SDG and International Society for Photogrammetry and Remote Sensing (ISPRS)

Lena Halounová, ISPRS Secretary General

Space-based systems for resilient and low-emission societies: The way forward
Working Group 3 on "International groups, platforms and partnerships
Nov 23, 2017

Agenda 2030 – 17 Sustainable development Goals

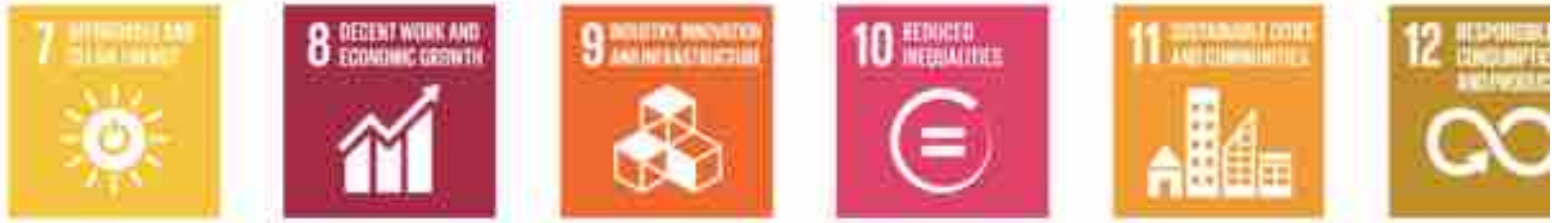
17 Sustainable Development Goals (SDGs) were adopted by world leaders in September 2015 at historic UN Summit

On 1 January 2016, the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development— officially came into force.

SDG

- Goal 1. End poverty in all its forms everywhere
- Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture – DRR – **drought**
- Goal 3. Ensure healthy lives and promote well being for all at all ages – DRR -**air pollution**
- Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- Goal 5. Achieve gender equality and empower all women and girls
- Goal 6. Ensure availability and sustainable management of water and sanitation for all

SDG



- Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all
- Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
- Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- Goal 10. Reduce inequality within and among countries
- Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable - DRR - **flood, landslide, earthquake, …**
- Goal 12. Ensure sustainable consumption and production patterns

SDG

- Goal 13. Take urgent action to combat climate change and its impacts
- Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss – *not classified as disasters*
- Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
- Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

ISPRS Working Groups - Goal 2

Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture

WG III/10: Agriculture and Natural Ecosystems Modelling and Monitoring

Some of ToR:

- *Development of new methodologies and algorithms for improving the contribution of remote sensing towards knowledges related to* ***agriculture and natural ecosystems***
- *Test and assess new remote sensing algorithms for monitoring* ***natural and anthropogenic ecosystems***
- *Apply remote sensing for supporting* ***precision agriculture*** *by spectral signature in crops for smart farm management*
- *Support climate change studies through remote sensing applications for global and regional scales* ***dynamics*** *monitoring and modelling*

ISPRS Working Groups - Goal 3

Goal 3. Ensure healthy lives and promote well being for all at all age

ICWG III/IVc: Environment and Health

<u>Some of ToR:</u>

Bridge the geospatial science, Earth science and health science communities to explore interdisciplinary collaborations to ***improve our overall health and well-being****.*

Develop two expert groups: 1) Remote Sensing and geospatial technology applications in estimating environmental exposure risk factor for clinical practices and 2) Remote Sensing and geospatial technology applications in ***ecosystem****,* ***climate change*** *and* ***variability****, and* ***public health*** *studies.*

ISPRS Working Groups - Goal 3

WG III/8: Remote Sensing of Atmospheric Environment

Some of ToR:

- *Development of satellite observations on atmospheric environment including* ***air pollutants, aerosol*** *and its dynamic process*
- *Development of new models for estimating atmospheric* ***aerosol optical depth****, characteristics and* ***particulate matters*** *(PMs) concentration*
- *Development of new models for extracting atmospheric parameters through sounders/GPS/LiDAR/radio occultation, etc.*
- *Development of spatio-temporal methodologies and* ***GIS-based systems*** *for atmospheric environment analysis*
- *Evaluation and validation of satellite* ***observations on atmospheric components and PMs concentration***
- *Assessment of the impact of urbanization and fossil energy on atmosphere environment*

ISPRS Working Groups - Goal 11

Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable

ICWG III/IVa: Disaster Assessment, Monitoring and Management

Some of ToR:

- *Generation of vulnerability and hazard zone maps for different type of disasters, such as **forest** fire, **cyclone, floods, drought, volcano** eruptions, **earthquakes**, **landslides** etc. and identification & assessment of potential risk zones*

WG III/9: Cryosphere and Hydrosphere

Some of ToR:

- *Develop early warning systems for natural disasters like **droughts** and **floods***

DRR – example: papers dedicated to landslides

LANDSLIDES EXTRACTION FROM DIVERSE REMOTE SENSING DATA SOURCES USING SEMANTIC REASONING SCHEME

Landslides Extraction, Semantic Reasoning, High Resolution Imagery

SPATIAL RESOLUTION EFFECTS OF DIGITAL TERRAIN MODELS ON **LANDSLIDE SUSCEPTIBILITY ANALYSIS**

Landslide, Susceptibility analysis, Certainty factor, Remote sensing

COMPARISON of FUZZY-BASED MODELS in **LANDSLIDE HAZARD MAPPING**

Landslide, Fuzzy-based Models, Quality Sum Index, Accuracy

DRR – examples: papers dedicated to **floods**

GOVERNMENT PARTNERSHIP TOWARDS EFFECTIVE APPLICATION OF GEOSPATIAL TECHNOLOGIES FOR SMARTER **FLOOD DISASTER MANAGEMENT**

Geospatial technology, Flood, Disaster management

3D GIS FOR FLOOD MODELLING IN RIVER VALLEYS

flood modelling, CityGML, laser scanning, 3D geometry modelling

INFLUENCE OF DEM IN WATERSHED MANAGEMENT AS **FLOOD ZONATION MAPPING**

GIS, DEM, Drainage Pattern, Flash-Floods

OPEN SOURCE WEB-BASED SOLUTIONS FOR DISSEMINATING AND ANALYZING **FLOOD HAZARD** INFORMATION AT THE COMMUNITY LEVEL

Web-based Solutions, Flood hazards, Information Dissemination, Community-level Hazard Assessment

DRR – examples: papers dedicated to **drought**

DROUGHT FORECASTING BASED ON MACHINE LEARNING OF REMOTE SENSING AND LONG-RANGE FORECAST DATA

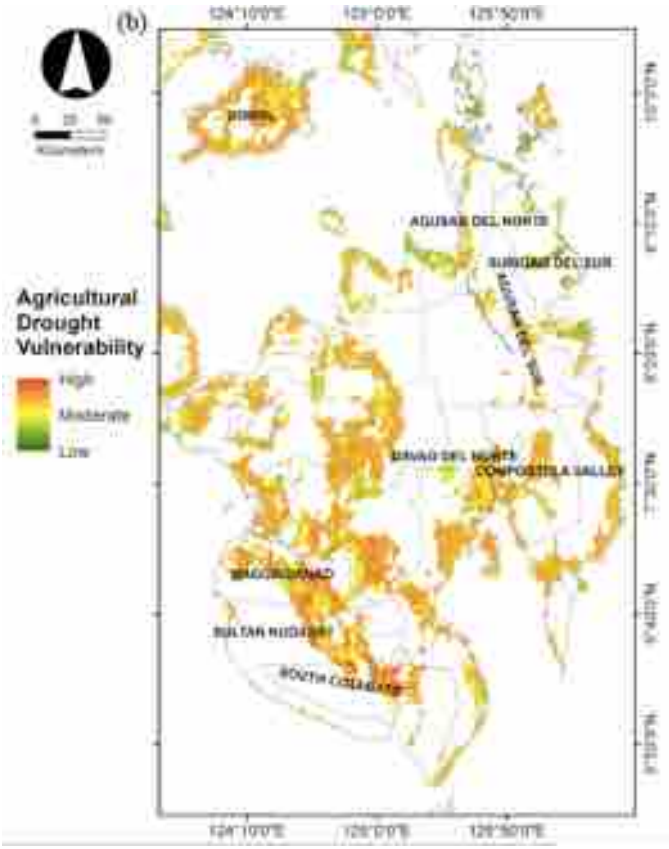
Forecasting, Machine learning, Long-range forecast, Remote sensing data – NDVI, evapotranspiration

A PROBABILITY MODEL FOR **DROUGHT PREDICTION** USING FUSION OF MARKOV CHAIN AND SAX METHODS

Markov Chain, Drought, Remote Sensing

FORECASTING AND MONITORING AGRICULTURAL DROUGHT IN THE PHILIPPINES

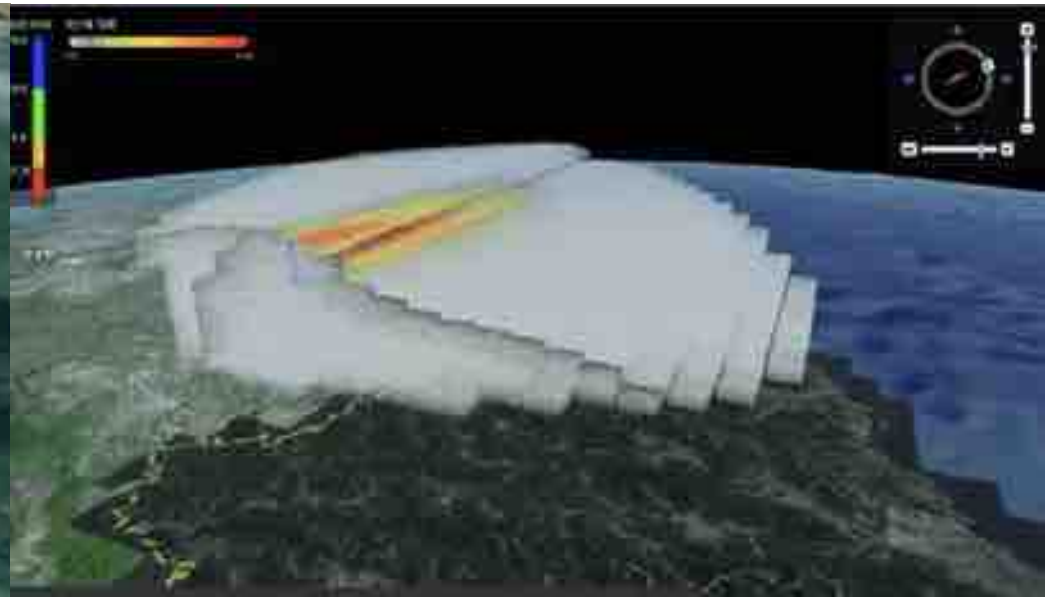
Remote Sensing Applications, Agriculture, Drought, Natural Hazards



DRR – examples: papers dedicated to **volcano**

3D VISUALIZATION OF **VOLCANIC ASH DISPERSION PREDICTION** WITH SPATIAL INFORMATION OPEN PLATFORM IN KOREA

modelling and visualisaton



DRR – example: papers on **food security**

FOOD VULNERABILITY AND ALLUVIAL FARMING FOR FOOD SECURITY IN CENTRAL DRY ZONE AREA OF MYANMAR

Food vulnerability map, alluvial farming

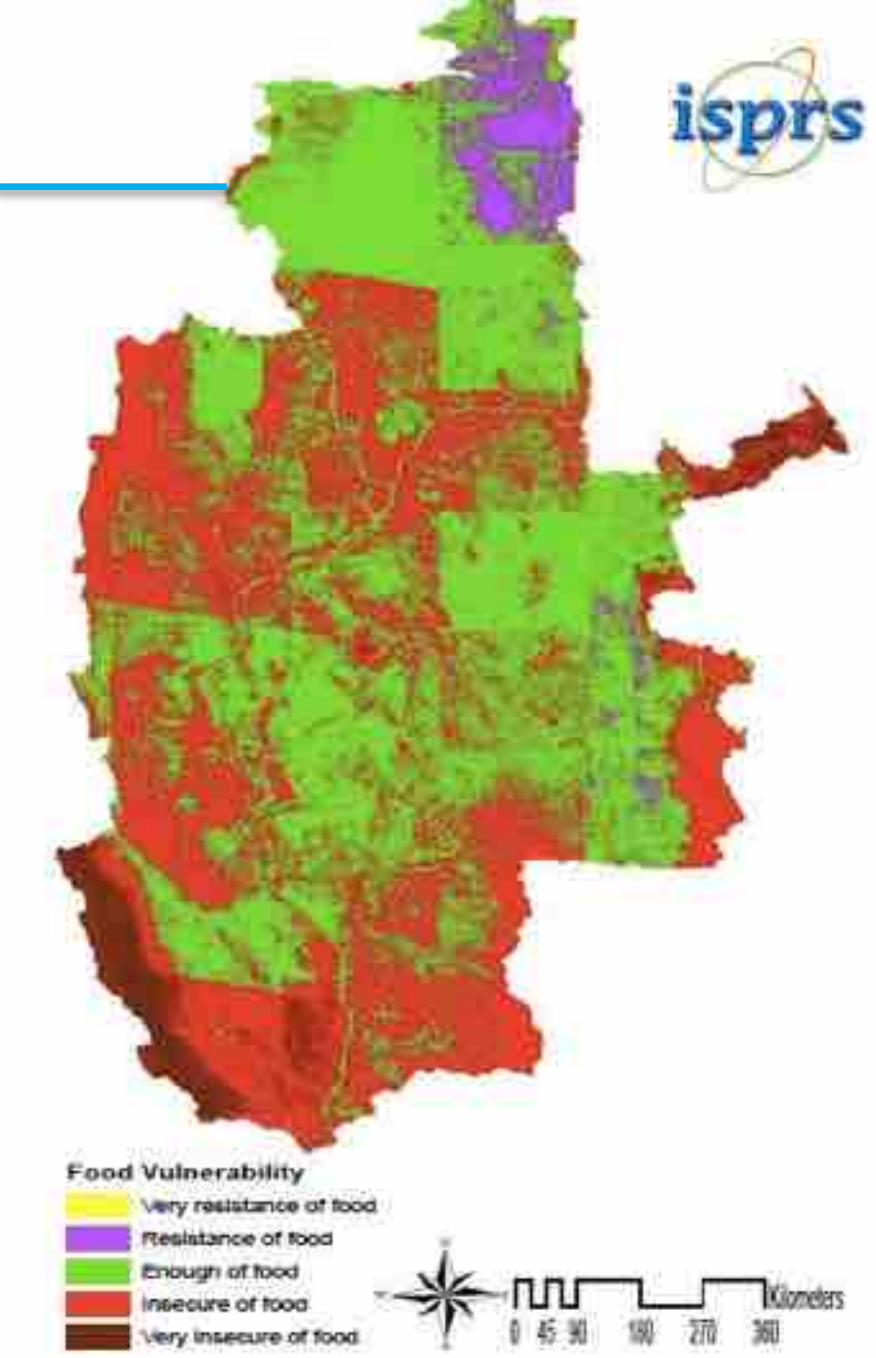


Figure 4. Food vulnerability map of central dry zone area of Myanmar

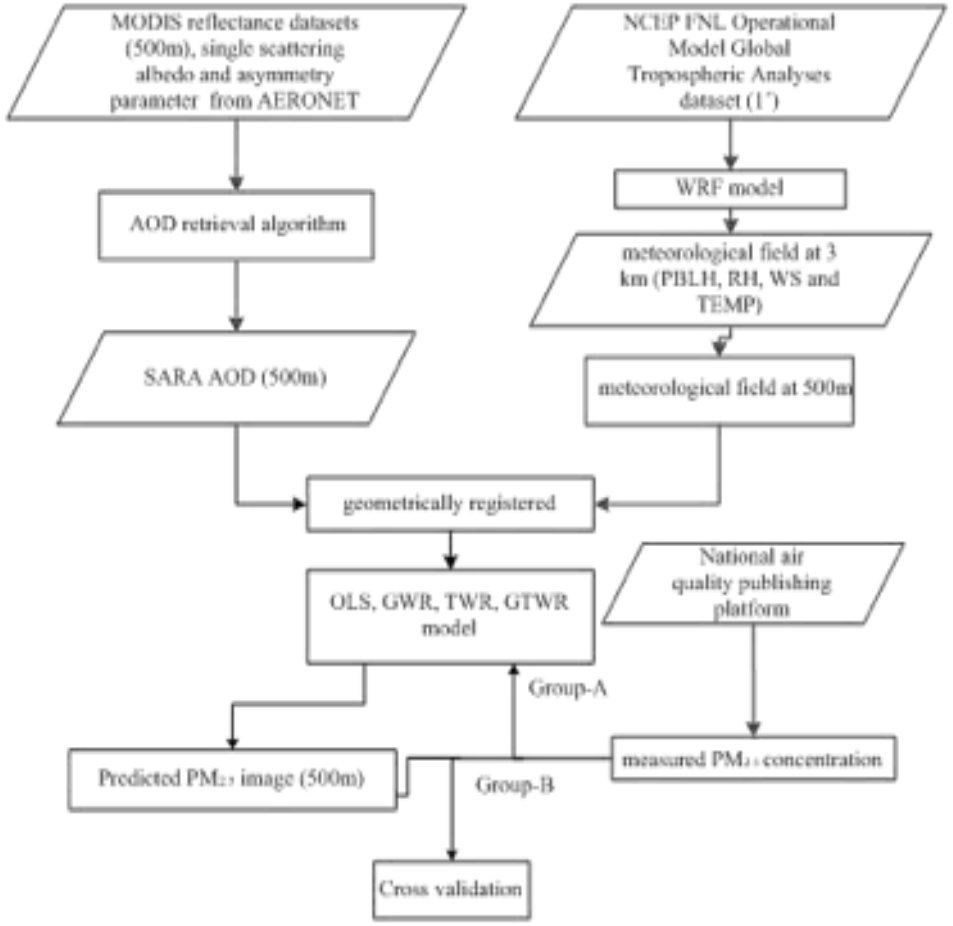
Some results dedicated to space technology applied for detection of air pollution by ISPRS

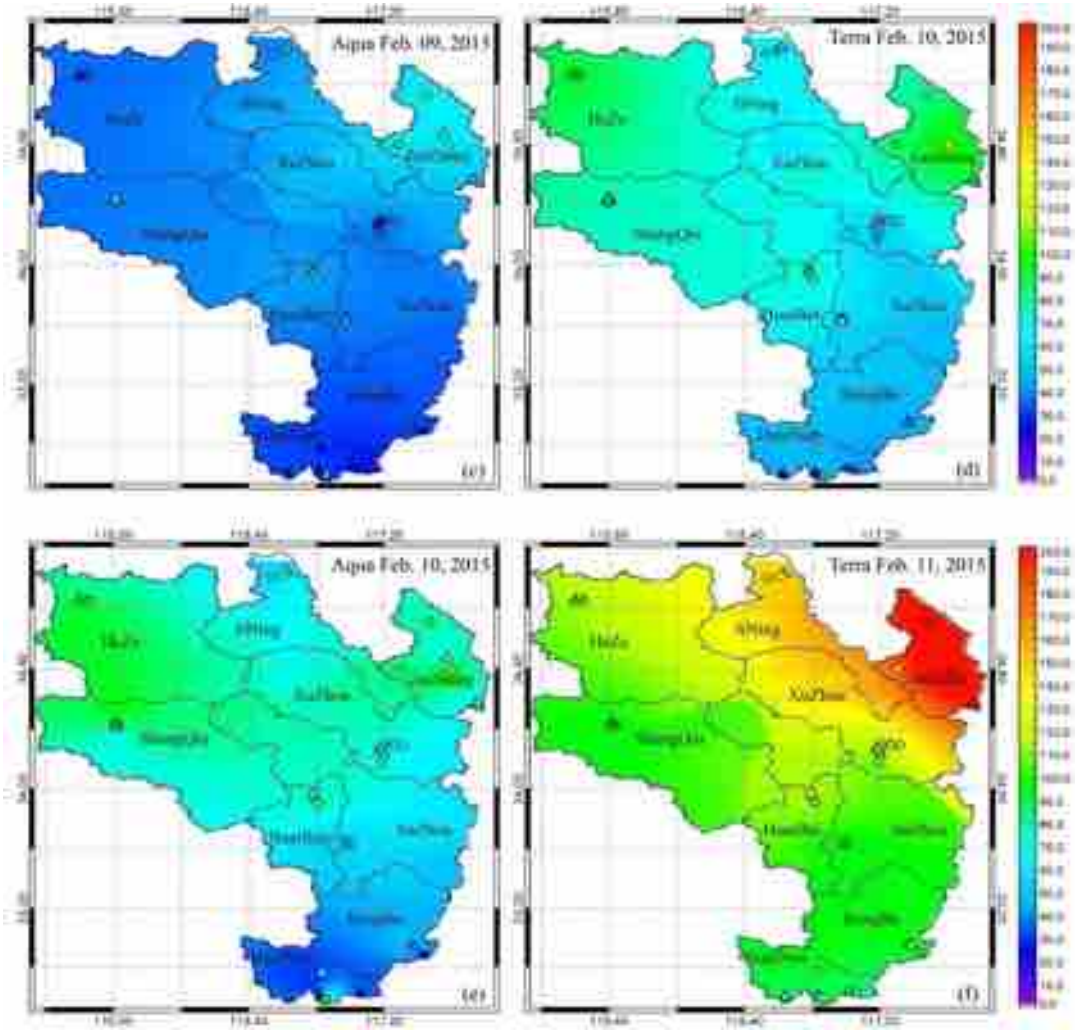
WG III/8: Remote Sensing of Atmospheric Environment

Air Pollution: Surface $PM_{2.5}$ from satellite observation

500m $PM_{2.5}$ estimation using MODIS/TERRA&AUQA satellites

Retrieval algorithm



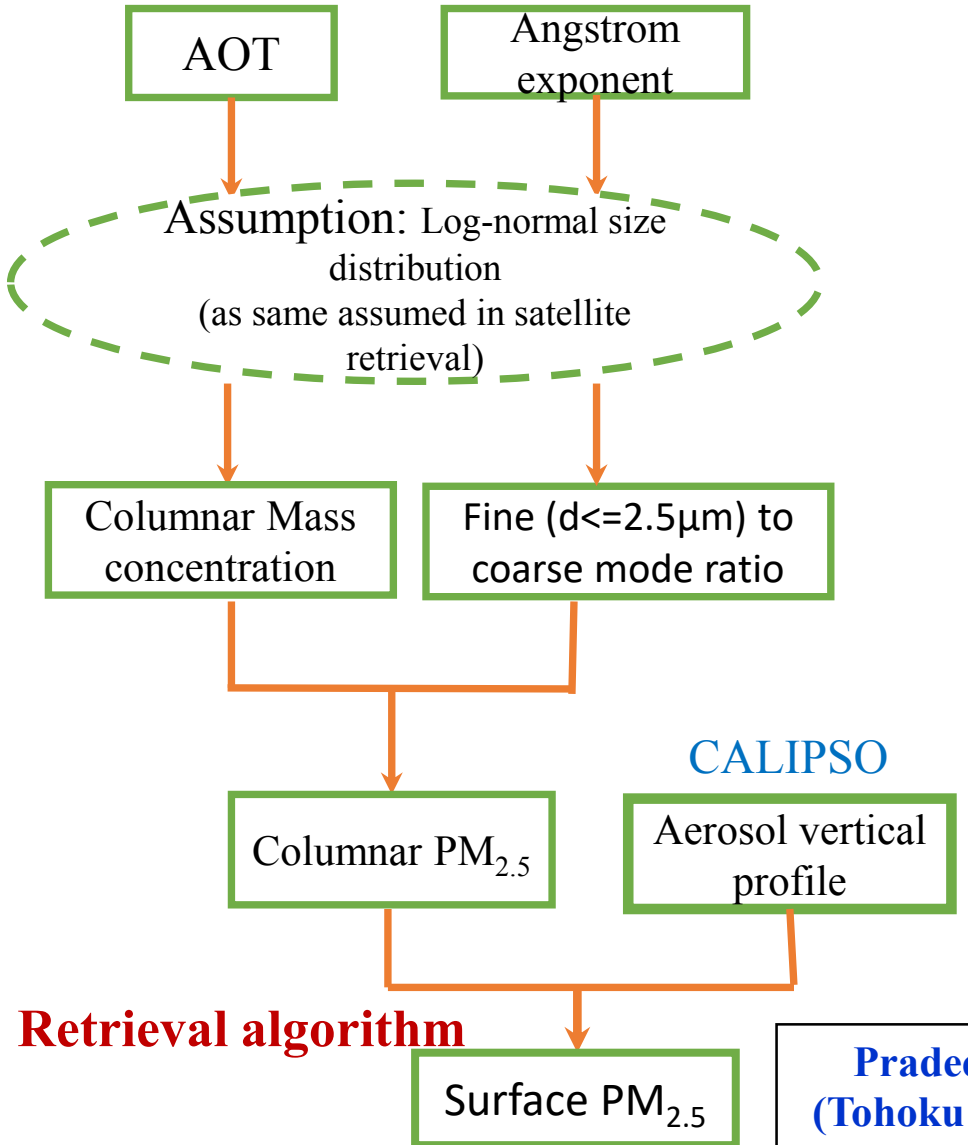


μg/m3

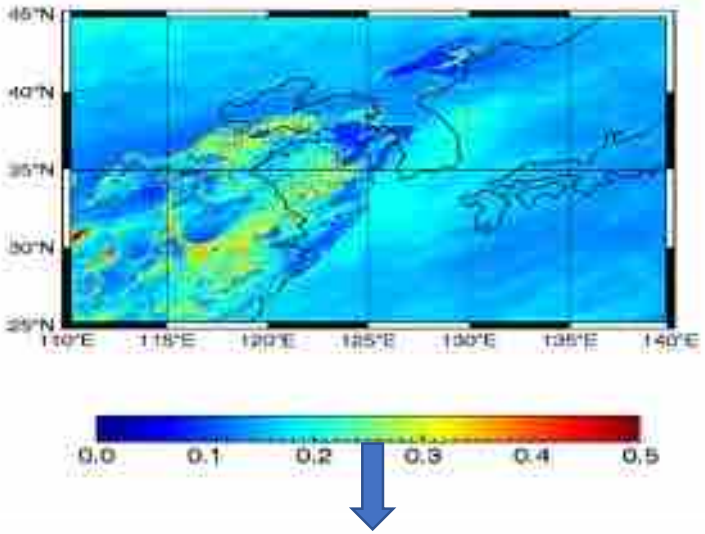
Reference: Bai Yang, Wu Lixin*, Qin Kai, et al. A geographically and temporally weighted regression model for ground-level $PM_{2.5}$ estimation from satellite-derived 500 m resolution AOD. Remote Sensing, 2016, 8(3): 262.

Air Pollution: Surface $PM_{2.5}$ from satellite observation

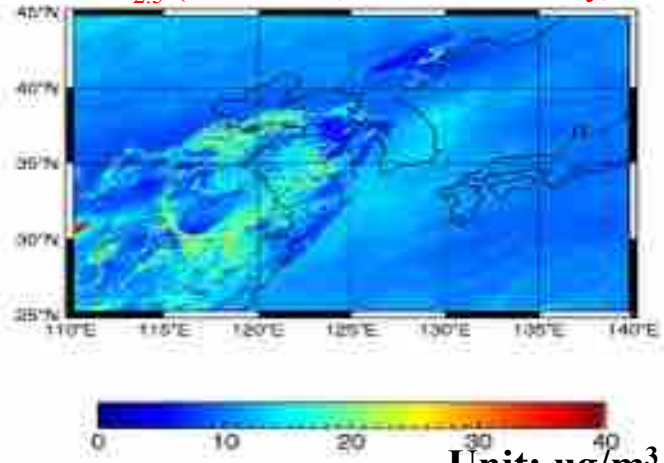
Hourly $PM_{2.5}$ estimation using AHI/Himawari-8 satellite



AOT (December, 2016 – February, 2017)



Surface $PM_{2.5}$ (December, 2016 – February, 2017)

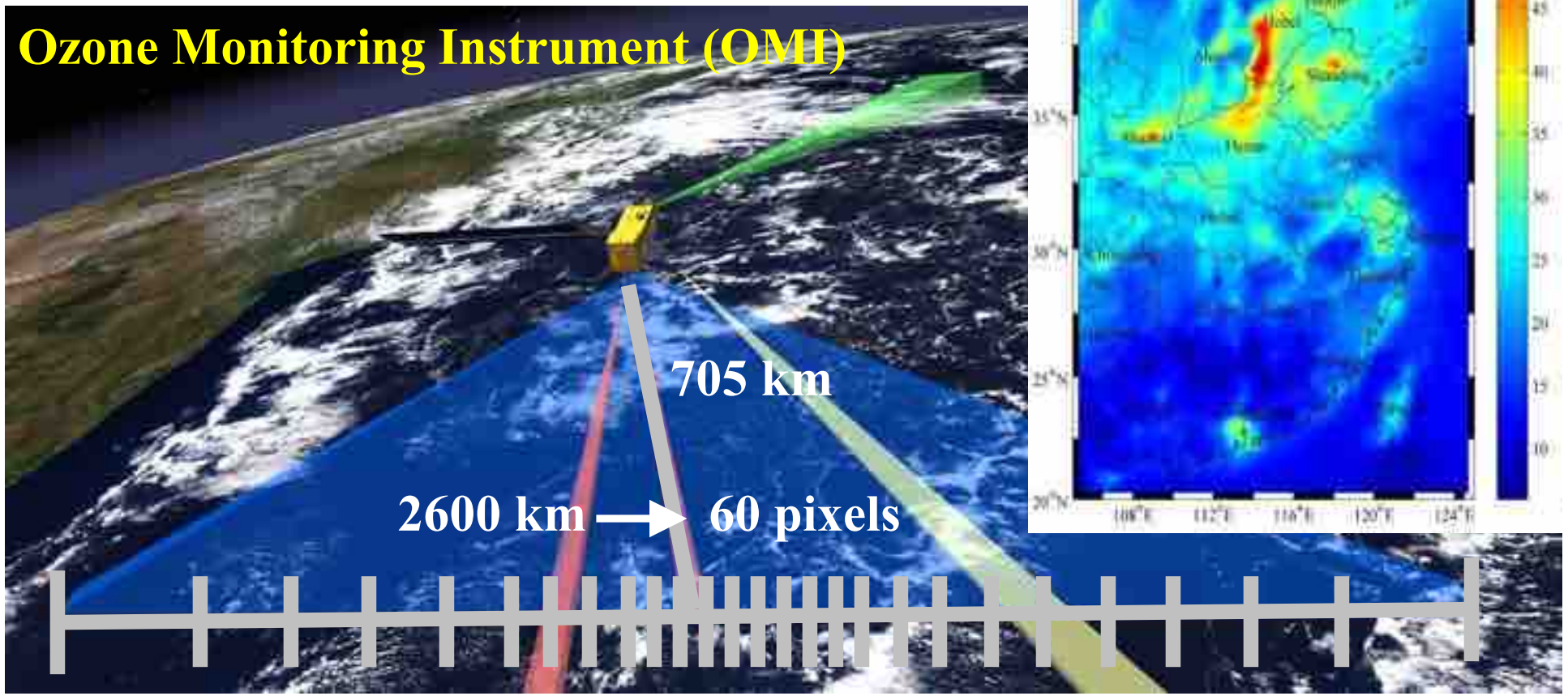


Unit: ug/m³

Pradeep Khatri
(Tohoku University)

Air Pollution: Surface NO_2 from satellite observation

- OMI satellite tropospheric NO2 columns together with ambient monitoring and meteorological data are used.
- A geographically and temporally weighted regression model is introduced.



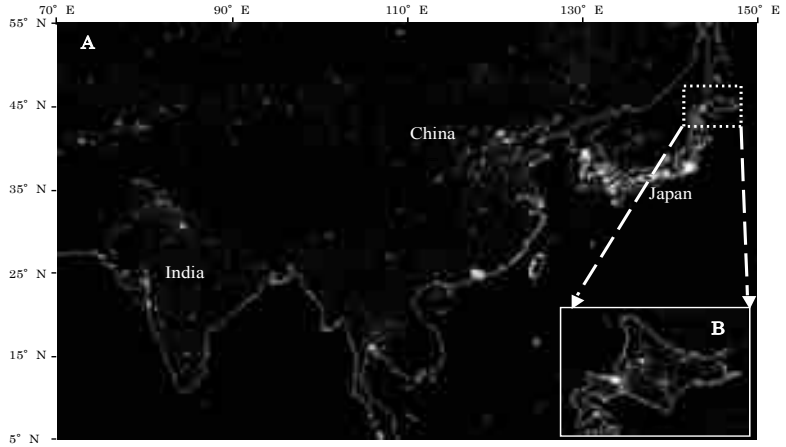
Reference: Qin Kai*, Rao Lanlan, Xu Jian et al. Estimating ground level NO_2 concentrations over central-eastern China using a satellite-based geographically and temporally weighted regression model. Remote Sensing, 2017, 9, 950.

Air Pollution: Estimation of power plant CO_2 emissions by using DMSP/OLS satellite nighttime light data

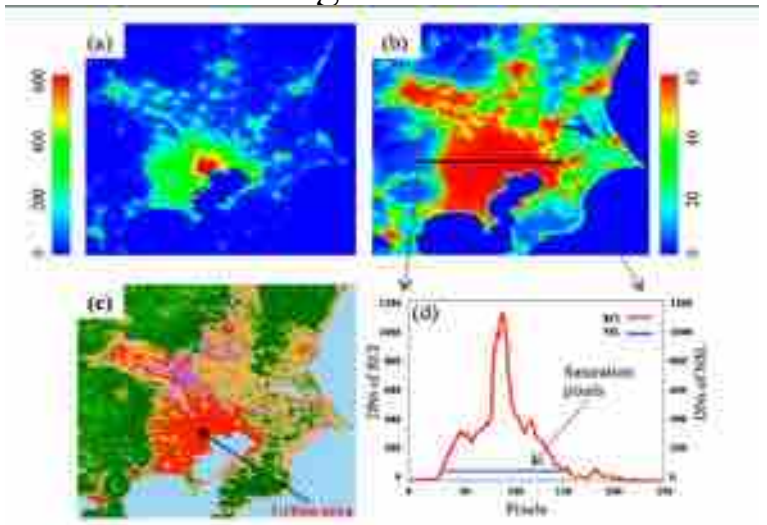
DMSP/OLS satellite
DMSP ： Defense Meteorological Satellite Program
OLS: Optical Linescan System

City light Gas flares Forest fires

Night time stable light for 1999



Saturation light correction method

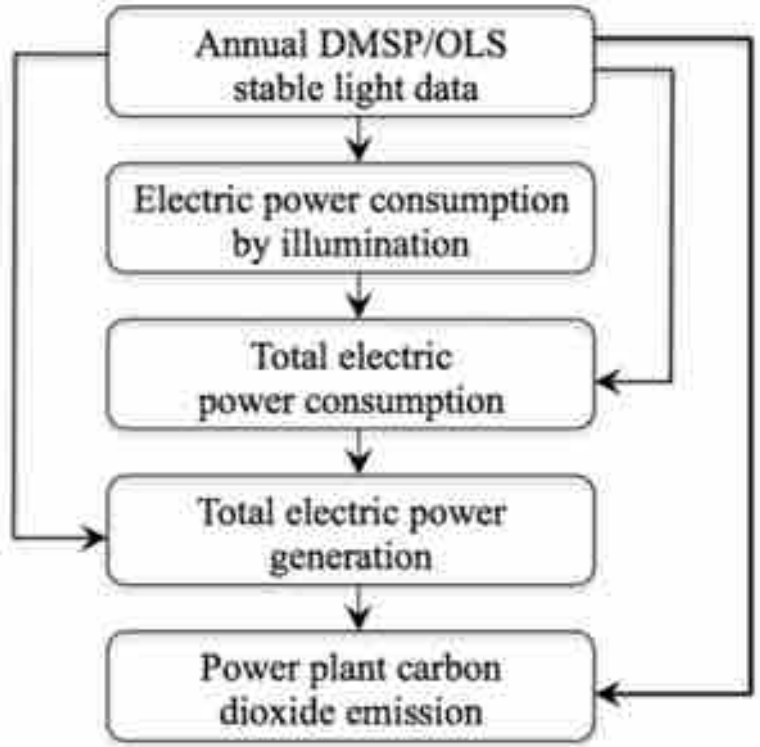


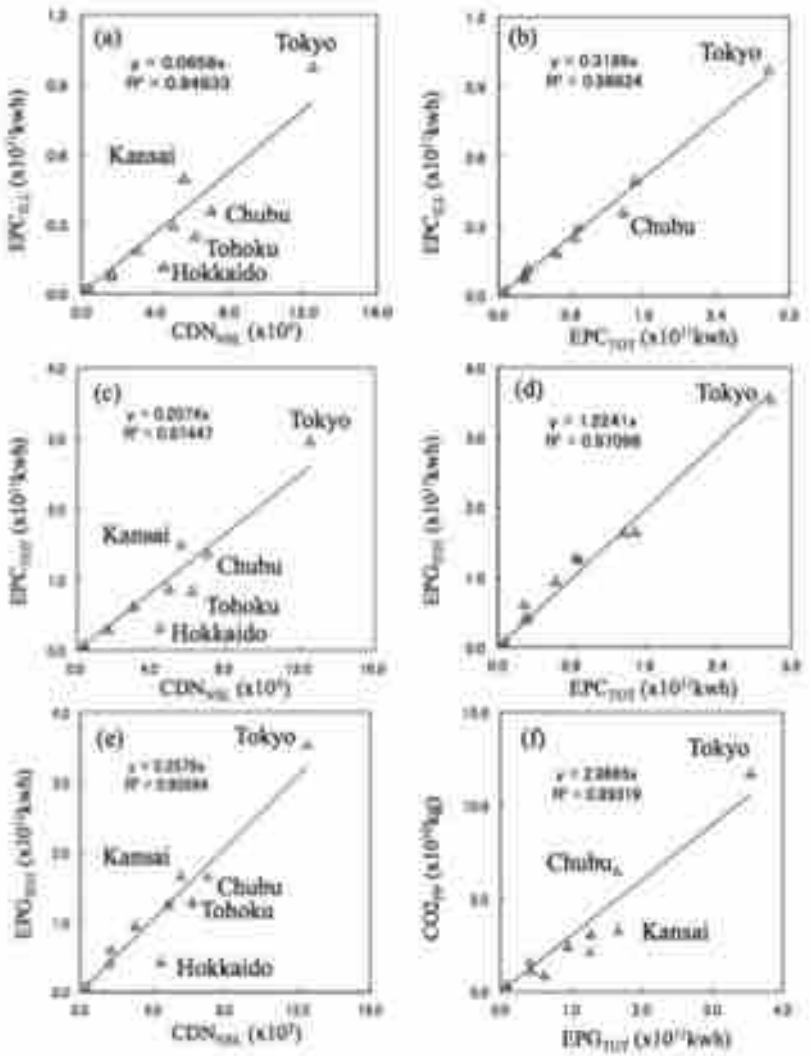
Reference:

1) Husi Letu*, Masanao Hara, Gegen Tana, Yuhai Bao, Generating the nighttime light of the human settlements by identifying periodic components from DMSP/OLS satellite imagery, *Environmental Science & Technology*, 49, 10503-10509, 2015.
2) Husi Letu*, Yuhai Bao, Gegen Tana, Fumihiko Nishio, Regional-scale estimation of electric power and power plant CO2 emissions using DMSP/OLS nighttime satellite data, *Environmental Science & Technology Letter*. 1 (5), 259–265, 2014.
3) Husi Letu*, Masanao Hara, Gegen Tana, Fumihiko Nishio, Saturated light correction method for the DMSP/OLS nighttime satellite imagery, *IEEE Transactions on Geoscience and Remote Sensing*, 50(2), 389-396, 2012.
4) Husi Letu*, Masanao Hara, Hiroshi Yagi, Kazuhiro Naoki, Gegen Tana, Fumihiko Nishio, Shuhei Okada, Estimating energy consumption from nighttime DMSP/OLS imagery after correcting for saturation effects, *International Journal of Remote Sensing*. 31 (16), pp. 4443–4458, 2010.

Air Pollution: Estimation of power plant CO_2 emissions by using DMSP/OLS satellite nighttime light data

Flowchart for estimating power plant CO_2 emission





(Letu et al., 2014, ESTL)

Conclusion

The way in which UNOOSA could work with ISPRS and other networks, groups and partnerships in the implementation of the Space 2030 agenda

Outputs of ISPRS members working in remote sensing:

1) detection of the actual events, situations

2) forcasting, models for future situations as prevention

ISPRS shares the knowledge and experience – by UNSPIDR GP STAR project

can share the knowledge and experience via – links to publications/authors, e.g.

Thank you

International Society for Photogrammetry and Remote Sensing (ISPRS)

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