AeroSAT posters

- AOKI
- AROLA
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- FAN
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- HSU
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- JiE
- KOLLACHI
- LIPPONEN
- LIU
- MAHMOOD
- MATTOO

- MEI
- NOROOZI
- THOMAS
- VANDEN-BUSSCHE
- VANDEN-BUSSCHE
- XIE

AOKI

Temporal and spatial variability of Aerosol optical properties retrieval from sky radiometer observation in Japan sites

Kazuma Aoki

University of Toyama, Japan

3. Example of Ground-based observation at several Japan sites.

We started the long-term monitoring of aerosol optical properties by using a sky radiometer since 1990's. The sky radiometer is an automatic instrument that takes observations only in daytime under the clear sky condition without cloud. Observation of direct and diffuse solar intensity of interval was made every ten or five minutes by once (direct measurement every one minute). Ship-borne type, GPS provides the position with longitude and latitude and heading direction of the vessel, and azimuth and elevaton angle of sun. Horizon sensor provides rolling and pitching angles. We used seven wavelengths (0.315, 0.4, 0.5, 0.675, 0.87, 0.94, 1.02 μm). The two wavelengths (0.315 and 0.94 μm) can be used to estimate total ozone amount and precipitable water. There were used to analysis direct solar irradiance and diffuse solar radiance at fifth wavelength (0.4, 0.5, 0.675, 0.87, 1.02 μm) by aerosol channel. The aerosol optical characteristics were computed using the SKYRAD.pack version 4.2 developed by Nakajima et al. (1996).

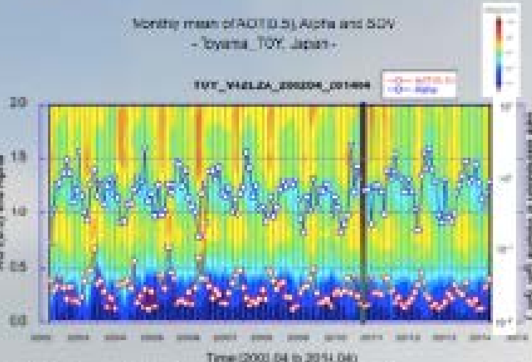


Fig.3 Aerosol optical thickness at 0.5 μm, Ångström exponent and volume size distribution averaged monthly for the period from April 2002 to April 2014 in Toyama

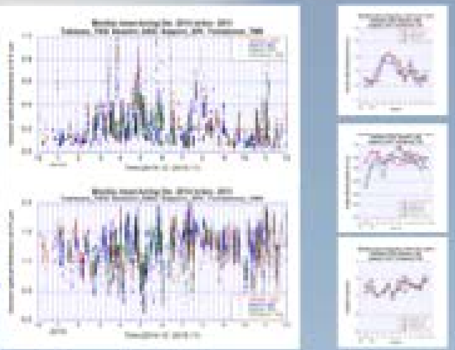


Fig.4 Aerosol optical thickness at 0.5 μm, Ångström exponent, and Single scattering albedo during December 2014 to November 2015 in Takikawa, Abashiri, Sapporo and Tomakomai/Hokkaido area.

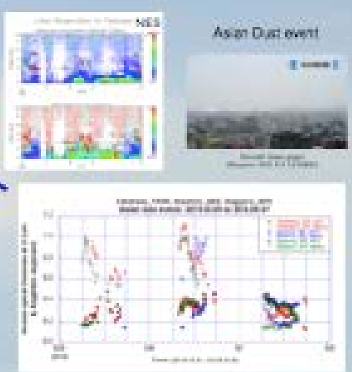


Fig.5 Aerosol optical thickness at 0.5 μm and Ångström exponent at 5 to 7 May 2016 in Takikawa, Abashiri, and Sapporo/Hokkaido at Asian dust event case.

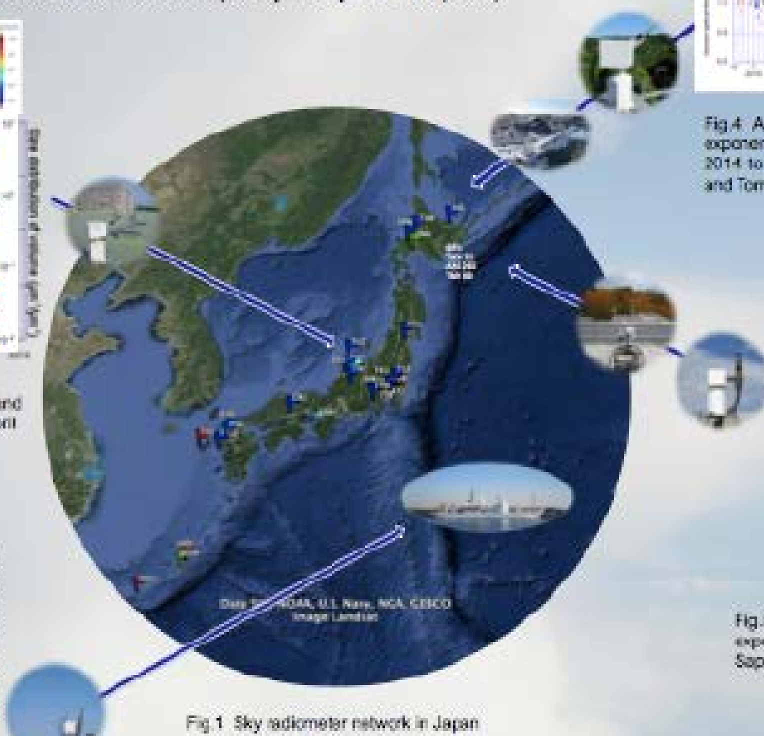
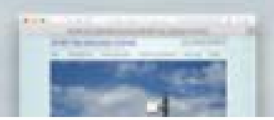


Fig.1 Sky radiometer network in Japan
(http://skyrad.sci.u-toyama.ac.jp)

4. Maritime Aerosol

Maritime Aerosol optical properties measurements were made in MR10-02 to MR14-06 cruise onboard the R/V Mirai, JAMSTEC. This cruise area included a Japan to Tropical ocean. Figure 6 shows the relationship of aerosol optical thickness at 0.5 μm (Ångström exponent) to Latitude (N) between 120E to 180E. Near the coast area, AOT and Alpha is high value and variability. Especially, near the Japan coast.



5. Summary

AROLA

Huttunen, J., Kokkola, H., Mielonen, T., Mononen, M. E. J., Lipponen, A., Reunanen, J., Lindfors, A. V., Mikkonen, S., Lehtinen, K. E. J., Kouremeti, N., Bais, A., Niska, H., and Arola, A.:
Retrieval of aerosol optical depth from surface solar radiation measurements using machine learning algorithms, non-linear regression and a radiative transfer-based look-up table,
Atmos. Chem. Phys., 16, 8181-8191, doi:10.5194/acp-16-8181-2016, 2016.

SSR = Function of SZA, AOD, SSA, WVC

SSR = Surface Solar Radiation
SZA = Solar Zenith Angle
AOD = Aerosol Optical Depth
SSA = Single Scattering Albedo
WVC = Water Vapor Content

Measured or known / input,
Retrieved / output

Following methods:

1) a look-up table method based on radiative transfer modelling
2) a non-linear regression method
3) Gaussian Process (GP)
4) Neural Network (NN)
5) Random Forest (RF)
6) Support Vector Machine (SVM)

Compared with AOD from AERONET site in Thessaloniki, Greece.

Look-up-Table

Gaussian Process

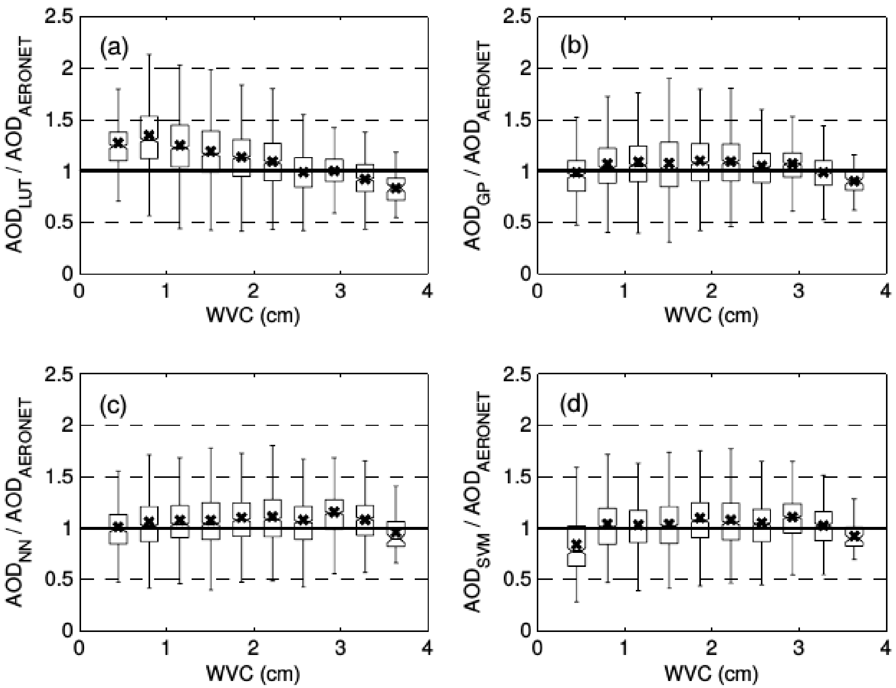


Figure 4. The same as Fig. 3, but the ratio of predicted to measured AOD is given as a function of the water vapour content (WVC).

Neural Network

Support Vector Machine

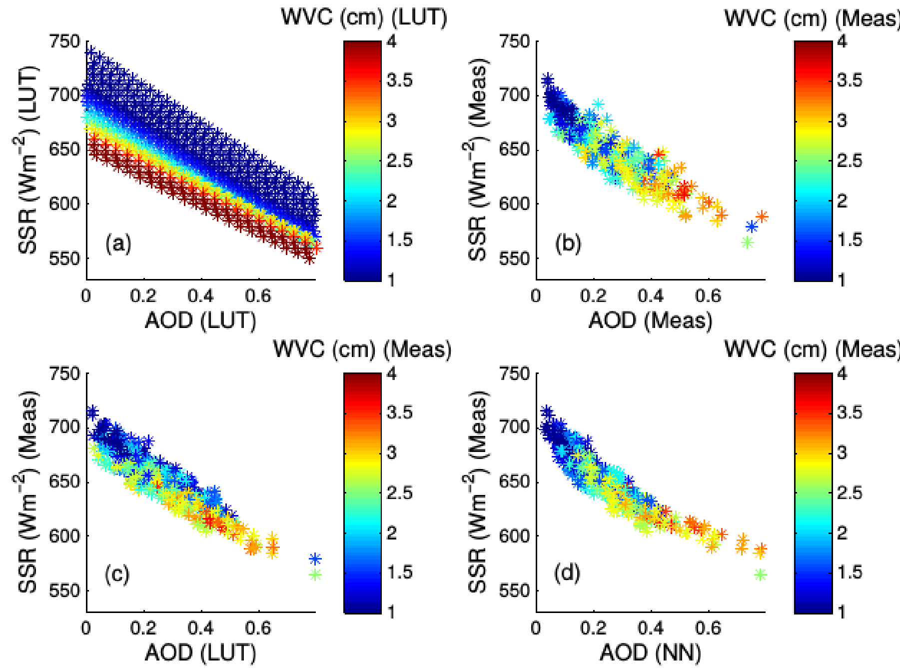


Figure 5. Solar surface radiation (SSR), aerosol optical depth (AOD) and water vapour content (WVC) for a fixed solar zenith angle (48.50–51.50°) for **(a)** look-up table (LUT) and **(b)** measurements (Meas). The predicted AODs for **(c)** LUT and **(d)** neural network (NN) are the same for SSR, WVC and SZA.

BAI

Ground-level $PM_{2.5}$ concentrations derived from 3km resolution MODIS AOD over the Yangtze River Delta in China

- A mixed effects model (*Lee et al*. 2011)was employed to predict $PM_{2.5}$ concentrations without using meteorological data.

- An obvious increase in R^2 for the model was found compared to the linear regression(Fig.1.).

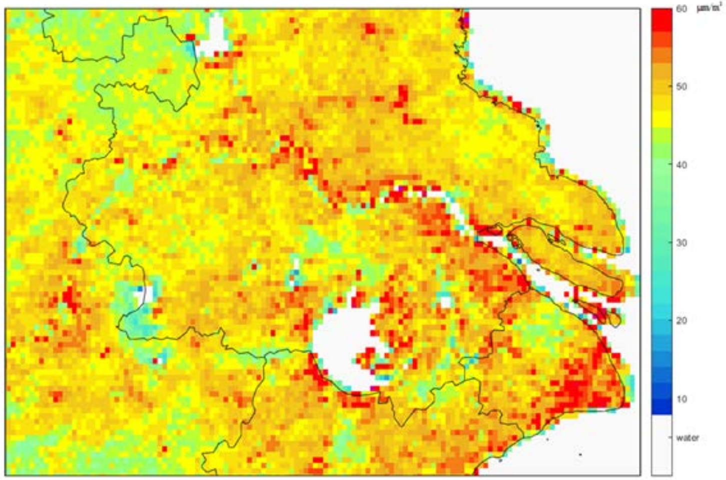


Fig.2. Mean $PM_{2.5}$ concentrations over the Yangtze River Delta.

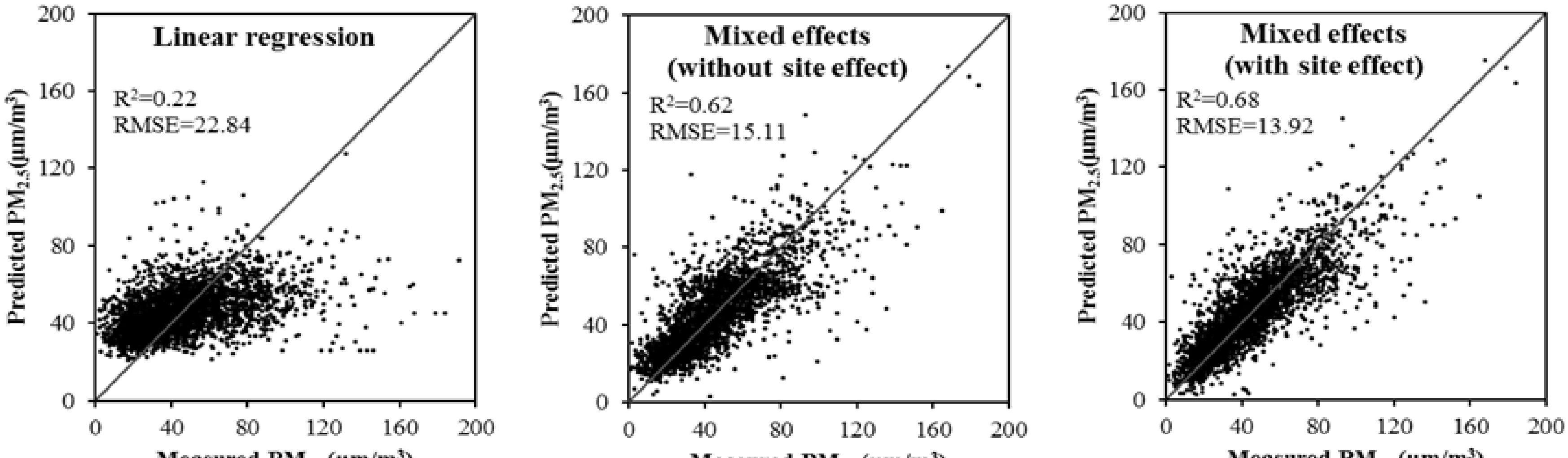


Fig.1. Scatter plots for CV results between measured and predicted $PM_{2.5}$ concentrations from different models.

Susceptibility of R^2 to the number of monitor sites involved

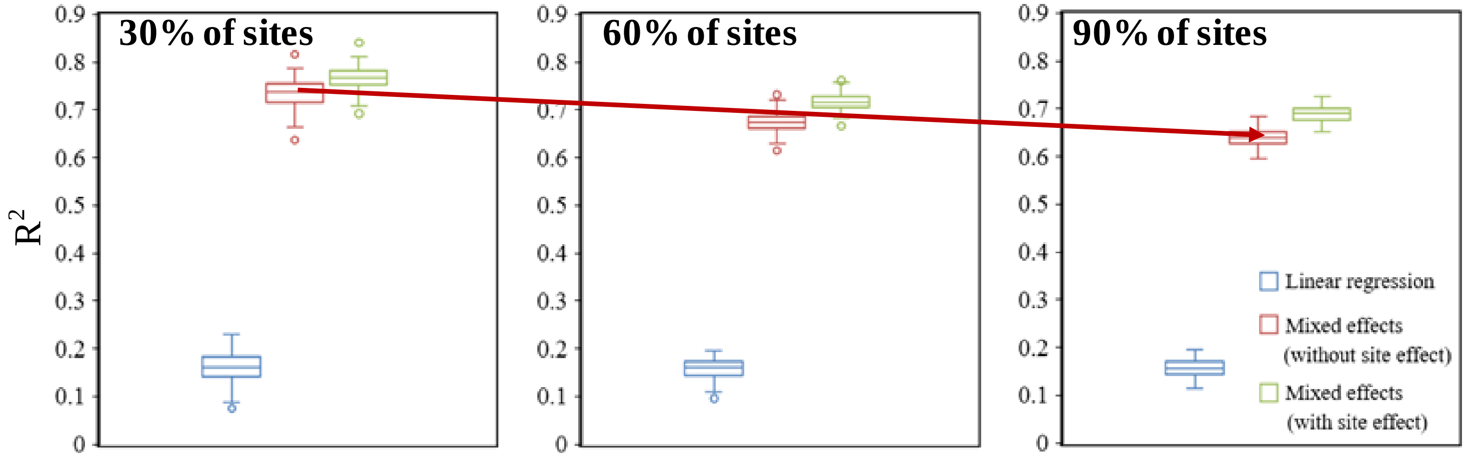


Fig.3. Box plots of R^2 of different models for 3 sensitivity tests.
(Left test involved 30% of sites, center and right employed 60% and 90%, respectively. Stations were chosen randomly for given number of sites and repeated 100 times)

- **The method has a good performance.**
- **R^2 of this model reduced when the number of monitor sites increased, which was opposite to the previous study (*Xie et al*. 2015).**
- **This was partly because the method insufficiently represented the spatial and temporal relationship between AOD and $PM_{2.5}$ over the given region, especially in heterogeneous area.**

CHE

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Institute of Remote Sensing and Digital Earth ,CAS

VALIDATION AND COMPARISON OF **AATSR AOD** L2 PRODUCTS **OVER CHINA**

Yahui CHE

Yong XUE， Jie GUANG， Jianping GUO，Ying LI，Cheng FAN, Yanqing XIE

RADI/CAS, Beijing

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Summary：

The main purpose of this word is to **validate different** performances of **AATSR AOD retrieval algorithms** over China from Aerosol_cci project, including the Swansea algorithm (SU), the ATSR-2ATSR dual view aerosol retrieval algorithm (ADV), and the Oxford-RAL Retrieval of Aerosol and Cloud algorithm (ORAC), using ground-based data from AERONET and CARSNET (China Aerosol Remote Sensing Network) in 2007, 2008 and 2010.

Five parts will be represented by this poster:

- Part 1 is about introduction of AERONET and CARSNET
- Part 2 is introduction of ADV, ORAC and SU algorithms.
- Part 3 validation results, including seasonal validations
- Part 4 is an analysis of results
- Part 5 is a summary.

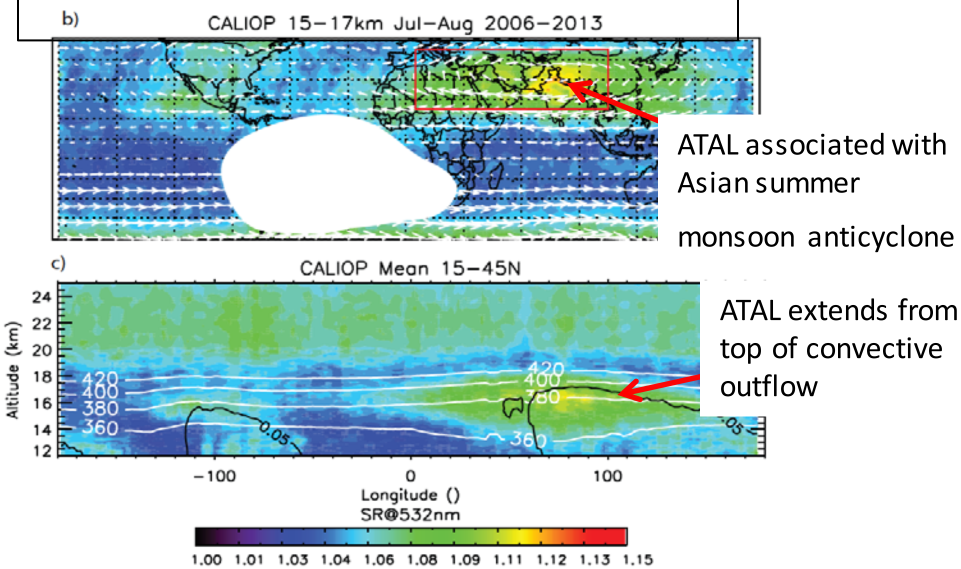
FARLIE

Characterizing the Asian Tropopause Aerosol Layer (ATAL): balloon-borne measurements, satellite observations and modeling approaches

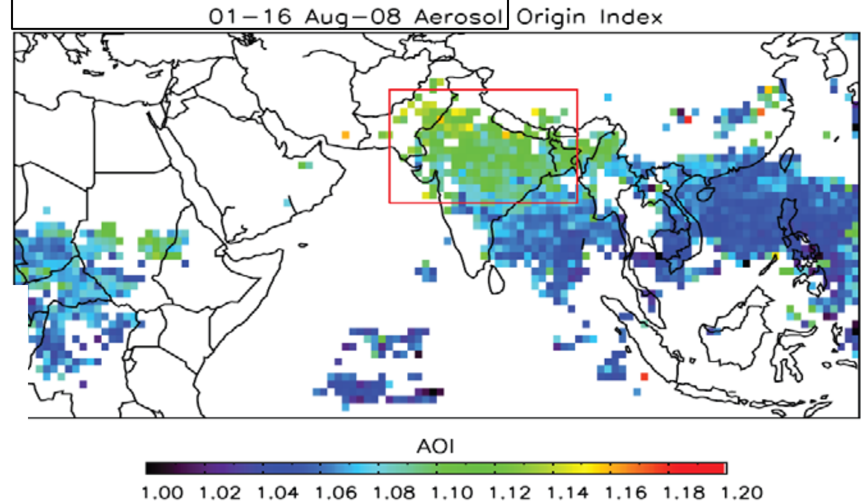
T. D. Fairlie[1], J.-P. Vernier[2], H. Liu[3], T. Deshler[4], M. Natarajan[1], K. Bedka[1], T. Wegner[1], N. Baker[1], M. V. Ratnam[5], H. Gadhavi[5], A. Jayaraman[5], A. Pandit[5], A. Raj[5], H. Kumar[5], S. Kumar[6], A. Singh[7], G. Stenchikov[8], F. Wienhold[9], and J. Bian[10]

1. NASA Langley Research Center, USA
2. Science Systems and Applications, USA
3. National Institute of Aerospace, USA
4. University of Wyoming, Laramie, USA
5. National Atmospheric Research Laboratory, Gadanki, India
6. National balloon facility, TIFR, Hyderabad, India
7. Banaras Banaras Hindu University, India
8. King Abdullah University of Science and Tech., Saudi Arabia
9. Swiss Federal Institute of Tech., Zurich, Switzerland
10. LAGEO, Inst. of Atmos. Phys., Chinese Acad. Sci., Beijing, China

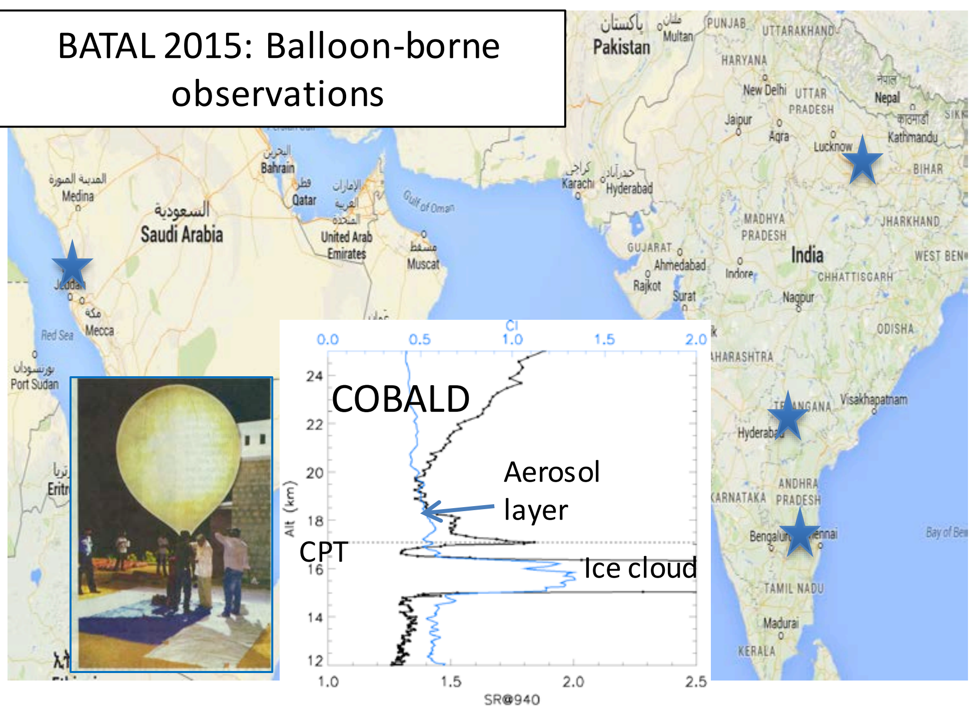
CALIPSO observations of ATAL layer



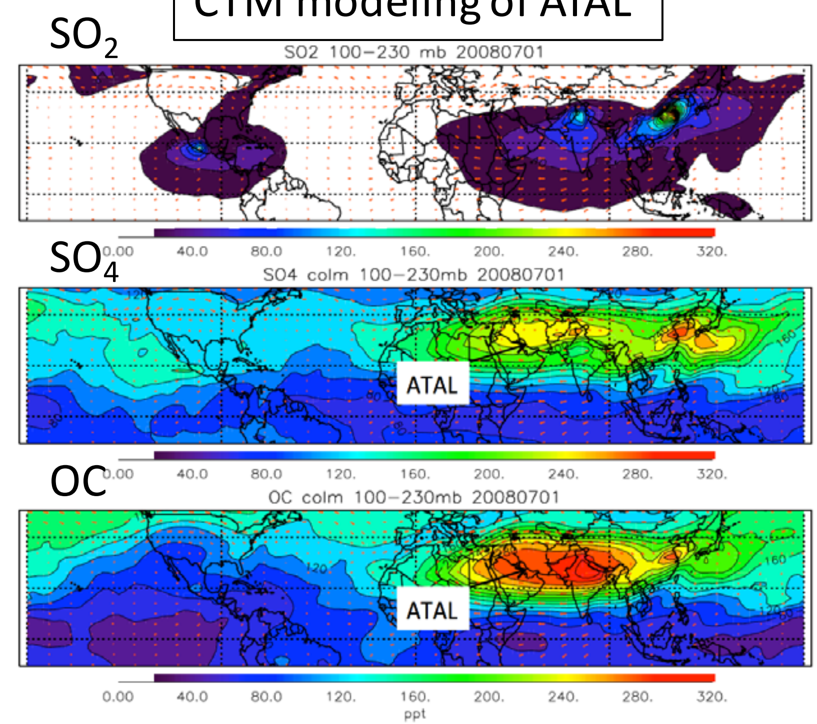
Source attribution



BATAL 2015: Balloon-borne observations



CTM modeling of ATAL



FAN

15th CAS-TWAS-WMO Forum

15th AeroCom and 4th AeroSAT Workshops

19-24 September,2016 | Beijing,China

Retrieval of Aerosol Optical Depth and Land Surface Reflectance from FY3/MERSI

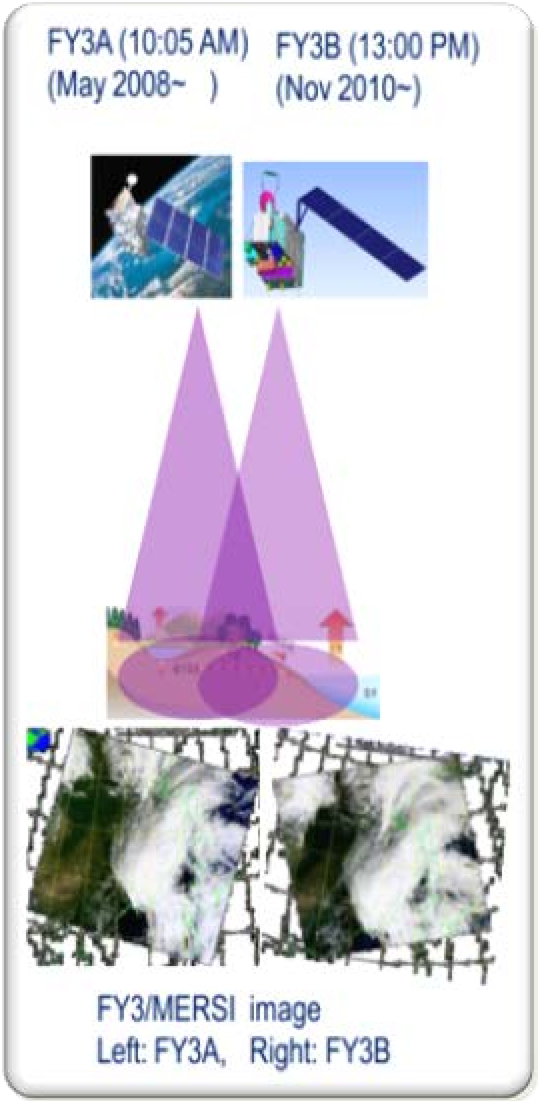
Cheng FAN

Jie GUANG，Yong XUE，Aojie DI，Lu SHE，Yahui CHE

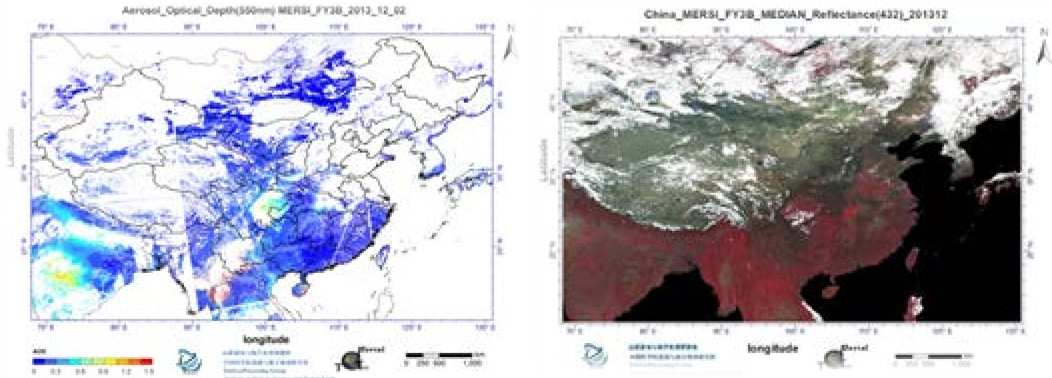
RADI/CAS, Beijing

www.tgp.ac.cn

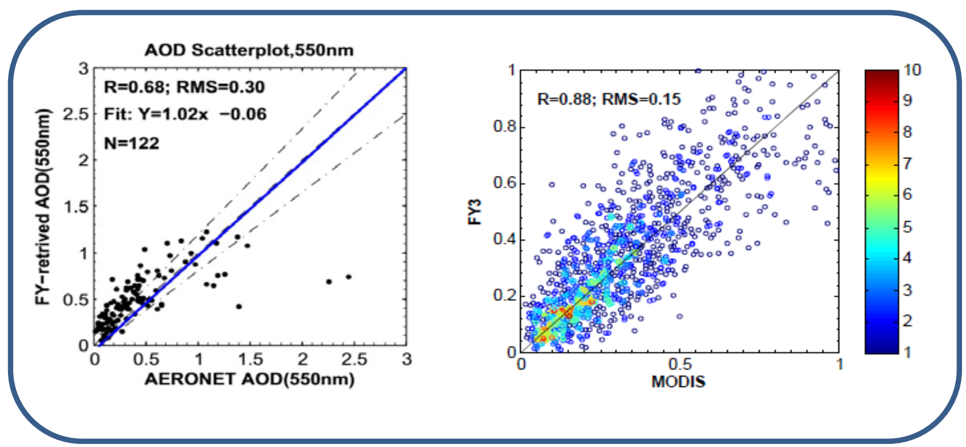
Email：chengfjane@163.com yx9@hotmail.com



Results



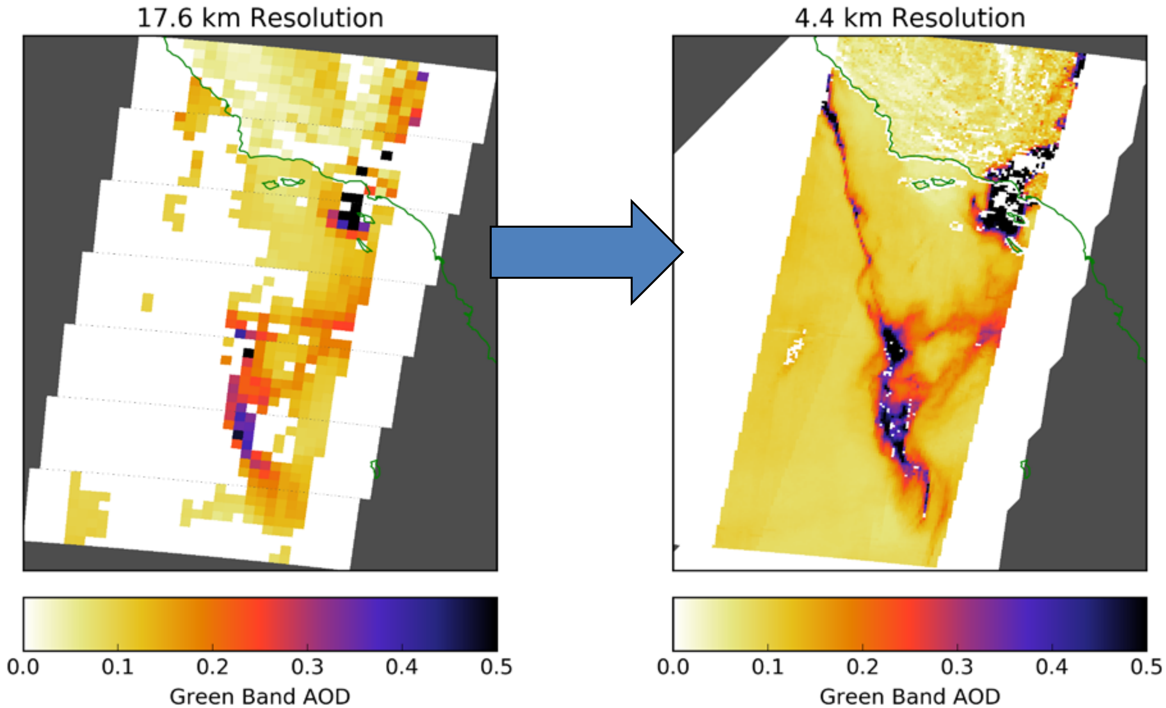
Validations



GARAY

MISR Aerosol

Orbit 88284, 2016-07-23 View of Smoke from Soberanes Fire (Left) and Sand Fire (Right) off Southern California



Old

- 17.6 km
- No uncertainty
- Hard to access navigation and time information
- Complicated field names
- Good performance relative to AERONET
- Particle property information

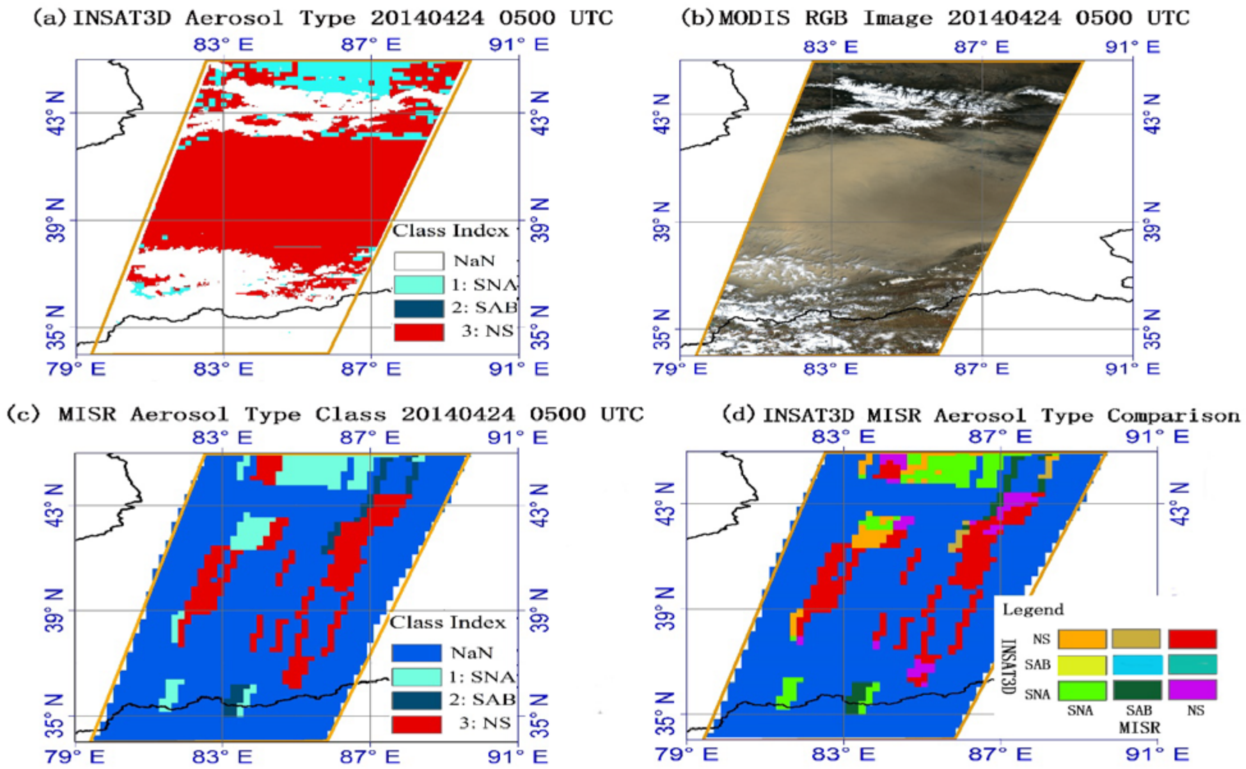
New (December 2016!)

- 4.4 km
- Per retrieval uncertainty
- Easy to use (can be read using tools like Panoply)
- Simplified content and field names
- Improved performance relative to AERONET (DRAGON)
- Particle property information

GUANG

Aerosol Optical Depth Retrieval in Xinjiang Region Using Indian National Satellite (INSAT 3D) Data

- This paper proposed an improved algorithm to retrieve AOD over bright surface (desert area) using a **Geostationary satellite-**Indian National Satellite (INSAT 3D) data.



More than 80 percent of valid pixels get the same types!

Figure 1. comparison between INSAT-3D retrieved aerosol type and MISR Aerosol type (SNA: Spherical Non-absorbing, SAB: Spherical Absorbing, NS: Non-Spherical)

Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences

Aerosol Optical Depth Retrieval in Xinjiang Region Using Indian National Satellite (INSAT 3D) Data

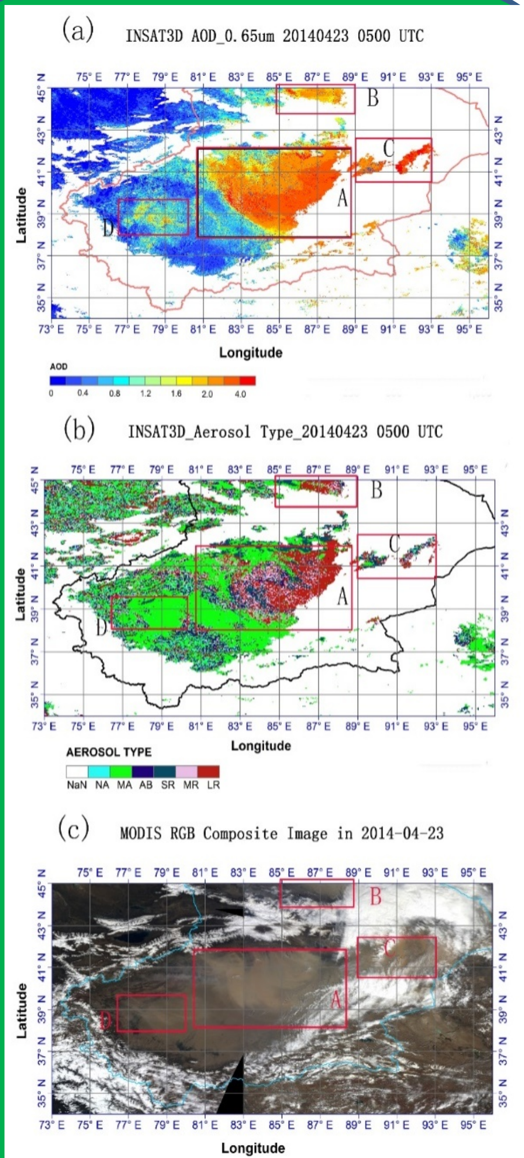


Figure 2

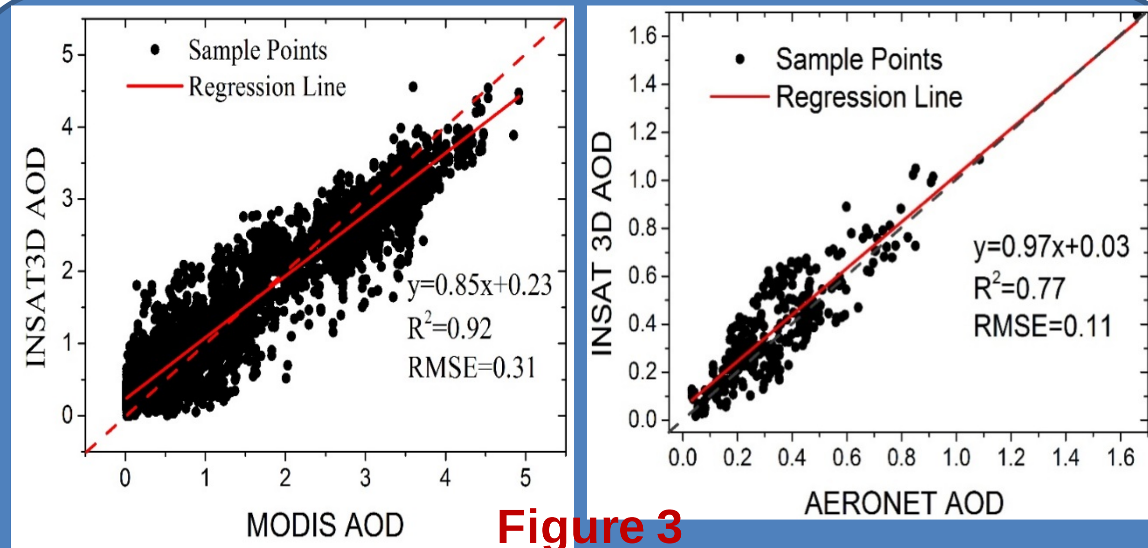


Figure 3

- **Figure 2. Comparison among the retrieved AOD (a), aerosol types (b), and MODIS RGB image (c) at the corresponding time.**
- **Figure 3. Validation of retrieved AOD from INSAT3D with MODIS AOD product and AERONET in-situ AOD.**

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HSU

Retrieving the Height of Smoke and Dust Aerosols by Synergistic Use of VIIRS, OMPS, and CALIOP Observations

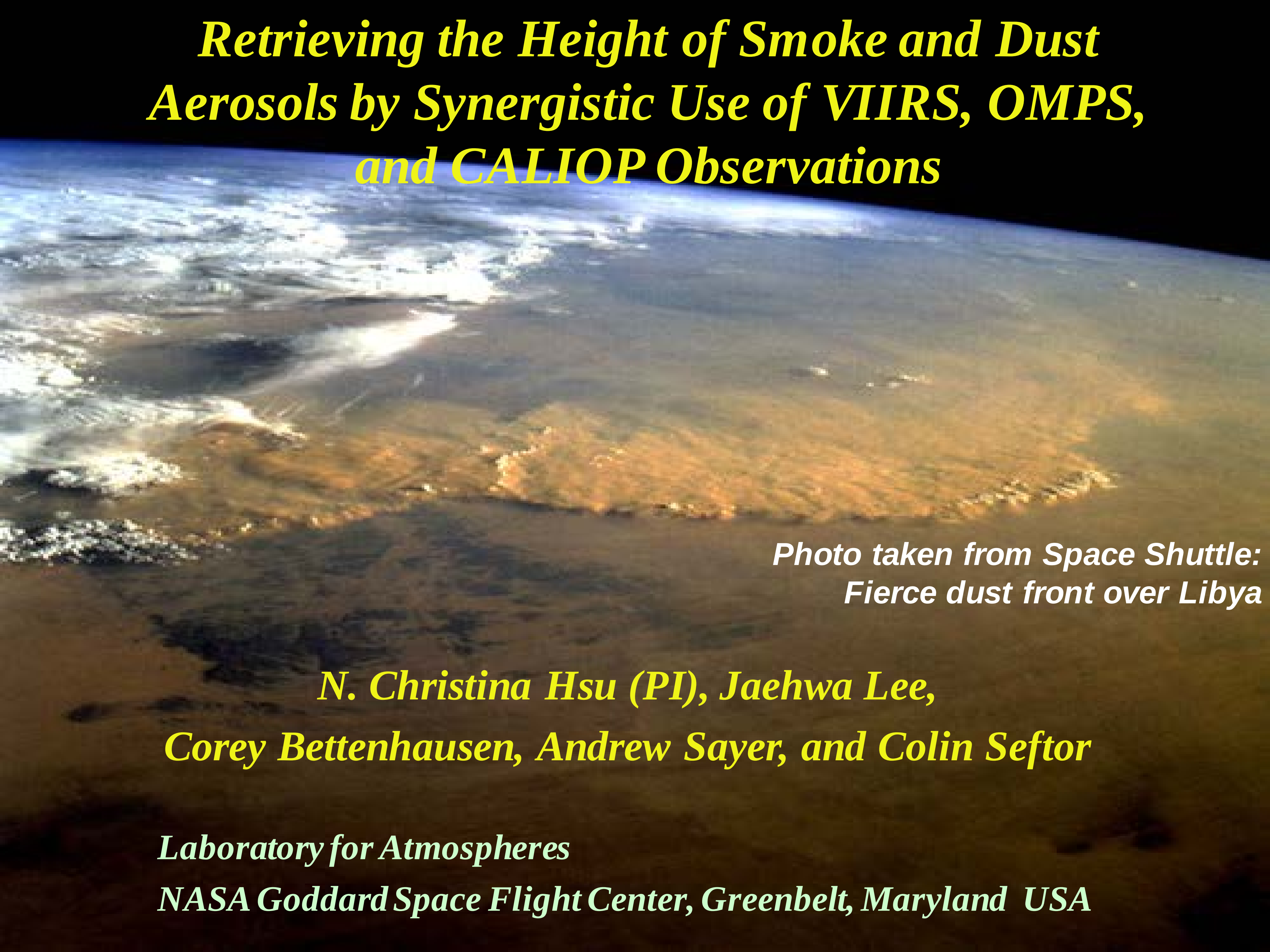


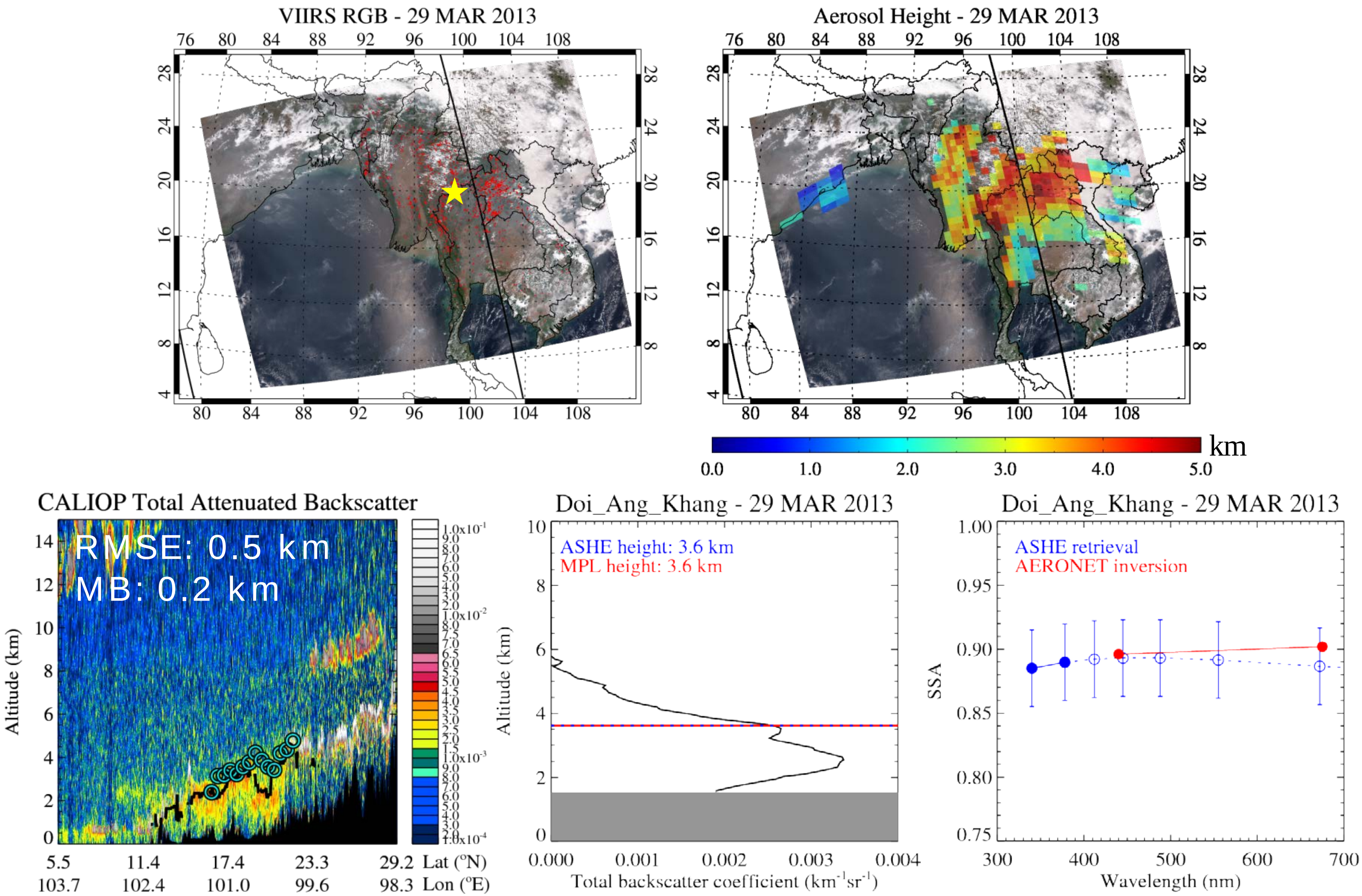
Photo taken from Space Shuttle: Fierce dust front over Libya

N. Christina Hsu (PI), Jaehwa Lee, Corey Bettenhausen, Andrew Sayer, and Colin Seftor

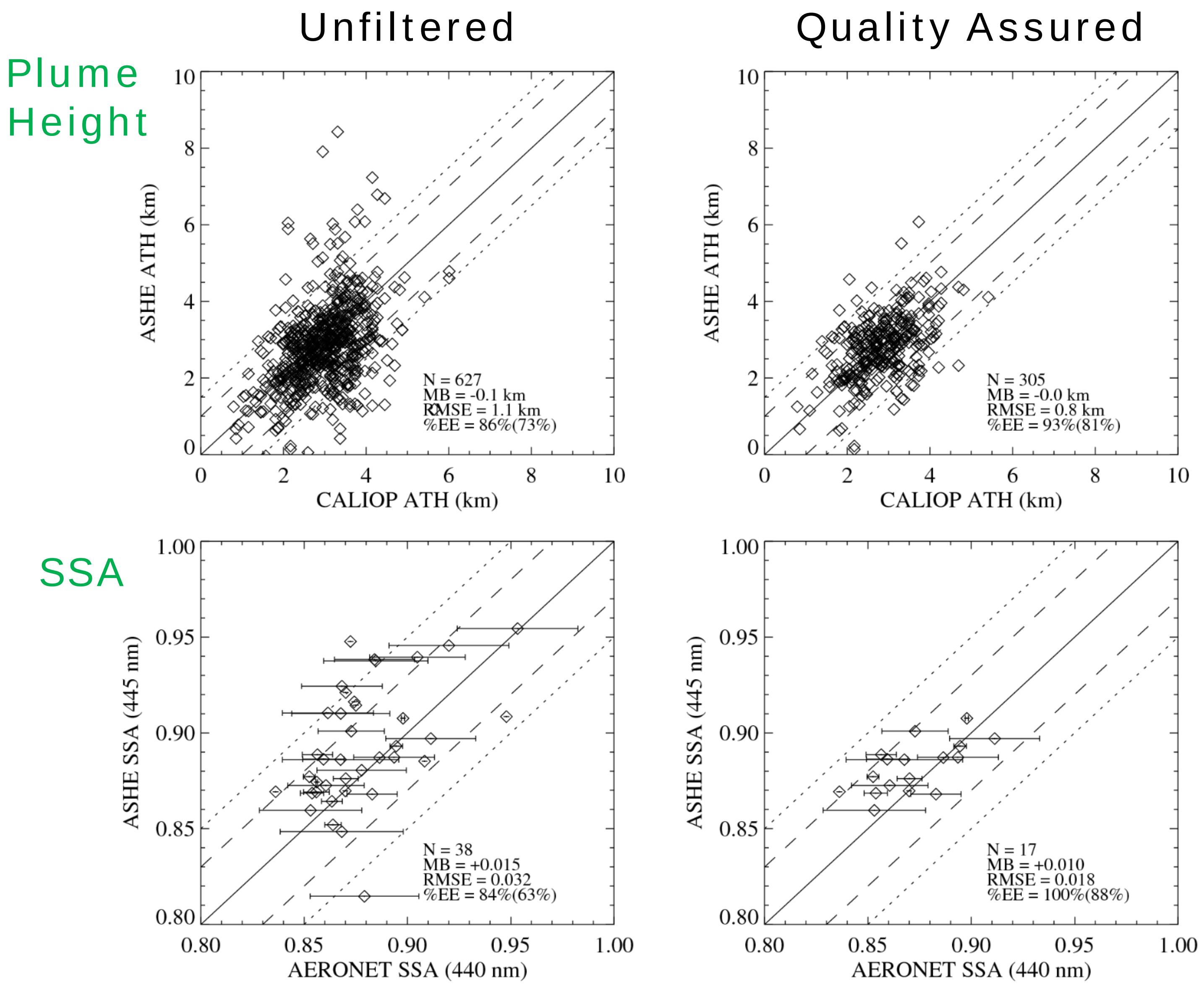
Laboratory for Atmospheres

NASA Goddard Space Flight Center, Greenbelt, Maryland USA

Product Validation Using 7SEAS field campaign Data



Retrieval Performance Evaluation Using Multi-year CALIOP and AERONET Data



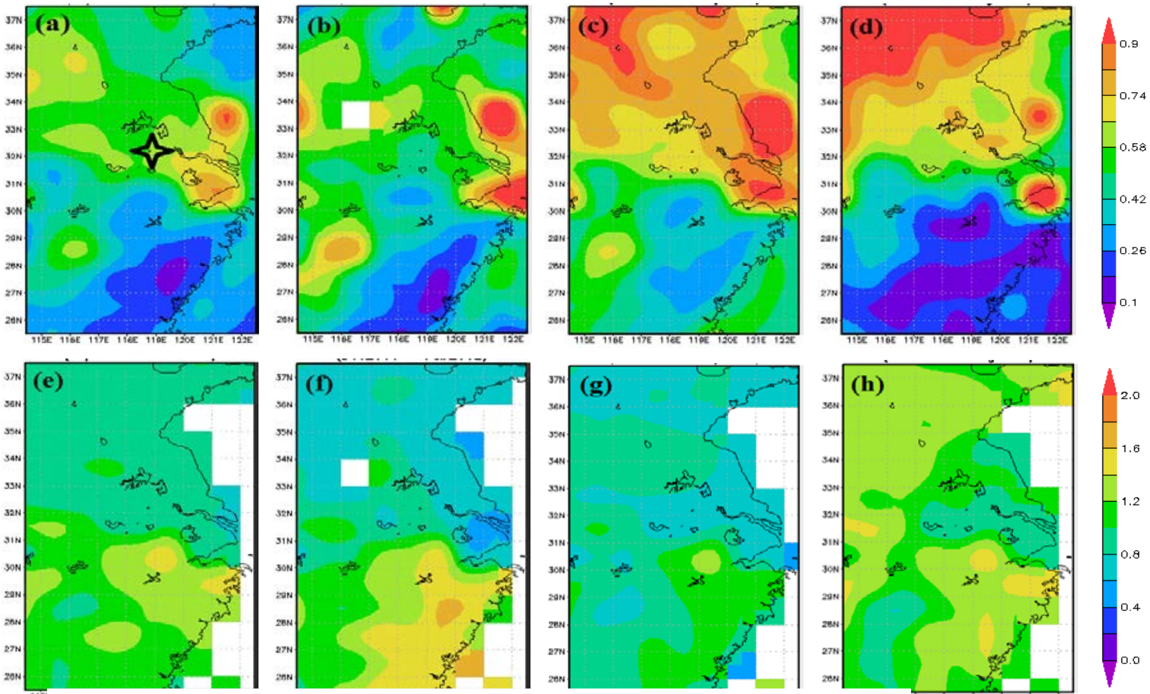
HU

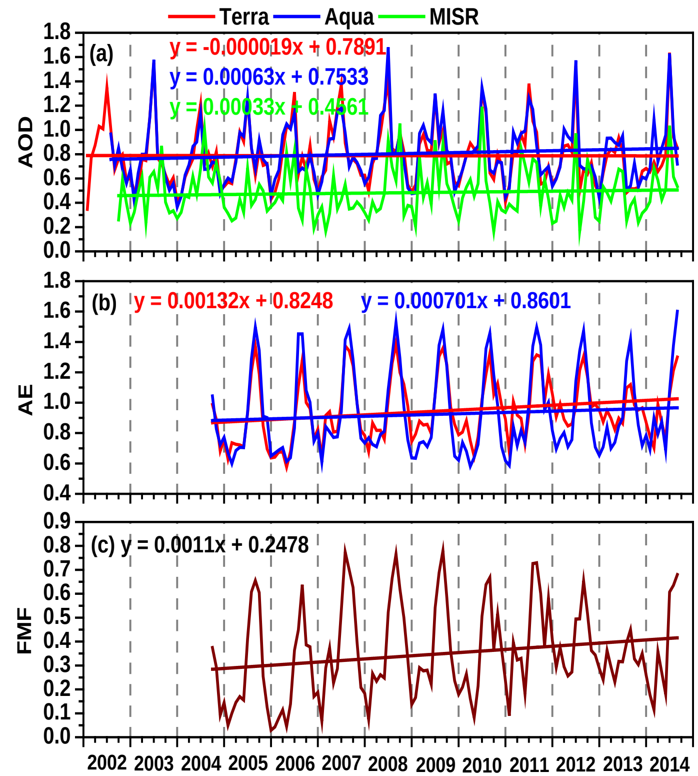
Climatology (2002-2014) of aerosol products derived from MODIS, MISR and OMI sensors over the Yangtze River Delta region

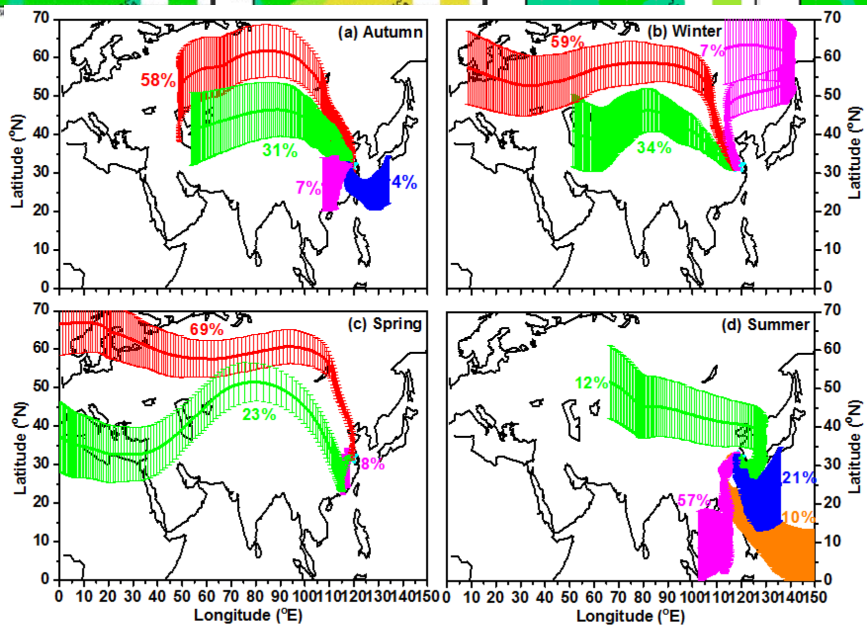
Kang Hu, K. R. Kumar, Na Kang
Key Laboratory for Aerosol-Cloud-Precipitation of CMA
Nanjing University of Information Science & Tech.
Nanjing, CHINA

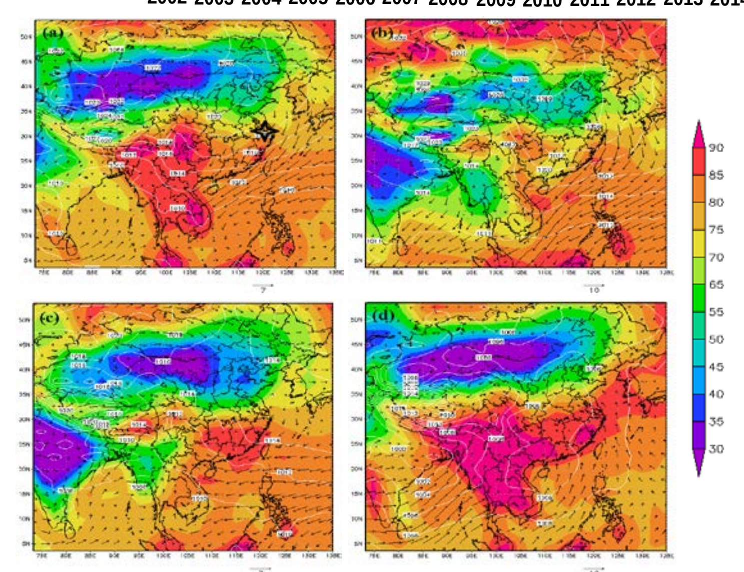
Email: 18252085328@126..com

Spatial and temporal distribution of AOD, AE over East China

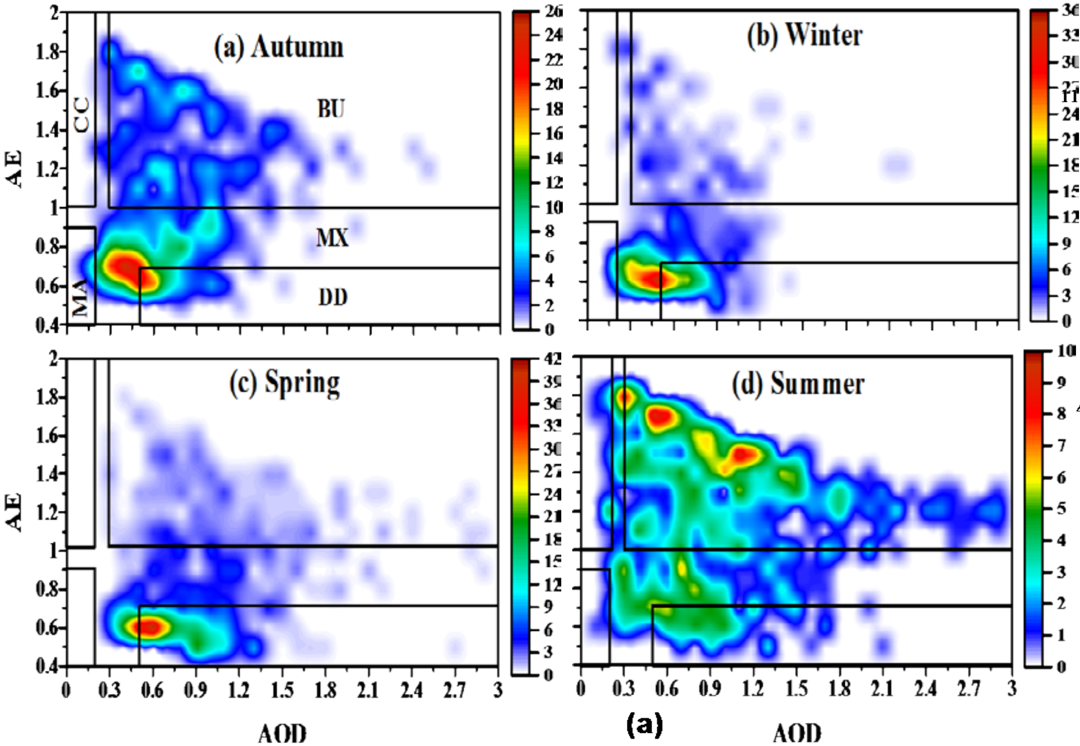


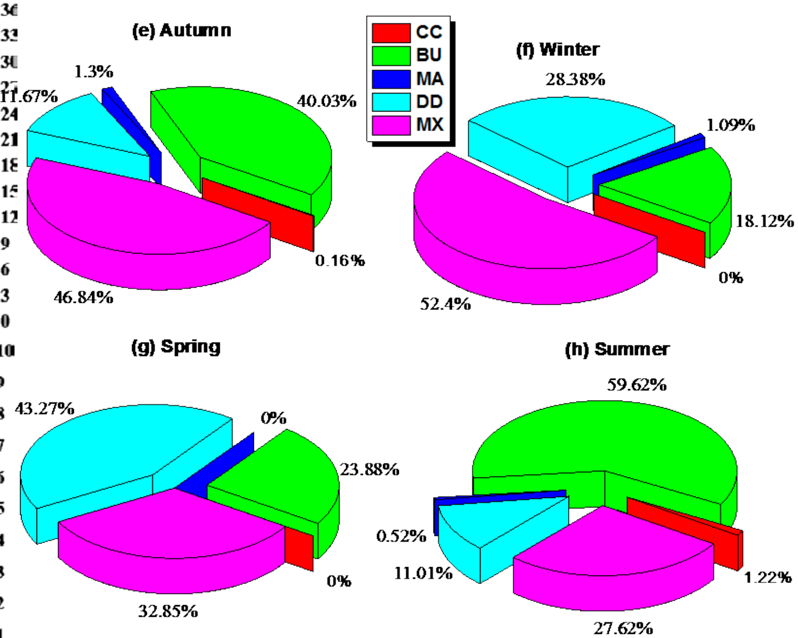


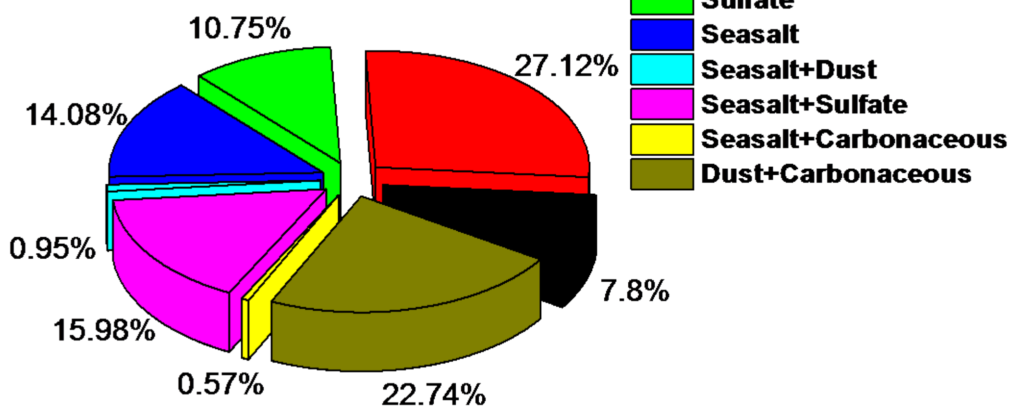




Aerosol type classification : MODIS – OMI algorithm







THANK YOU

JIE

Aerosol Optical Depth Retrieval in Xinjiang Region Using Indian National Satellite (INSAT 3D) Data

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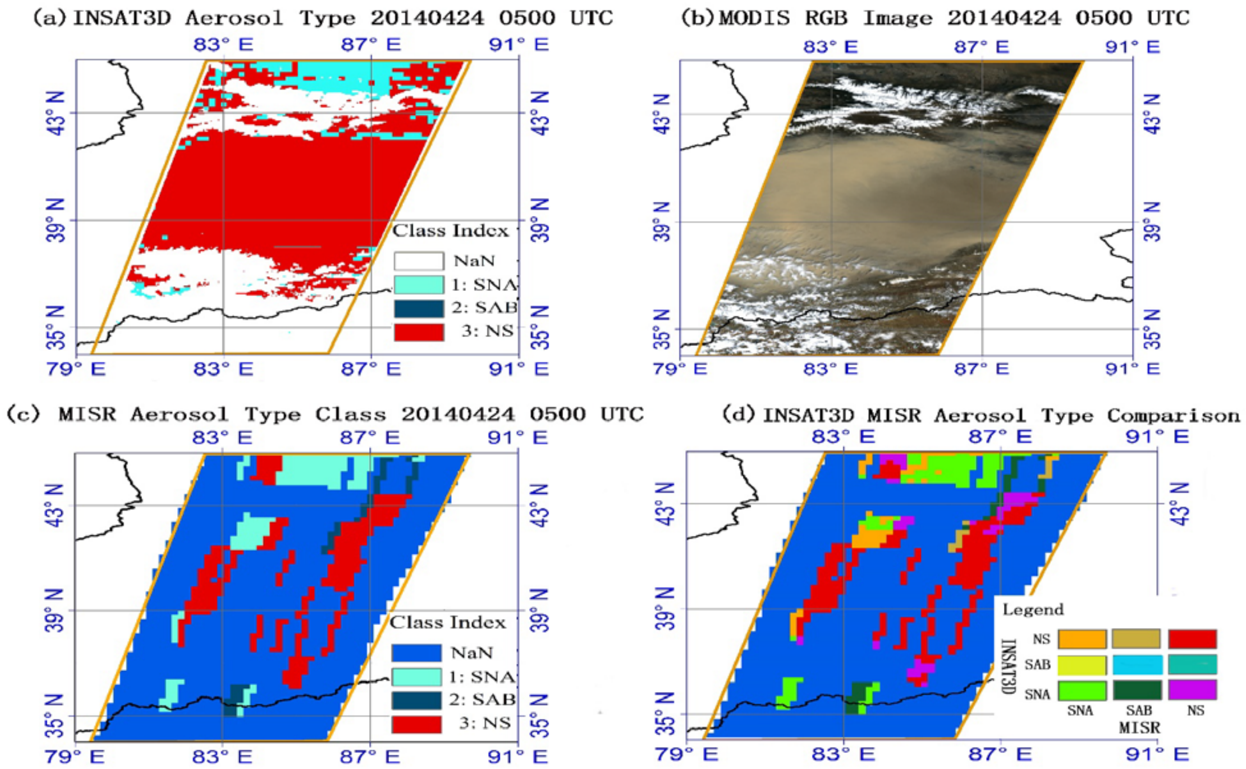

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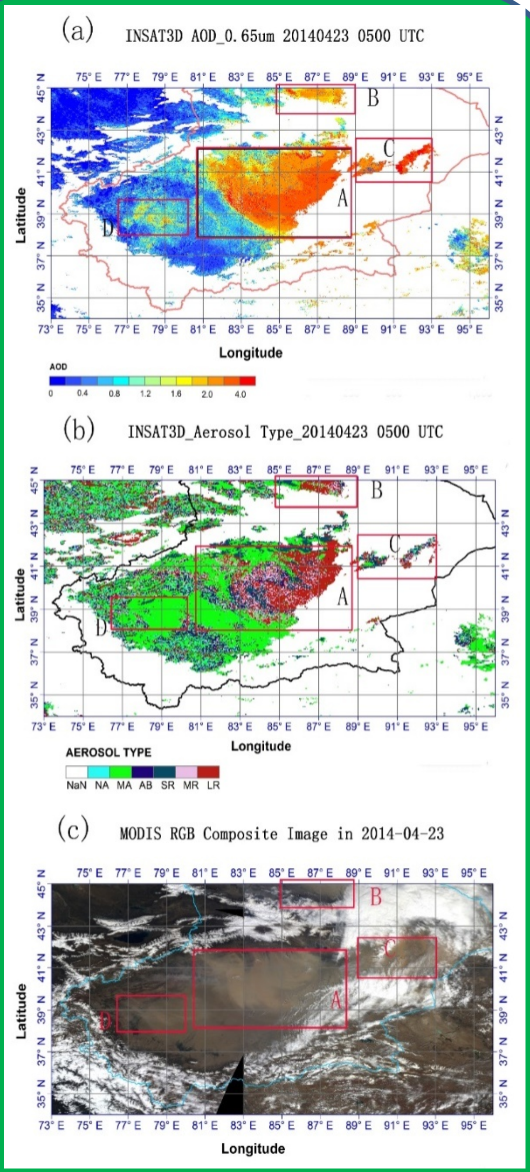
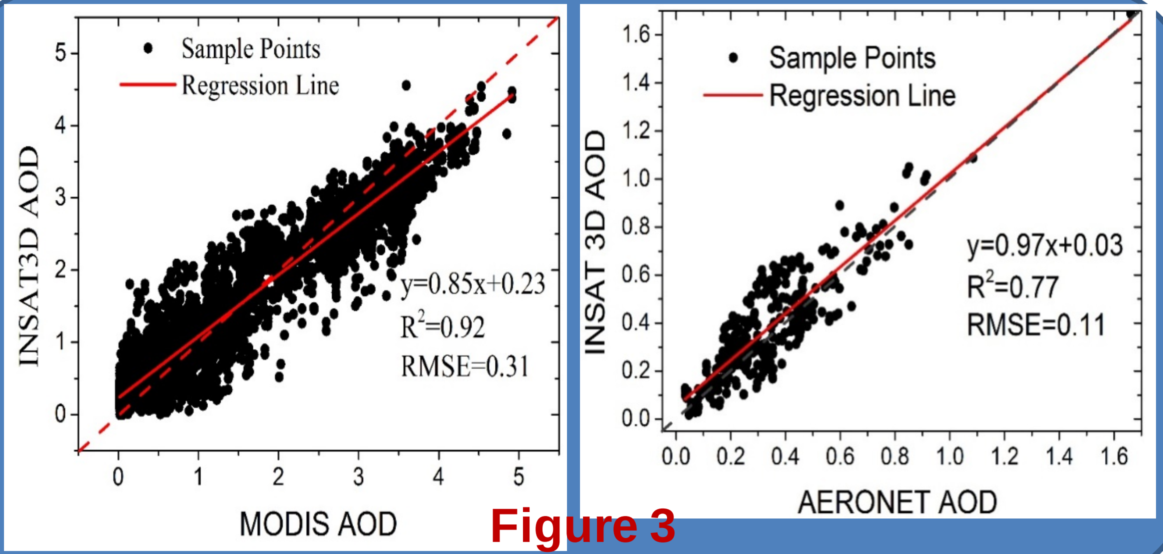


Figure 2



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KOLLACHI

The relationship between characteristics of physiographic and dust storm phenomena in Khuzestan, Iran

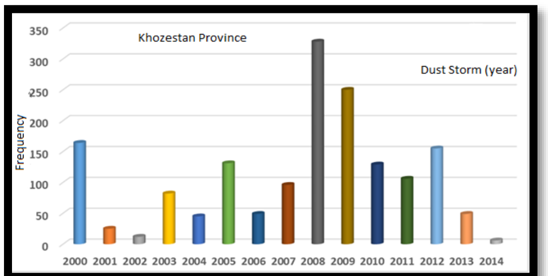
Abdolnabi Abdeh Kolahchi and Ali Akbar Noroozi
kolahchi@scwmri.ac.ir, noroozi_aa@scwmri.ac.ir

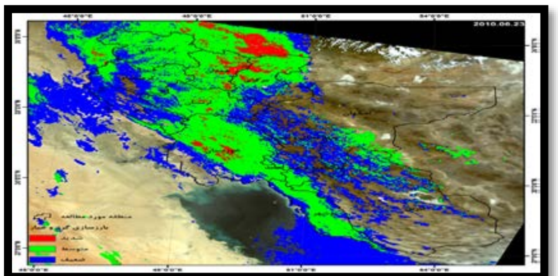
The aims of this study: To investigate Role of land cover changes in Internal dust storm generation in the Khuzestan province, Iran.

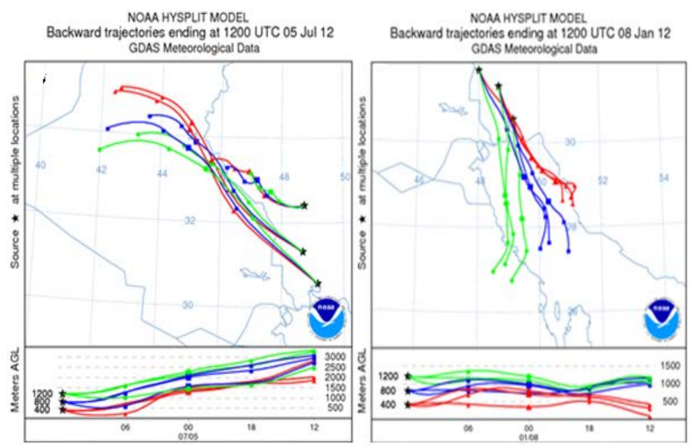
- Data
  - Remote Sensing (Landsat 7 and 8)
    - Various Supervised Classification method (MLC, SAM and SID)
  - ASTER (DEM)
    - Elevation, Slope, Aspect
  - The MODIS (level 2) images and the Brightness Temperature Difference (BTD) Index
    - For Detection of Dust Phenomenon
  - Climate Data
    - (Wind Speed, Wind Direction)
  - Physiographic
    - (Slope, Aspect, Soil erosion and Geological sensitive formations)
  - Modeling Techniques
    - Tracking the movement of dust particles using wind speed and wind direction

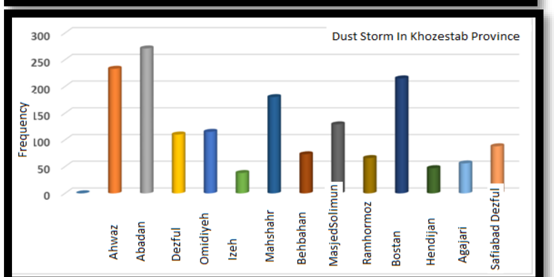
Conclusions:

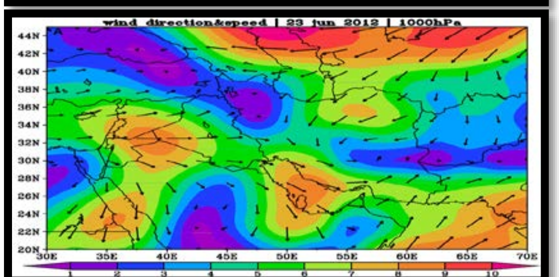
The tracking dust storm of the regions shows that most of dust comes from North West direction toward South East as well as West direction toward East during warm seasons and from South direction to North in cold seasons. The farmland and irrigated farm decrease and bare land increase during 2000-2015. These features, along with physiographic features such as erosion on formations, salty and swampy soil, low soil moisture, land use changes caused potential for dust to be targeted west and south west province such as Khuzestan province.

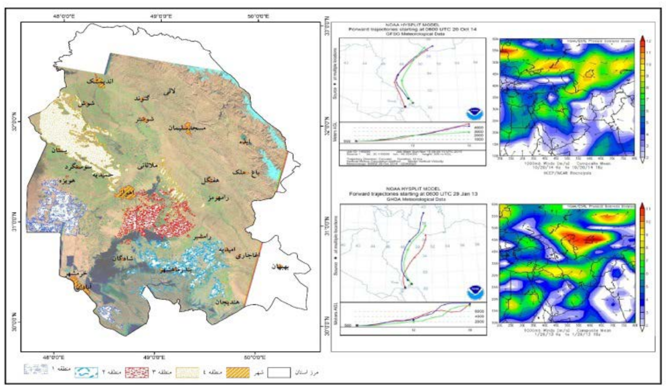


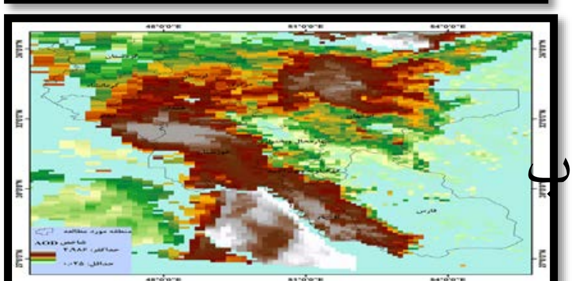










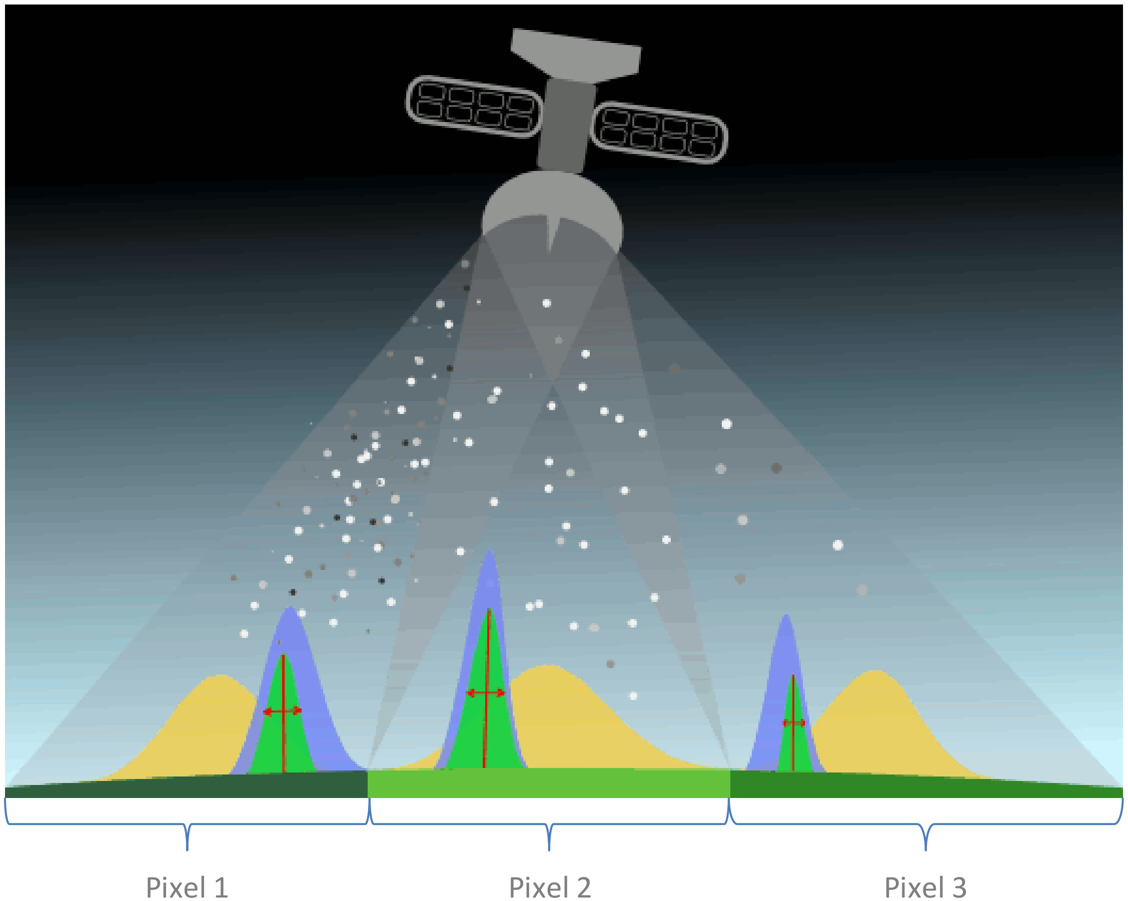


LIPPONEN

Pixel level uncertainty estimates for AOD using Bayesian Dark Target algorithm

ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

Antti Lipponen



Probability distributions:

Prior distribution

- Spatial correlations
- Seasonality
- Non-negativity of AOD

Likelihood distribution

- Connects observations to unknowns
- Observation model
- Uncertainty models

Posterior distribution

- Solution to our retrieval
- Pixel level uncertainty estimates

LIU

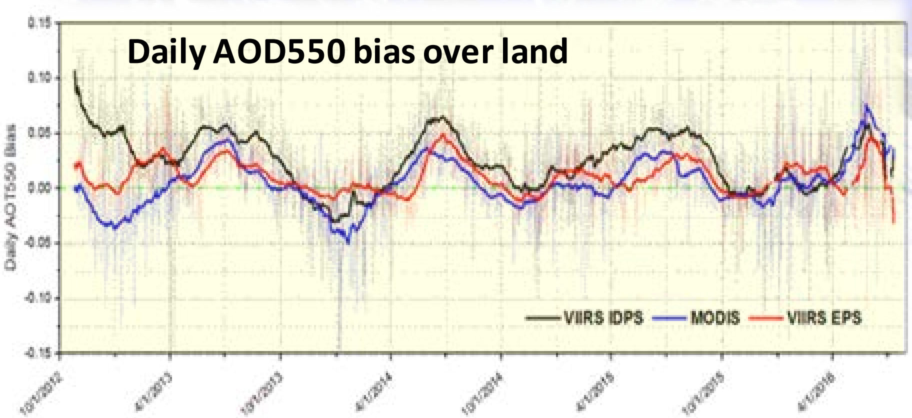
NOAA VIIRS Dark Target-Bright Surface Aerosol Optical Depth Algorithm

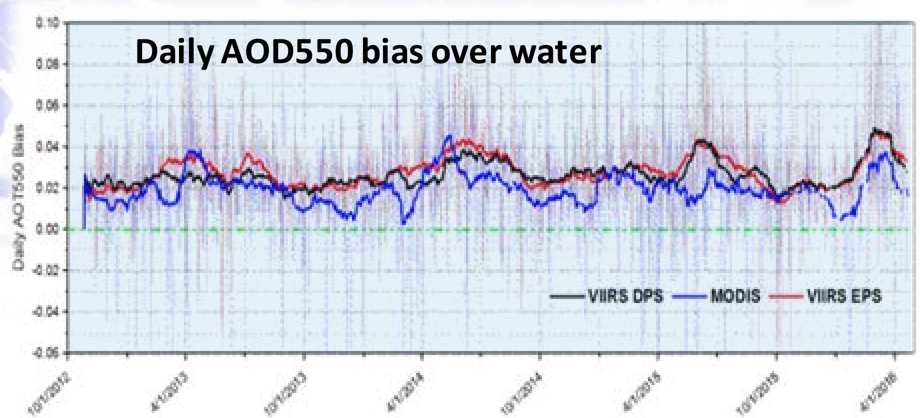
Hongqing LIU[1,2] (Hongqing.Liu@noaa.gov), Hai ZHANG[1,2], Istvan LASZLO[2,3], Shobha KONDRAGUNTA[2], Lorraine REMER[4], Pubu CIREN[1,2], Jingfeng HUANG[2,5], and Stephen SUPERCZYNSKI[2,6]

1. I.M. Systems Group, Inc., Rockville, USA
2. National Oceanic and Atmospheric Administration, College Park, USA
3. Department of Atmospheric and Oceanic Science, University of Maryland, College Park, USA
4. Joint Center for Earth systems Technology, University of Maryland Baltimore County, Baltimore, USA
5. Earth System Science Interdisciplinary Center, University of Maryland, College Park, USA
6. Systems Research Group, College Park, USA

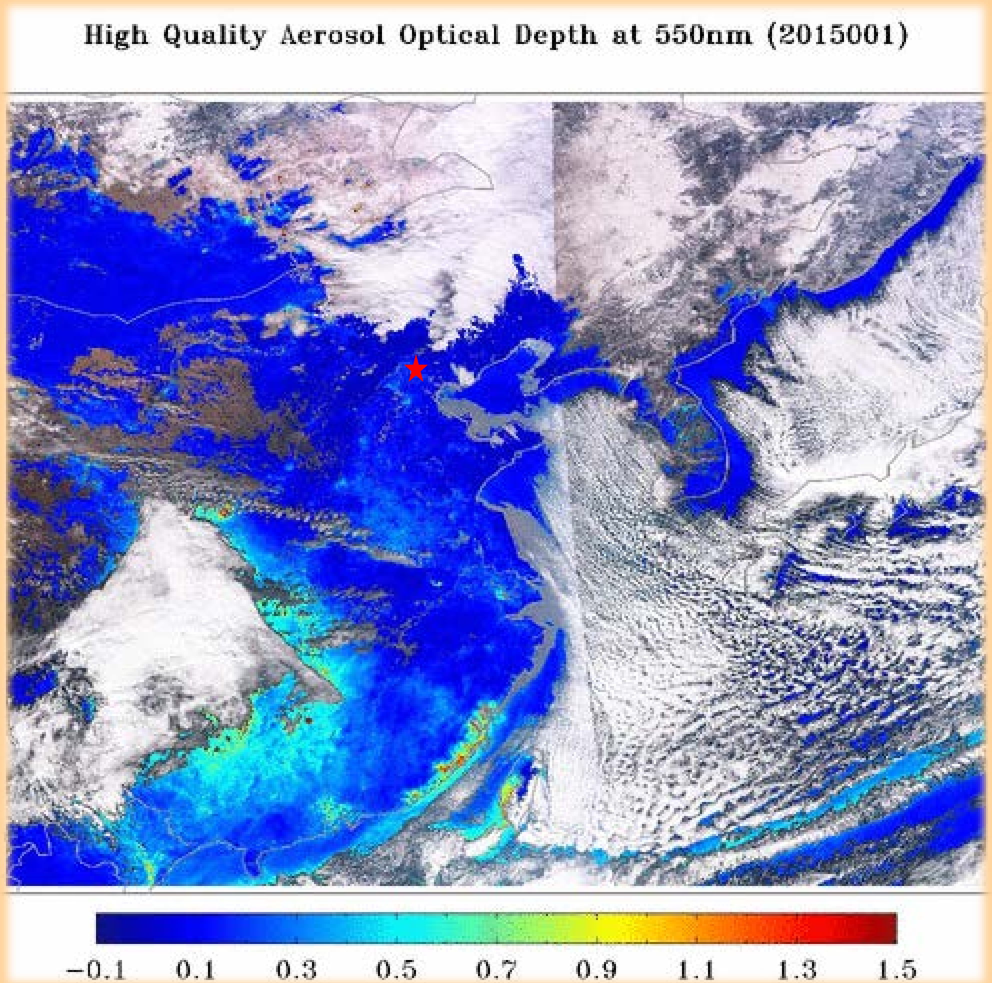
A new algorithm (EPS) was developed at NOAA/NESDIS to retrieve aerosol from multispectral, single-look, unpolarized Visible Infrared Radiometer Suite (VIIRS) reflectances.

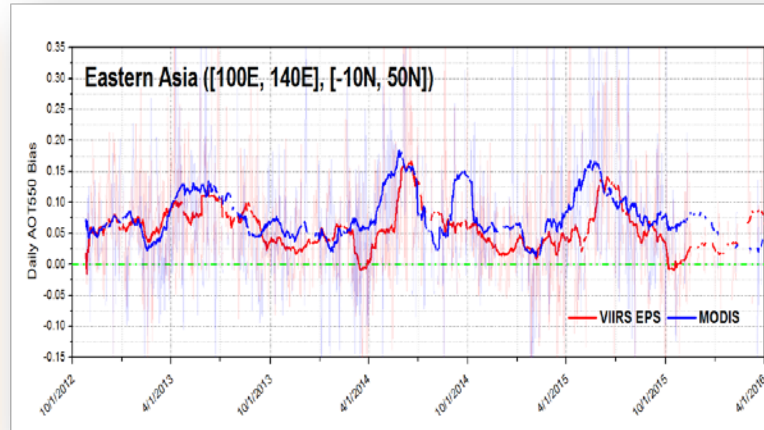
- **Retrieves over both dark and bright snow-free surface**
- **High spatial resolution (0.75km)**
- **Improves over current operational VIIRS aerosol product (IDPS)**
- **Validation shows performance is comparable to MODIS**

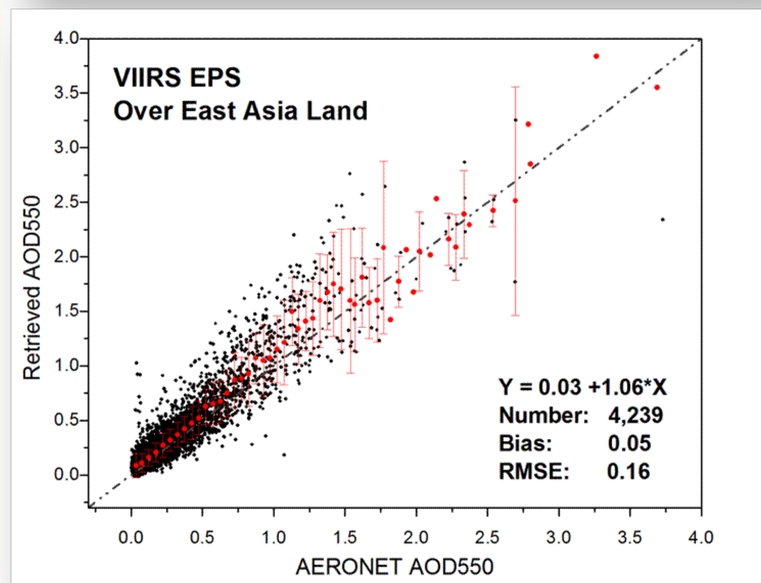




Focus on Asia



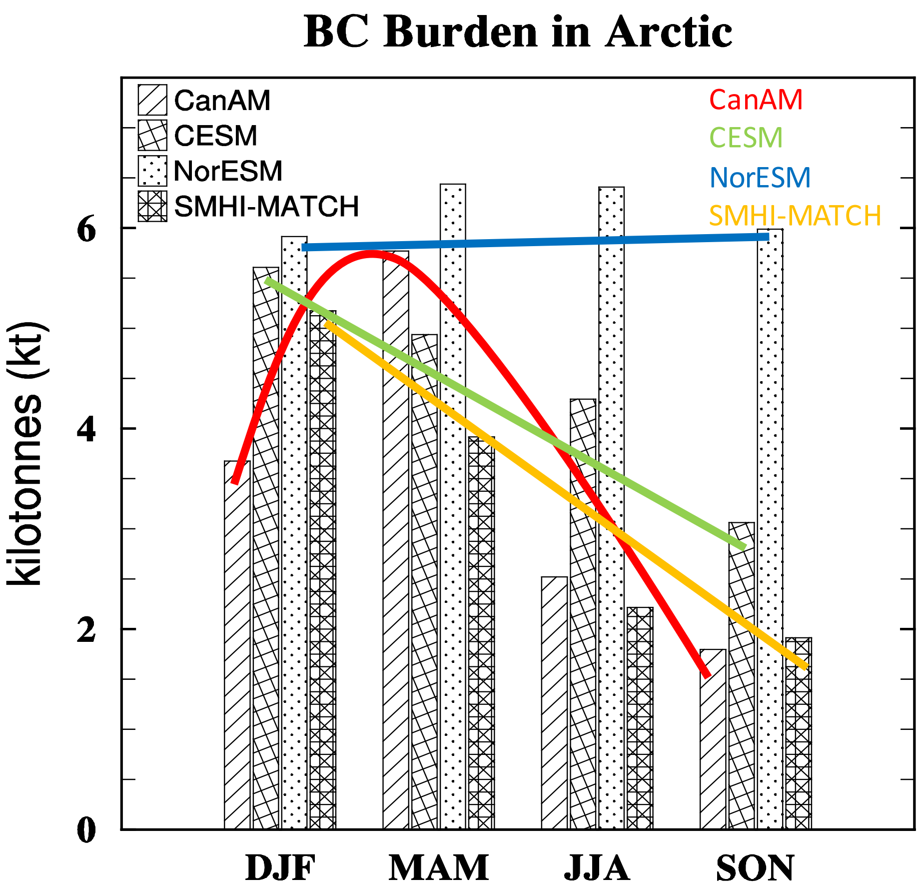


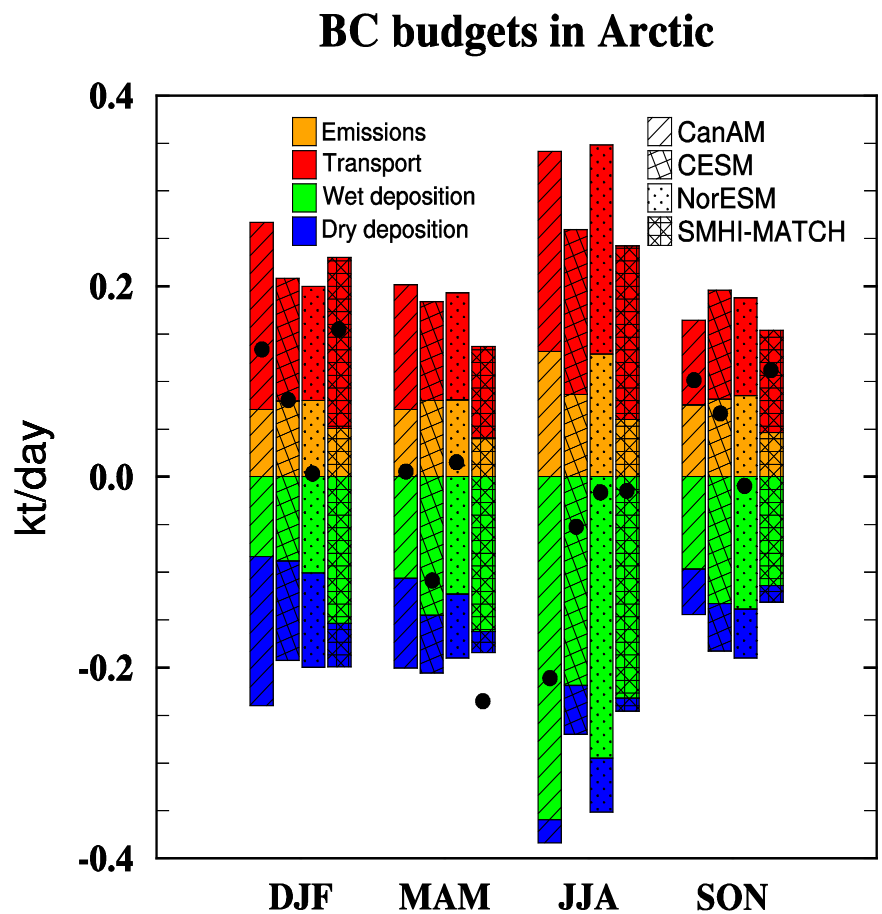


MAHMOOD

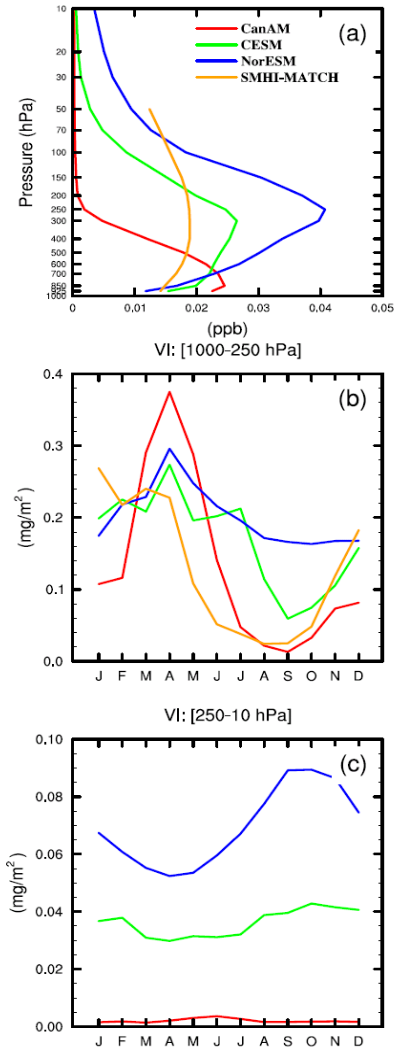
Seasonality of global and Arctic black carbon processes in AMAP models

R. Mahmood, K. von Salzen, M.G. Flanner, M. Sand, J. Langner, H. Wang, L. Huang
Postdoc (SEOS, University of Victoria, Victoria BC, Canada), Funding: NETCARE project

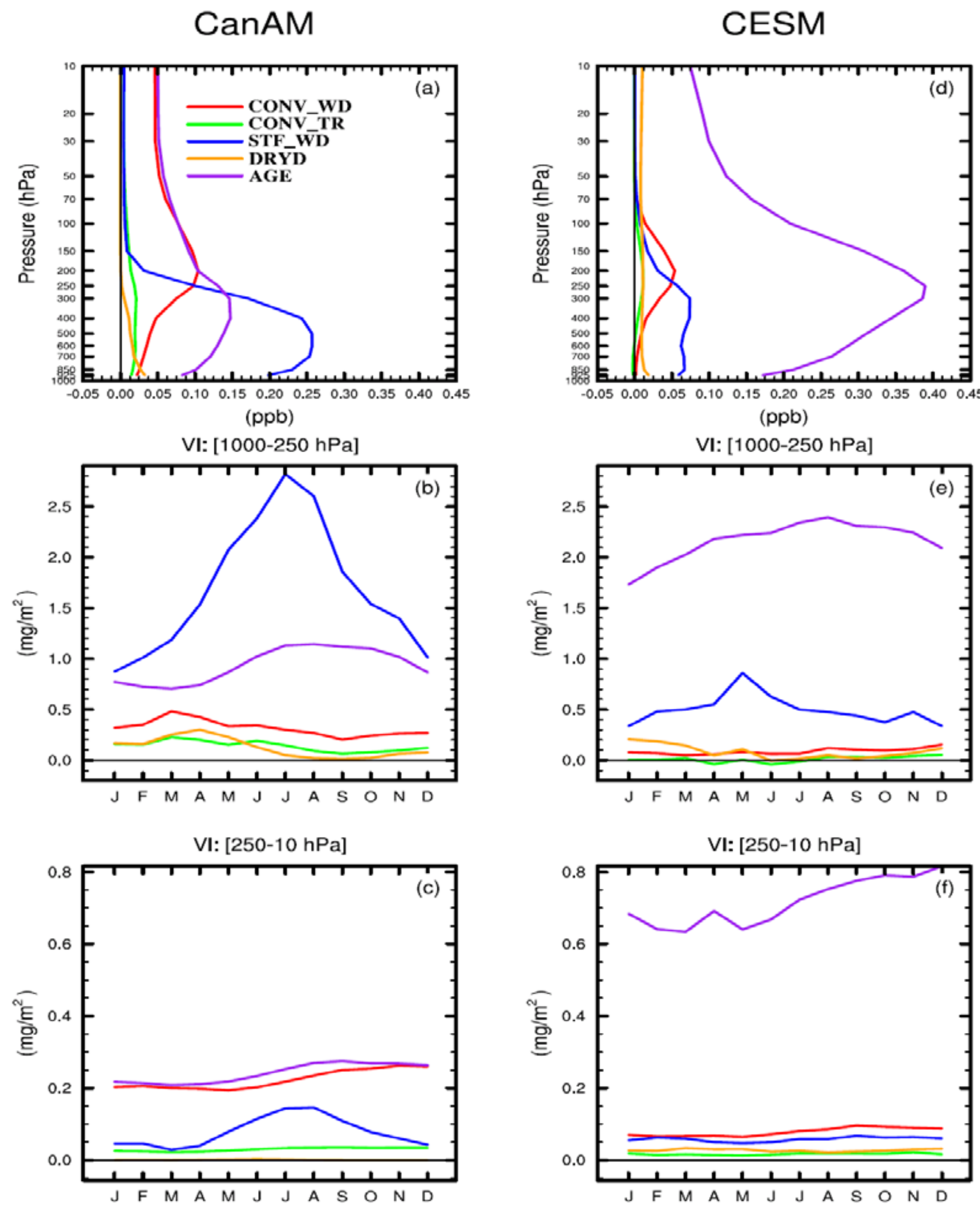




NETCARE



Results from sensitivity experiments:



For details:

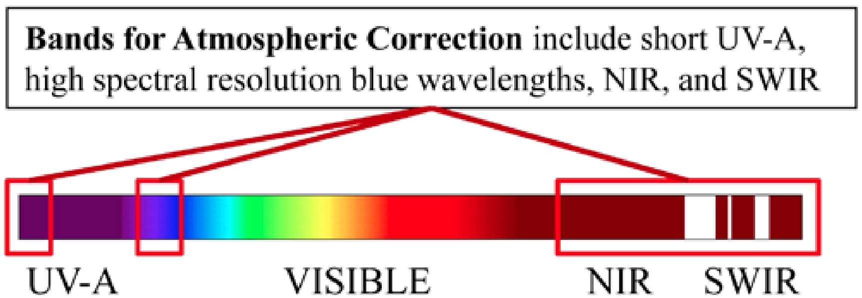
Mahmood et al. (2016): *J. Geophys. Res. Atmos.*, 121, doi:10.1002/2016JD024849.

MATTOO

Aerosol absorption retrievals from the PACE broad spectrum Ocean Color Instrument (OCI)

Shana Mattoo[1,2], Lorraine A. Remer[3], Robert C. Levy[2], Pawan Gupta[4,2], Ziauddin Ahmad[5,2], J. Vanderlei Martins[6], Adriana Rocha Lima[3,2], Omar Torres[2]

PACE will be a NASA mission launch ~2022

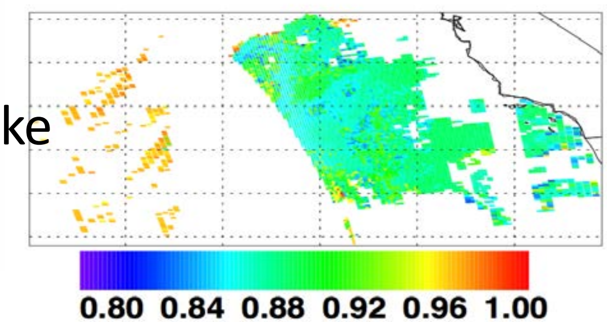


OCI on PACE is the first broad spectrum imager, With UV at 1 km resolution and bands into the SWIR.

It’s like a fine resolution OMI with MODIS, on the same instrument

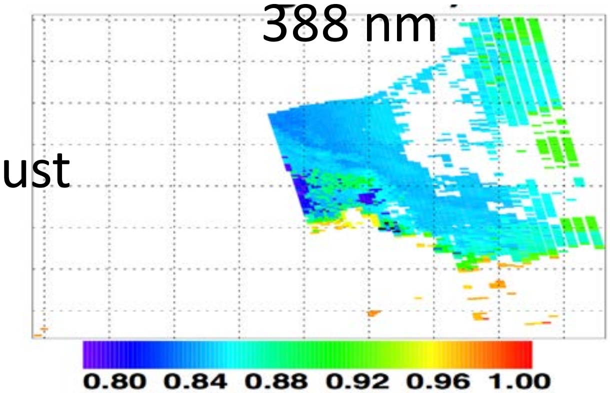
Single scattering albedo 388 nm

smoke



Single scattering albedo 388 nm

dust



MEI

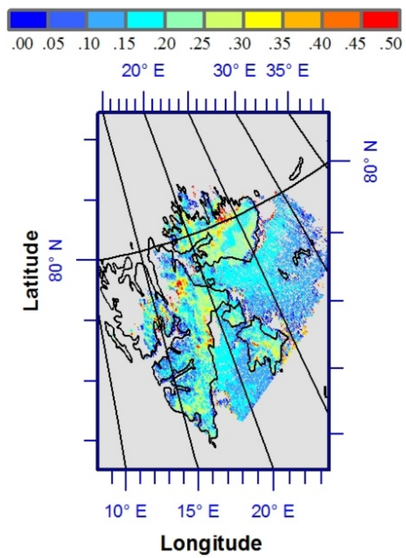
Aerosol retrieval over Polar region

Linlu Mei [1,2], Vladimir Rozanov [1], Marco Vountas [1], Yong XUe [2,3], John P. Burrows [1]

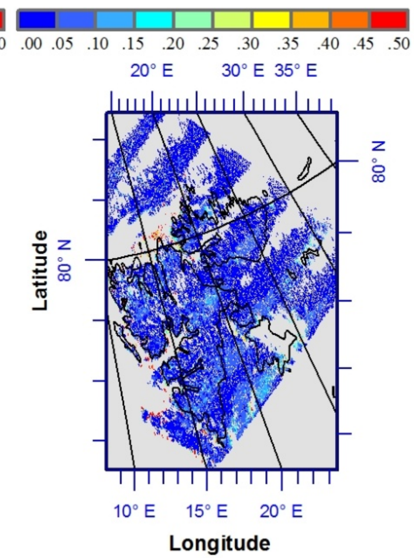
1 Institute of Environmental Physics, University Bremen, Germany
2 Key Laboratory of Digital Earth Science, Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences, Beijing 100094, China
3 Faculty of Life Sciences and Computing, London Metropolitan University, 166-220 Holloway Road, London N7 8DB, UK

mei@iup.physik.uni-bremen.de

Satellite remote sensing of aerosol and surface spectral reflectance properties in the Arctic

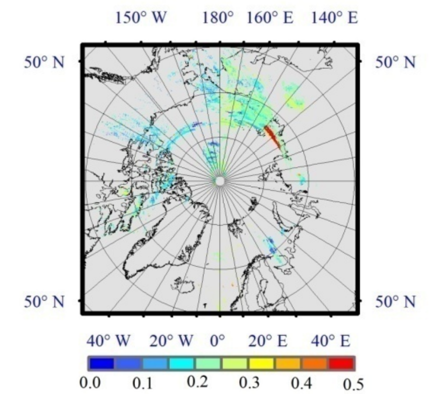


AOD [550nm] May/03/2006

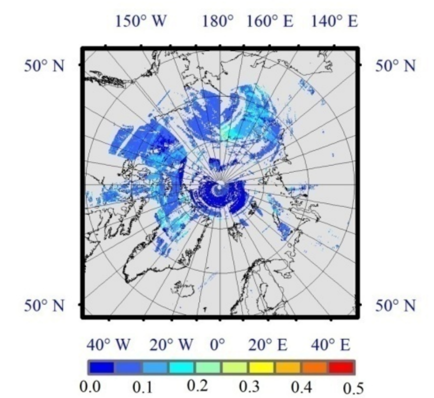


AOD [550nm] March/29/2006

IUP/UB-VIS AOT [550nm] 3 May,2006



IUP/UB-VIS AOT [550nm] 29 March,2006



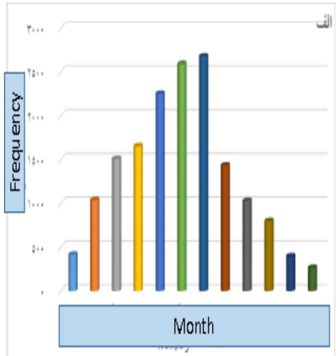
Changes in aerosol and surface spectral reflectance play a significant role in arctic amplification and related feedback in cloud free regions.

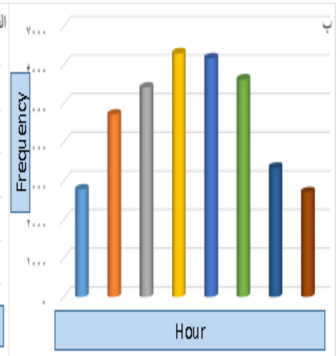
NOROOZI

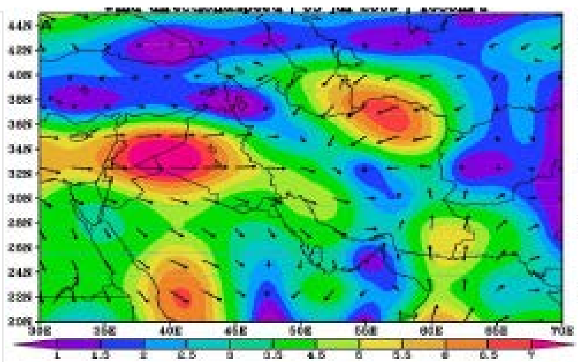
Identify areas with dust storm potential of physiographic and climatic characteristics

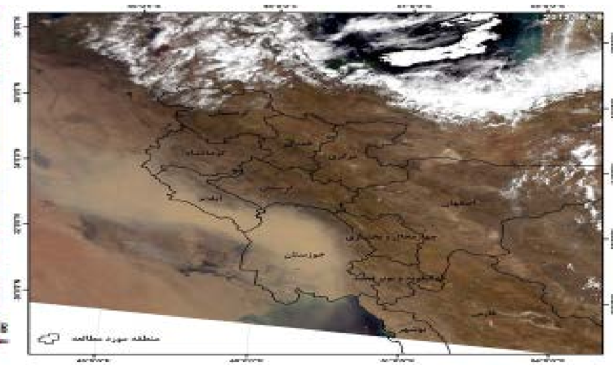
- **Ali Akbar Noroozi** & Elham Haghnejad noroozi.aa@gmail.com ; noroozi_aa@scwmri.ac.ir

A combination of statistical methods, remote sensing and modeling were used.
The data used included: daily synoptic stations, Landsat and MODIS daily satellite images, U and V data from the NOAA Web site and Landuse changes over the period 2000-2015.

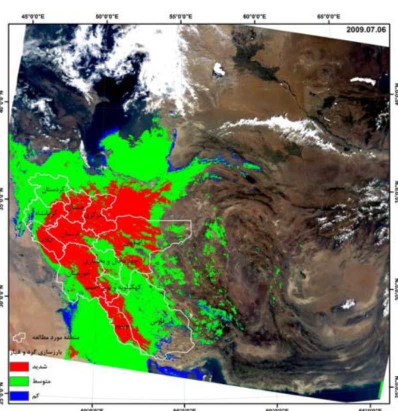


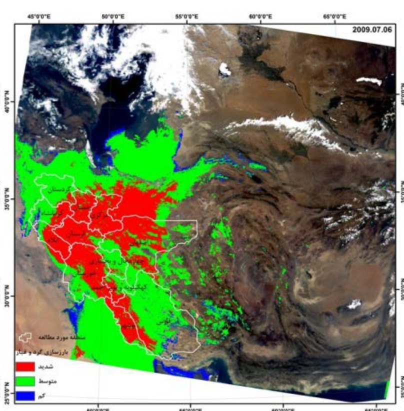


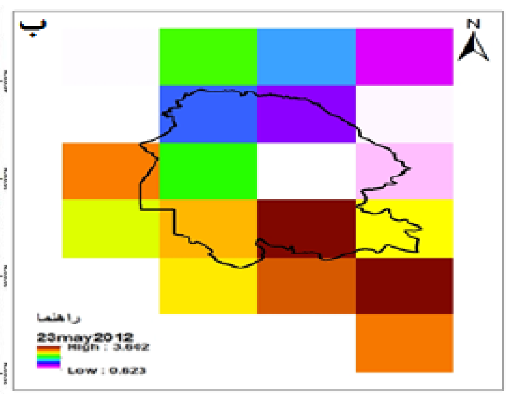


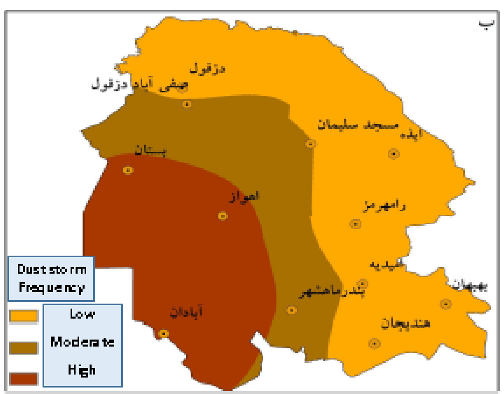


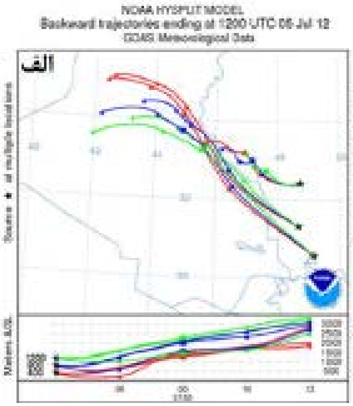
Detection of dust storm on satellite imagery and their concentration using images obtained from AOD and BTD indices, represent the largest concentration of dust in the West and South West regions of Khuzestan province, where more than 80 percent of the dust in these areas were consistent with the results of statistical data.

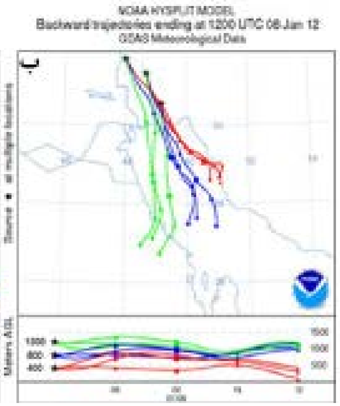




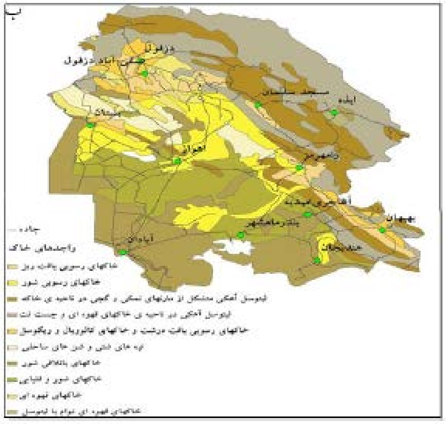


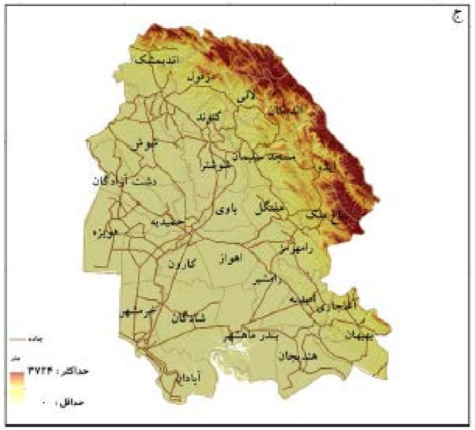


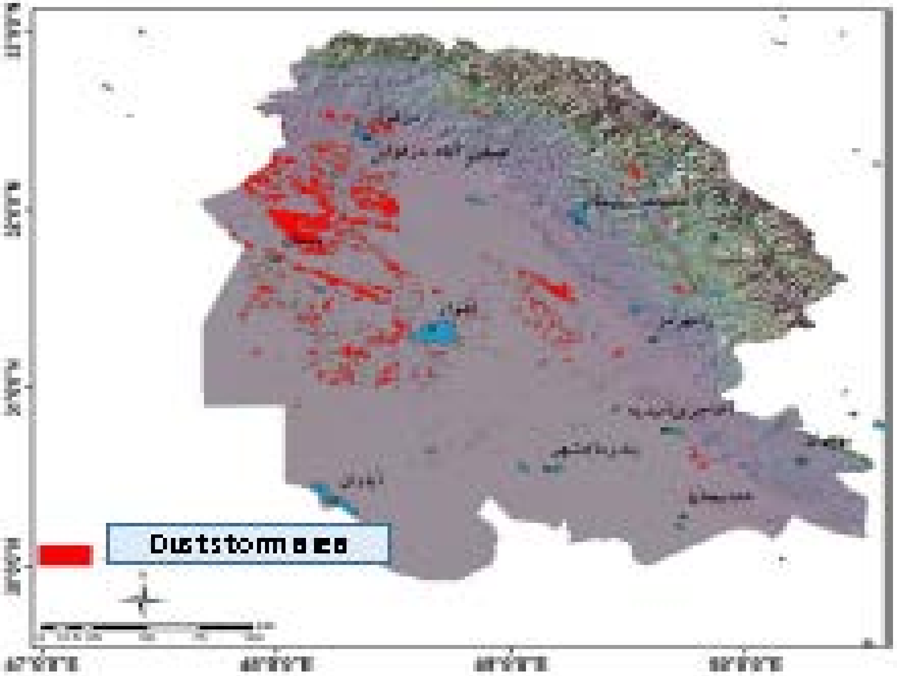


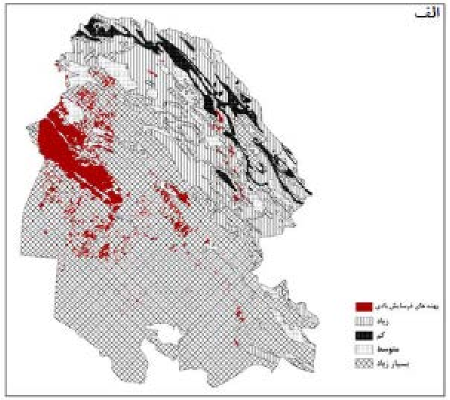


Trace Route dust entering the province using backward trajectory techniques and speed and wind direction maps showed that during the warm period of the year the most dust input is from northwest - southeast and west - East and in the cold period from South - to the north

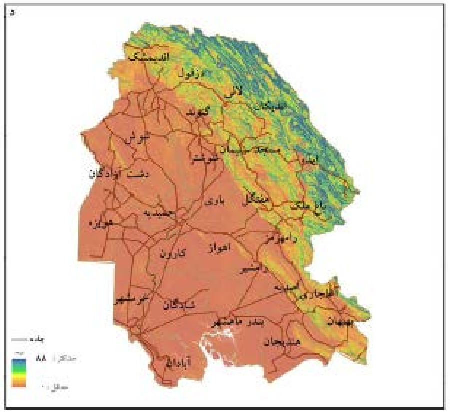








Physiographic features such as susceptibility, salty and swampy soil, low soil moisture, changes in land uses indicative of areas prone to the potential for dust to the West and the southern province. Hence the decision-making and planning necessary to prevent escalation of this phenomenon in various organizations and if possible confront the event that more be done to areas of the West and the southern province



THOMAS

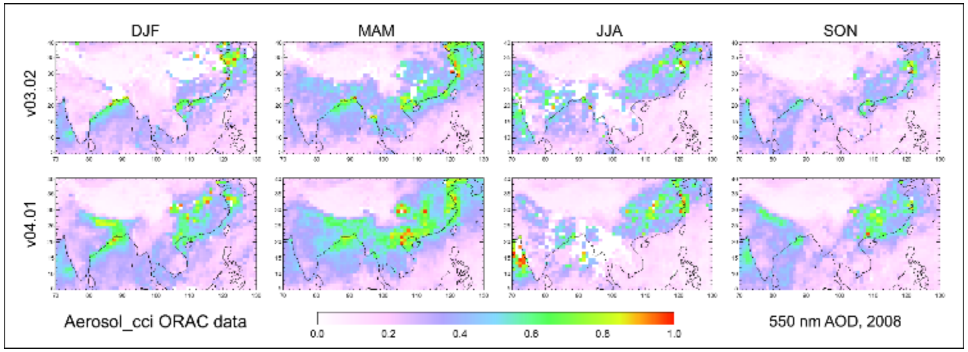
ORAC

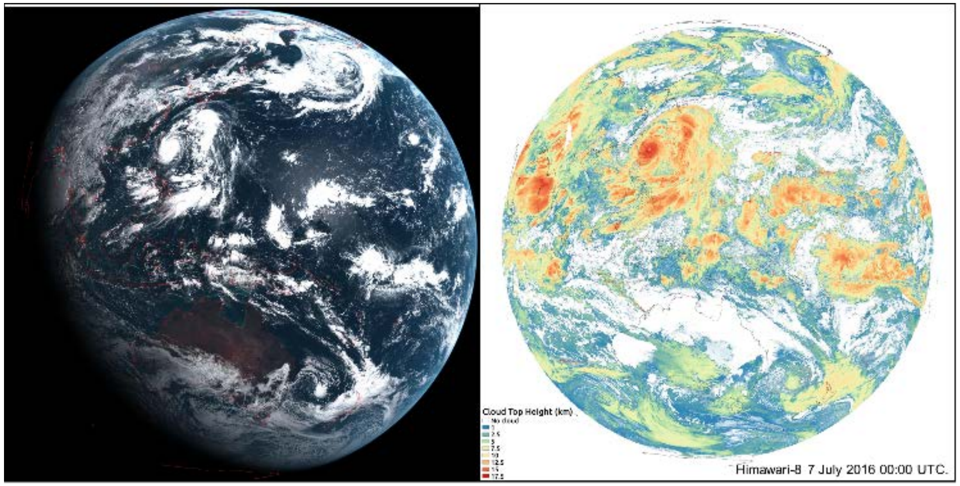
Optimal Retrieval of Aerosol and Cloud

Gareth Thomas

RAL Space, Rutherford Appleton Lab, UK

- Introduction to, and update on the ORAC algorithm
- A one-stop-shop for the retrieval of aerosol and cloud from visble-IR satellite imagers



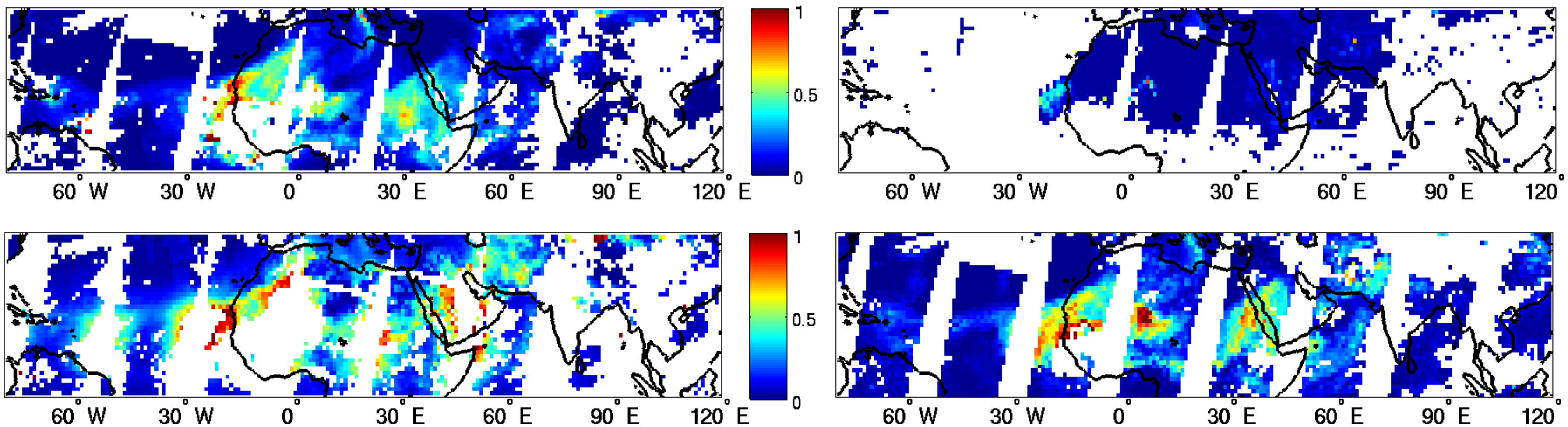


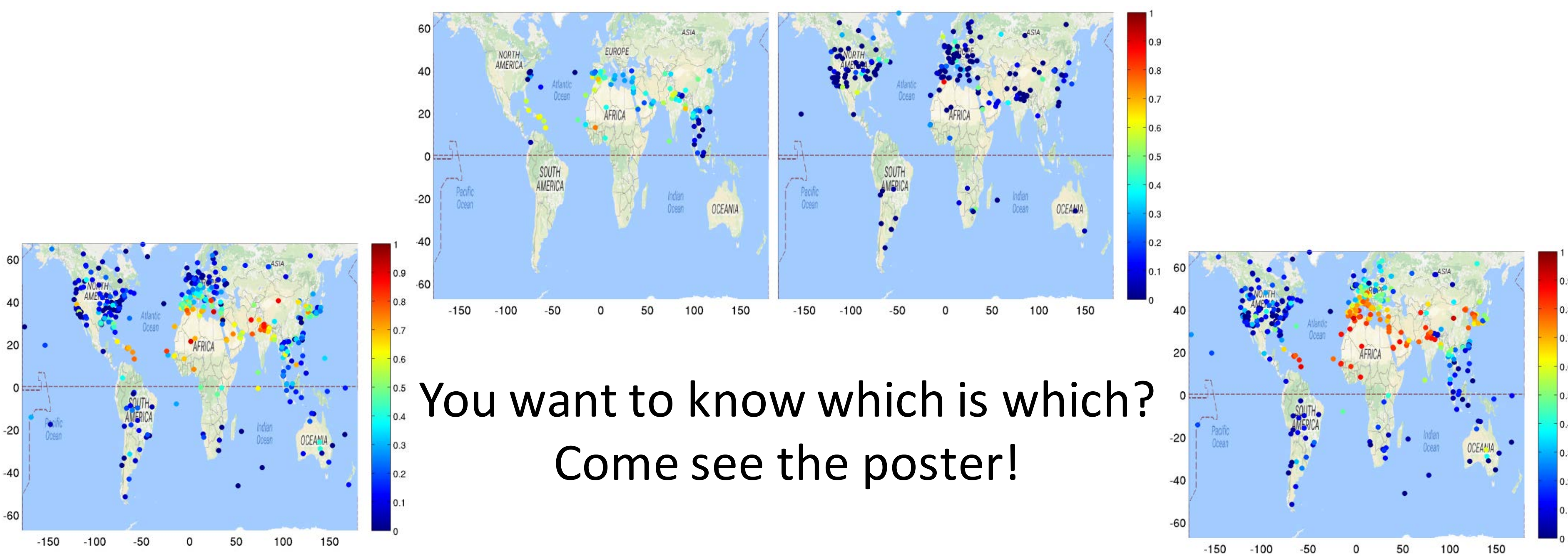
gareth.thomas@stfc.ac.uk P-2-22

VANDENBUSSCHE

Poster P2-24: IASI dust

Comparison of 4 algorithms





You want to know which is which?

Come see the poster!

VANDENBUSSCHE

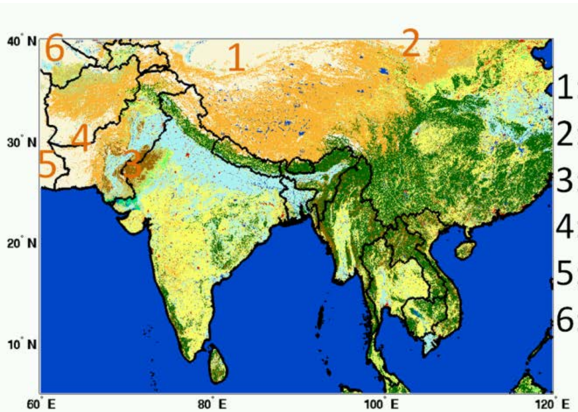
Living Planet Fellowship

BIRA-IASB

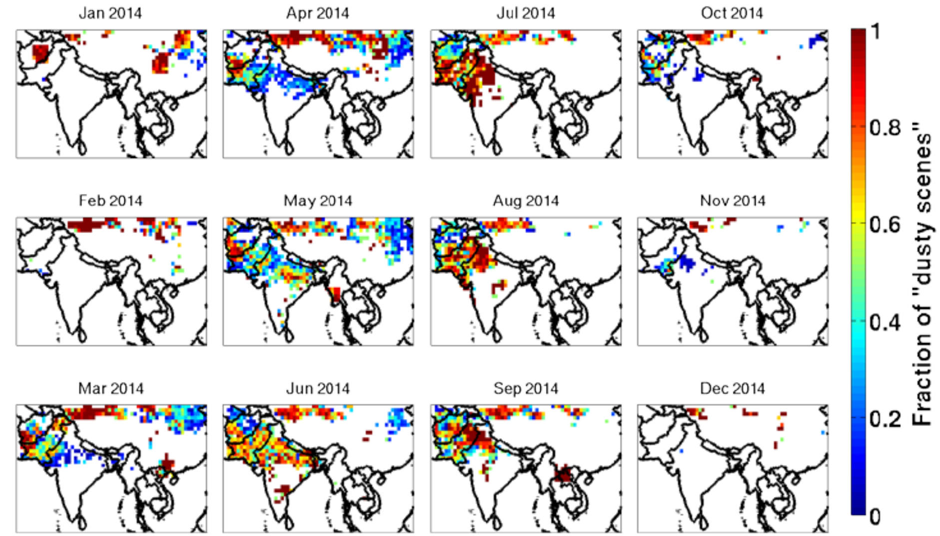
aeronomie.be

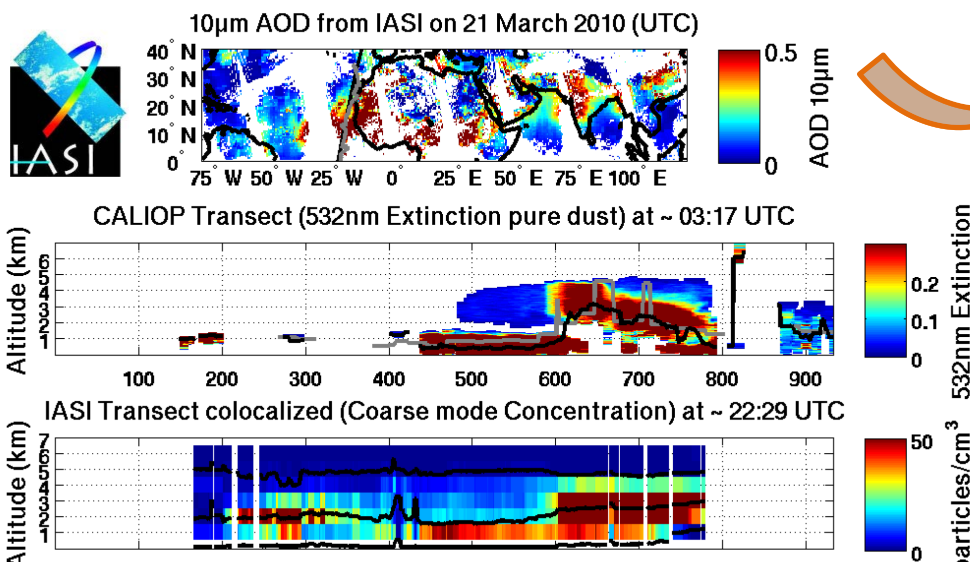
Poster P2-25: Study of Asian dust sources

Seasonality, long term changes, …



1: Taklamakan
2: Alashan / Gobi
3: Thar / Great Indian
4: Registan
5: Dasht-e Lut
6: Karakoum





About 10 years of 3D dust distribution over the « dust belt »

Quality checks

Ensuring surface sensitivity

Reporting occurrence of dusty scenes

XIE

Image fusion of MODIS AOD products based on maximum likelihood estimate method

Method

In this study, we use the maximum likelihood method to determine the weights of various images involved in fusion to produce an Brazil's AOD data set from 2007 to 2010 based on two AOD products: MOD DB and MOD DT according to the pixel error

- First we compare the various products to AERONET to determine the error size of the pixels of the various products.
- Then, we study and determine the relationship among the observation error, the value of the remote sensing observations and the value of surface reflectance, so as to determine the error size of the observation value in the absence of the ground sensing station
- Finally, we determine the weight of the fusion according to the root mean square error of the different products (Xu et al., 2015)

Study results and conclusion

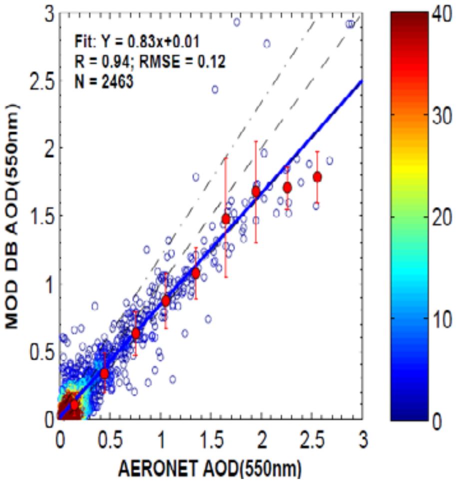


Fig. 1. MOD DB vs AERONET data from 2007 to 2010.

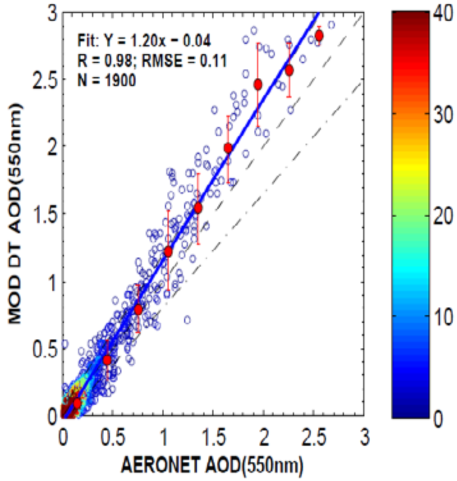


Fig. 2. MOD DT vs AERONET data from 2007 to 2010.

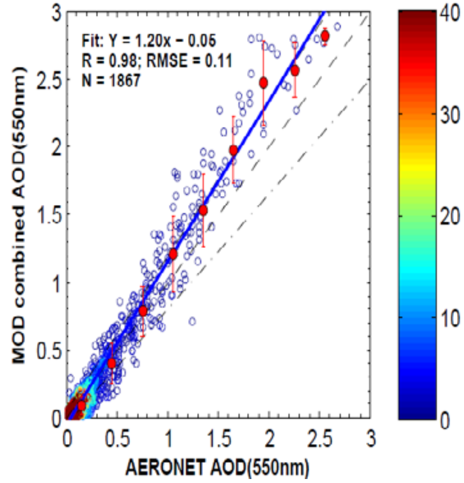


Fig. 3. MOD combined vs AERONET data from 2007 to 2010.

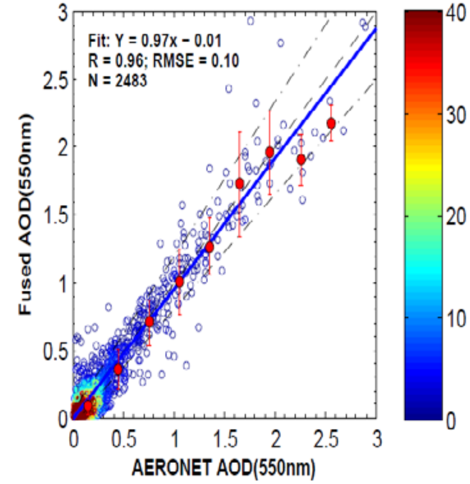


Fig. 4. MOD fused vs AERONET data from 2007 to 2010.

After comparing the original data, combined data and fused data with the AERONET observations, we find that the **RMSE of the fused image is smaller than all other data**, and **its correlation coefficient is better** than MOD DB AOD, so the data quality is improved. Meanwhile, the proportion of the fused AOD image with valid value is larger than any of the original products and MOD combined AOD. Thus, the fusion increases the spatial coverage.