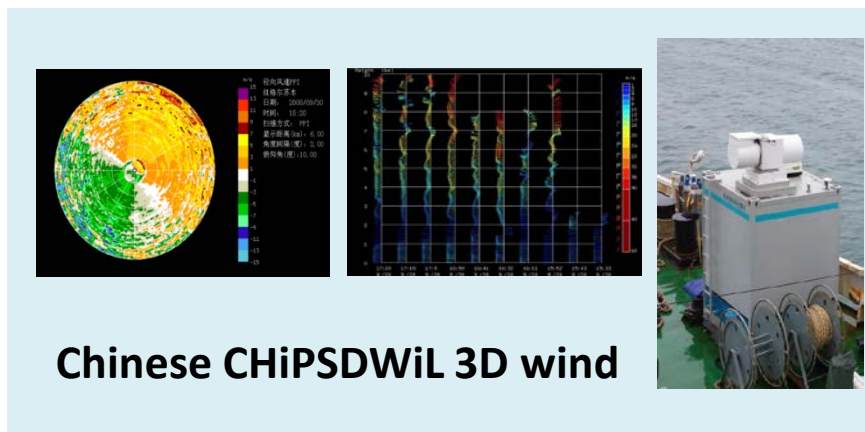
IPDA lidar prototype



PIs	Title
O. Reitebuch, DLR S. Wu, OUC	Validation of ADM-Aeolus by airborne and ground-based wind lidar observations

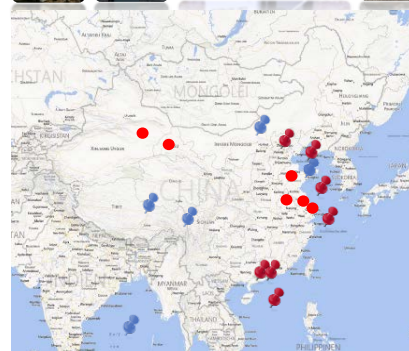
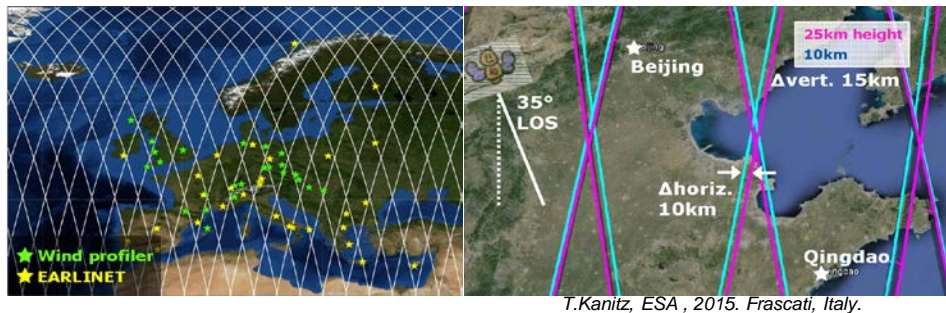


2015: 4 wind lidar instruments operating parallel from 2 aircraft (DLR Falcon, NASA DC-8) for the first time worldwide
 2016: Coordinated flights involving up to 3 aircraft (DLR Falcon, HALO, SAFIRE Falcon) with various instruments (lidar, radar, etc.)



Development and successful test of new mobile ground based wind lidar systems.
 Deployment to ground campaigns in China

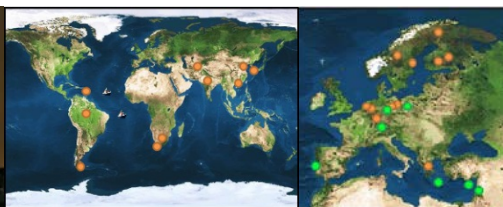
PIs	Title
D. Althausen, TROPOS S. Wu, OUC	Long-range dust transport and validation using ground-based and satellite lidar observations



Lanzhou Univ. SACOL station



TROPOS Lidars



Past and present locations of the TROPOS Portable Raman lidar systems (Polly)



OUC lidar facilities

Ground-based co-located measurements with lidars during overpasses of Aeolus and EarthCARE are foreseen in China (Costal cities, China Seas, inland cities, Tibetan Plateau, Taklimakan desert) and in Central Europe.

Young scientists contributions

European YS

- Dr. LUX Oliver
post-doc (2016.3-2019.2)
working on the ALADIN Airborne
Demonstrator (A2D) for the
validation of Aeolus at DLR-IPA
Germany.

Chinese YS

- Mr. DAI Guangyao
joint Ph.D student (2016.11-
2018.4) working on aerosol and
cloud laser remote sensing with
TROPOS/Germany and OUC/China
- Ms. ZHAI Xiaochun
joint Ph.D student (2018.1-2019.2)
working on the ADM-Aeolus wind
product Cal/Val with DLR-
IPA/Germany and OUC/China

Young scientists contributions

German YS

- Dr. LUX Oliver
post-doc (2016.3-2019.2) working on the ALADIN Airborne Demonstrator (A2D) for the validation of Aeolus at DLR-IPA Germany.
- Research experience:
 - ✓ Solid-state laser systems for lidar applications
 - ✓ Laser frequency stabilization
 - ✓ Ground and airborne operation of a direct-detection wind lidar system
 - ✓ Wind retrieval algorithms
 - ✓ Active remote sensing of CO₂ and CH₄



Young scientists contributions

Chinese YS

- Mr. DAI Guangyao
joint-Ph.D student (2016.11-2018.4) working on aerosol and cloud laser remote sensing with TROPOS/Germany and OUC/China.
- Research experience:
 - ✓ Construction of lidar system, calibration and validation
 - ✓ Water vapor calibration
 - ✓ Depolarization ratio calibration
 - ✓ Quality control (QC) and Quality assurance (QA)
 - ✓ Lidar products retrieval



Photo with Polly^{XT}

Young scientists contributions

Chinese YS

- Ms. ZHAI Xiaochun
joint-Ph.D student (2018.1-2019.2) working on the ADM-Aeolus wind product Cal/Val with DLR-IPA/Germany and OUC/China.
- Research experience:
 - ✓ Lidar cloud and aerosol retrieval
 - ✓ Coherent Doppler Lidar detection technique in atmospheric turbulence
 - ✓ Wind field, wind turbine wake and wake vortex analysis by Doppler Lidar
 - ✓ Marine atmospheric boundary layer structure



Academic exchanges & joint publications

Academic exchanges & cooperation

Provide update & outcomes on

- **Meetings**

SIOM, DLR-IPA and OUC group meeting for the Cal/Val and symposium preparation for the Chinese Aerosol, Cloud and Differential CO₂ Lidar Mission.

Meeting after ESA Training Course in October 2016 in Shanghai

Meeting during ESA ADM-Aeolus cal/val rehearsal workshop in Toulouse in 2017

- **Visiting scientists**

Christian Lemmerz visited SIOM and USTC-Hefei in 2016;

Dietrich Althausen visited OUC in 2015;

OUC lidar group visited DLR in 2016;

OUC lidar group visited TROPOS in 2015;

Summary on progress and collaboration

OUC and TROPOS submitted a joint proposal to NSFC and DFG in 2017 for

Lidar Measurements of Atmospheric Mineral Dust and Absorbing Aerosol Profiles for the Determination of Radiative Aerosol Impacts at Eurasian Coastal Zones (IMPACT)

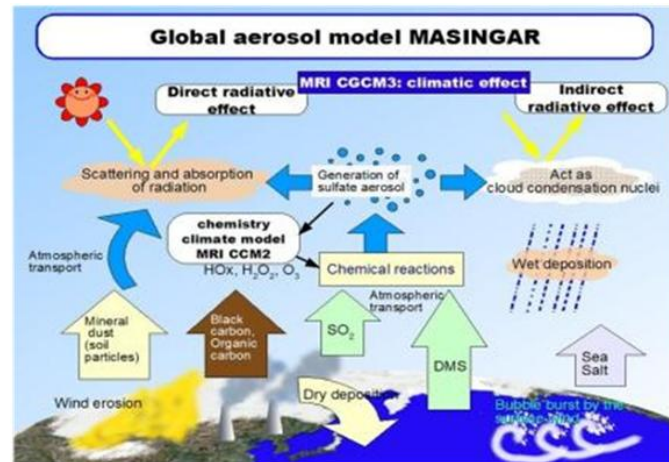
(in peer review...)

2017年中国海洋大学与德国莱布尼兹对流层研究所联合向国家自然科学基金委与德国科学联合会申请课题：

欧亚海岸带海气边界层气溶胶光学特性激光雷达探测技术研究

(评审中...)

Silke Groß, DLR, became member in EarthCare MAG



Plans for the next 2 years

TROPOS, DLR, OUC: Preparation and conduction of airborne (in Europe and Iceland) and ground campaigns (in Europe and China) for the Cal/Val phase of Aeolus (launch Jan. 2018).

SIOM: Airborne demonstrator for ACDL based on engineering model satellite hardware - measurements of CO₂-column in 2018, China.

DLR: CHARM-F airborne campaign CoMet in 2018 for CO₂ and CH₄ column measurements in preparation of ACDL and Merlin mission, Europe.

Thank you!

Danke!

Xièxie!

谢谢!

Knowledge for Tomorrow

