



ESA-MOST Dragon Cooperation

中国科技部-欧洲空间局“龙计划”合作

2017 DRAGON 4 SYMPOSIUM

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DRAGON 4 ID. 32271 PROJECT

SUMMARY AIR QUALITY OVER CHINA

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Sub-projects and themes:

Id. 32271_1 Air Quality Observations and Emission Estimates

Themes: Air quality, climate

Id. 32271_2 AEROSOL: Satellite-derived aerosol properties over
mainland China: application to air quality and trend analysis

Themes: Air quality, climate, cultural heritage

Id. 32271_3 Assessment of the characteristics, sources and impact of
haze in China

Themes: Air quality, climate

Summary EO data exploitation – cumulative stats all subprojects

ESA & ESA TPM DATA	Nos. scenes or inform if by FTP	SENTINELS 1, 2 & 3 DATA	Nos. scenes	CHINESE EO DATA	Nos. scenes
ERS SAR		Sentinel 1-A/B SAR		HJ-A/B	
ASAR		Sentinel 2-A/B MSI		GF-1	
MERIS		Sentinel 3-A OLCI		GF-2	
AATSR	Complete data record	Sentinel 3-A SLSTR	Complete data record	HY-A	
SMOS		Sentinel 3-A SLAR		FY-3	Complete O3 L2 data set
Third party missions	Complete data record	Etc.		Etc.	AOD
TOTAL		TOTAL		TOTAL	

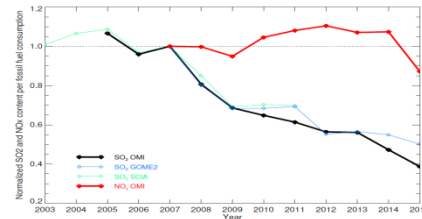
Results summary id. 32271_1

Ground observations of VOC emissions for satellite validation:

- Monoterpenes were the dominant BVOCs in the subtropical *Pinus* plantation.
- Space-based inventory provides a satisfactory agreement with isoprene emissions in summer.
- Isoprene, monoterpene and BVOCs emissions decreased during last 4 years.

Trend study of NO_x and SO₂ over China:

- Satellite observations show that without air quality regulations in China:
 - NO_x emissions would be at least 25% higher
 - SO₂ concentrations would be 2.5 times higher



Intercomparison of emission inventories:

- Space-based NO_x emissions have at least same quality as bottom-up, but is faster available.

Results summary id. 32271_2

- 3-D AOD climatology over China for 2 decades: ATSR-2/AATSR/MODIS (1995-2015) showing AOD variations, CALIOP (2007-2015) vertical profiles and dust
- Long time series & seasonal trends by region: relations with economy, emission policy and meteorology under investigation;
- AVHRR AOD long time series since ca. 1980 over China and Europe
- AATSR fusion product AOD over China: improved coverage
- HIMAWARI geostationary AOD retrieval over China
- Effects of trace gases and aerosols on cultural heritage and other materials

Young scientists contributions

European YS

Jieying Ding (PhD student) studied space-based NO_x emissions:

- Intercomparison with other inventories over China (poster contribution)
- Ship emissions over Chinese seas

Chinese YS

She Lu (PhD student) studied AOD from geostationary satellite Himawari

Che Yahui (PhD student) studied fusion of AOD satellite data sets

Chen Guili & Li Yng (PhD students) studying PM_{2.5} from satellites

Academic exchanges & joint publications

Academic exchanges & cooperation

- MarcoPolo User Workshops organised at Beijing, early 2017
- Working periods in China at:
 - RADI by Gerrit de Leeuw
 - NUIST by Ronald van der A

Joint publications

In preparation or submitted:

- Ding et al., ACPD, 2017, Intercomparison of NO_x emission inventories over East Asia.
- De Leeuw et al., ACPD, 2017, Two decades of satellite observations of AOD over mainland China
- Bai et al., Atm. Env., 2017, Variations and mechanism of atmospheric constituents in North China
- Che et al., Atm. Research, 2017.
- and many other publications

Summary on progress and collaboration

- Connecting ground-based and satellite data for aerosol and air pollutant studies
- Cooperation on validation of satellite-derived VOC emissions.
- Air pollution trend and mechanism studies
- Mobility project between FMI and RADI: 4 mutual visits to exchange information and cooperate on AVHRR/ATSR retrieved AOD time series
- YS project still has to start.

Plans for the next 2 years

- Analyses of covariations of trace gases and aerosols
- Spatial and temporal variability of air pollutants
- Study ratio of natural and anthropogenic contributions to concentration changes
- PM2.5 data will be used for estimation of deterioration rates (corrosion or soiling) of specific materials.
- Assessment of the characteristics, sources and impact of haze in China
- Visiting scientists
- Validation campaign of S5p, TanSat and GF5 ??