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International workshop on Middle East (Regional) Dust Sources and Their Impacts

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NEWS

International workshop on Middle East (Regional) Dust Sources and Their Impacts

The Workshop on Middle East Dust Sources and Impacts will be held on 23-25 October 2017 in Istanbul/Turkey to share and evaluate the scientific research on the sources, transport, monitoring and impacts of dust.

The goal of this workshop is to exchange information and share experience between interested scientists and related organizations to better evaluate Middle East dust sources and impacts in the scientific framework. This workshop will be focused on;

- > Dust sources and monitoring the changes on these sources over Middle East Region
- > Dust-Climate interaction in the Middle East
- > Dust forecast and modelling
- > Monitoring and impacts of dust transport affecting Middle East

Please send detailed abstracts which should be related to subjects given above **by 28 July 2017** to below contact emails. Every abstract will be evaluated by at least three members of the scientific committee. There is a limited budget for the flight tickets of the experts whose abstracts are accepted by the scientific committee.

Contact emails:

akucumen@ormansu.gov.tr; svrncetin@ormansu.gov.tr; gulewera@ormansu.gov.tr; agisik@mgm.gov.tr

Please "CC" all above contacts to your email while sending your documents.

Expected participants who can send abstracts: Interested scientists, institutions and organizations.

Organization:

The workshop is hosted by the Republic of Turkey Ministry of Forestry and Water Affairs, Turkish State Meteorological Service (TSMS) and General Directorate of Combating Desertification and Erosion (ÇEM).

Place: Istanbul/Turkey

LATEST NEWS

6th Training Course on WMO SDS-WAS Products [Satellite and Ground Observation and Modelling of Atmospheric Dust]
May 12, 2017

International workshop on Middle East (Regional) Dust Sources and Their Impacts
May 12, 2017

WMO releases the first issue of Airborne Dust Bulletin
Mar 29, 2017

UPCOMING EVENTS

International workshop on Middle East (Regional) Dust Sources and Their Impacts
Oct 23, 2017
- Istanbul, Turkey

6th Training Course on WMO SDS-WAS Products [Satellite and Ground Observation and Modelling of Atmospheric Dust]
2017
Turkey



Methodology Framework for SDS Sources Identification

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&

Mohsen Bakhtiari, Naser Moghadasi, Amir-Fateh Vahdati and Farzaneh Moshaiedi



1. Sources of SDS

- ❖ Anthropogenic
- ❖ Natural

2. Dust Sources Categorization

- ❖ Deserts
- ❖ Agricultural Fields
- ❖ Dried River Beds, Lakes, Dams
- ❖ Degraded Rangelands
- ❖ Dried Wetlands

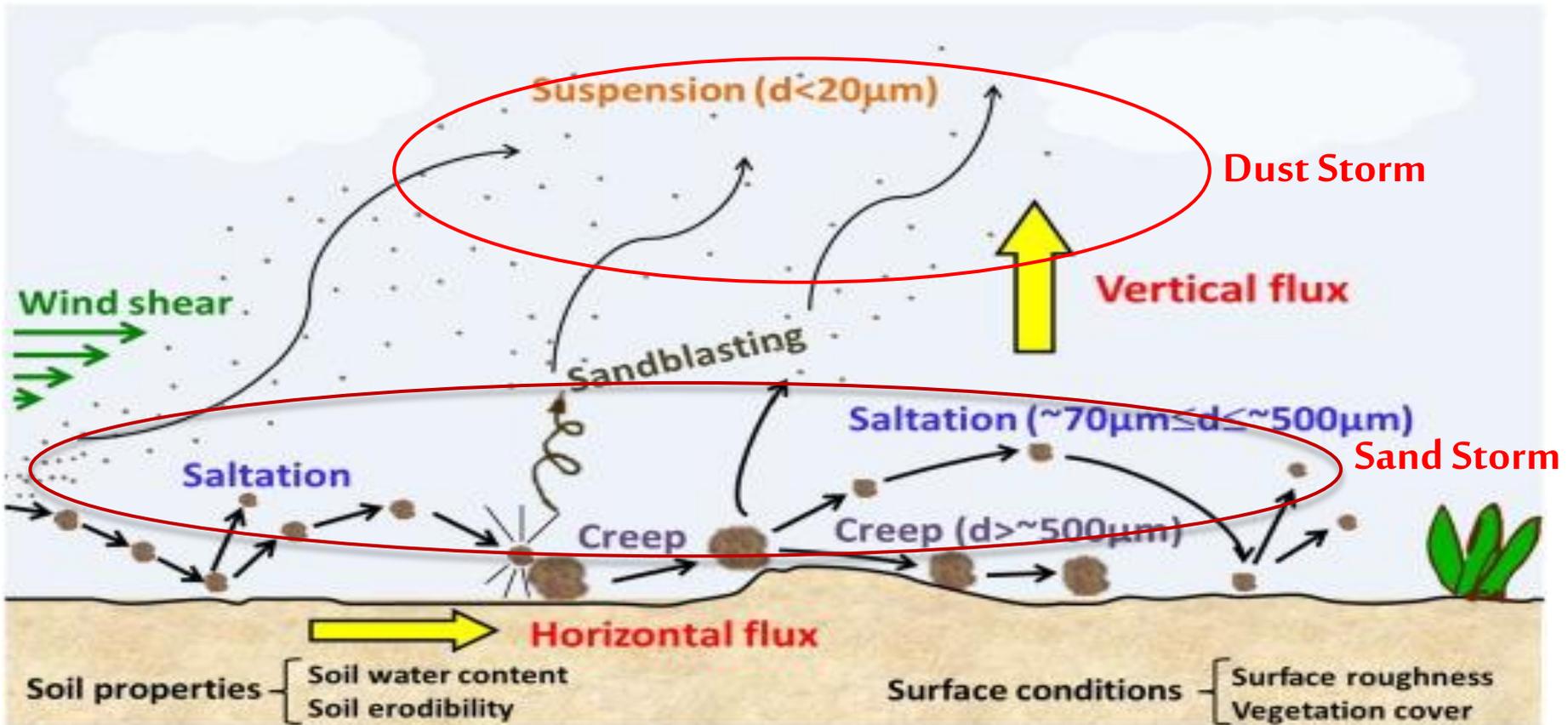
3. Dust Particles (Dust Compositions)

- ❖ Mineral
- ❖ Transportation (Road)
- ❖ Civil Construction
- ❖ Agricultural
- ❖ Industrial (Factories)

4. Developed Methodologies in SDS sources identification

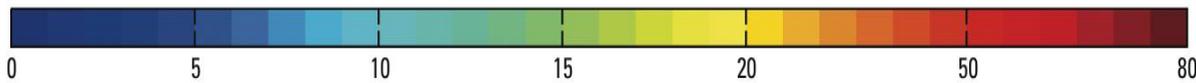
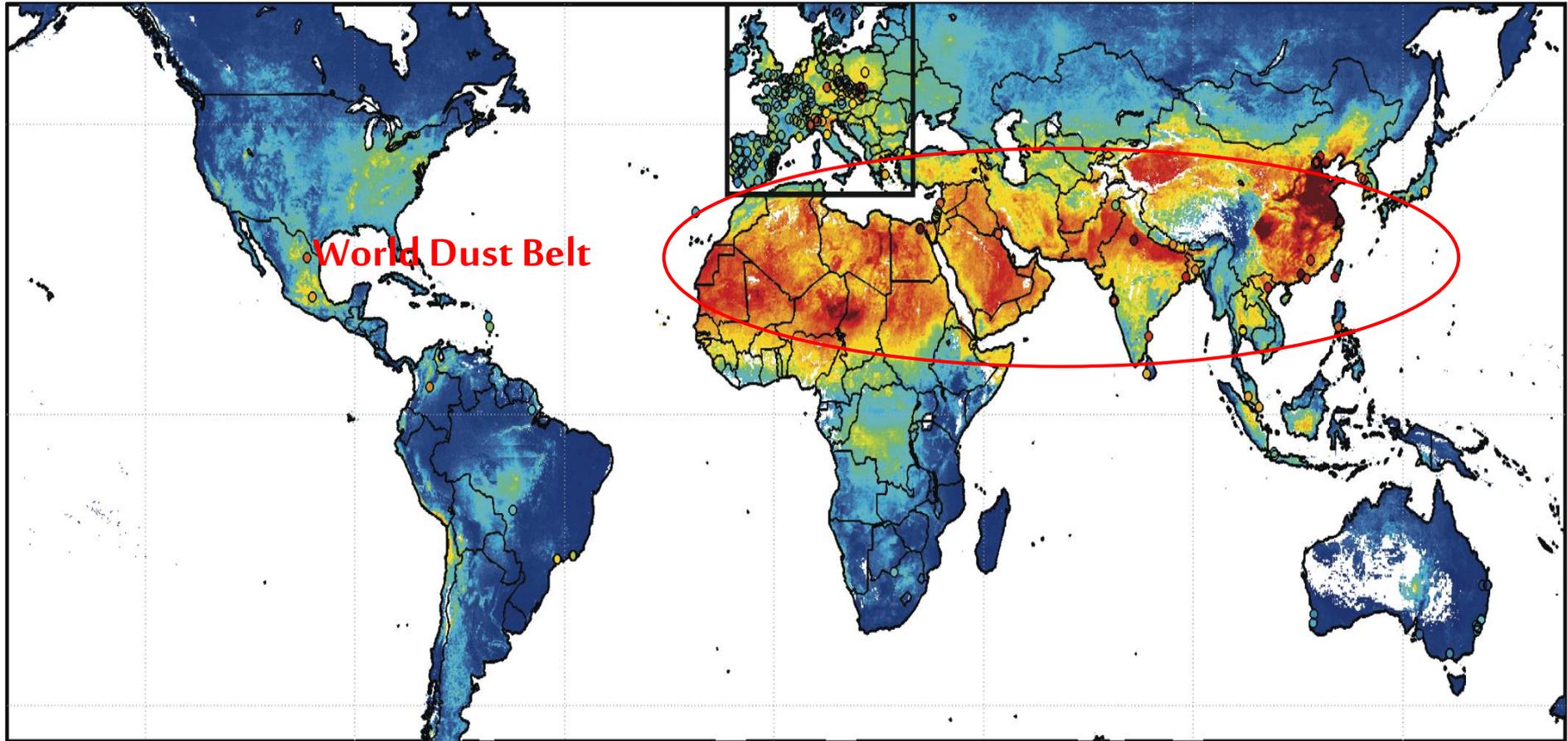
Definitions of Sand & Dust Storms

Sand storms and dust storms bear inextricable relationships and hence SDS is used as a general term to refer to both unless clarified in my presentation.





Sources of SDS: A General Overview of SDS



Satellite-derived $PM_{2.5}$ ($\mu g/m^3$)

Van Donkelaar et al

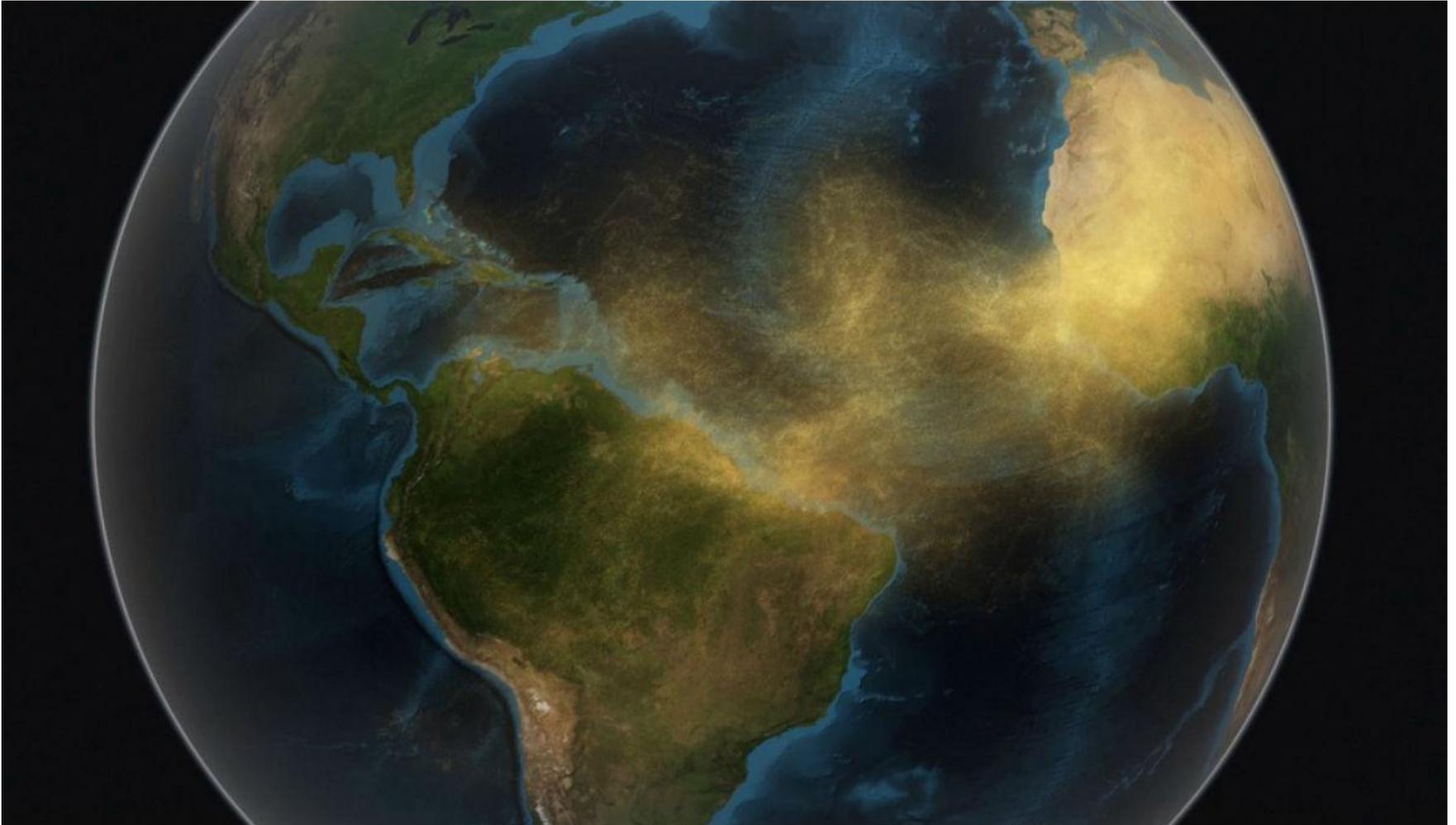


GEOINFORMATICS
Research Institute (GRI)

Sources of SDS: Natural Dust Sources



Uni. Of Tehran





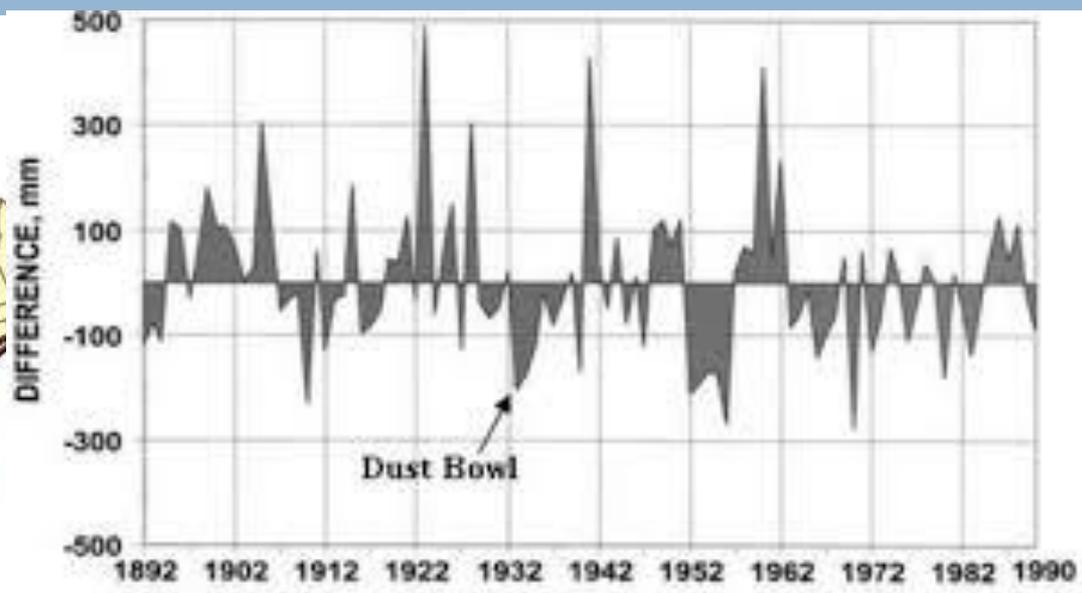
(1) Anthropogenic Dust the USA



DUST STORM DAMAGE, 1930-1940

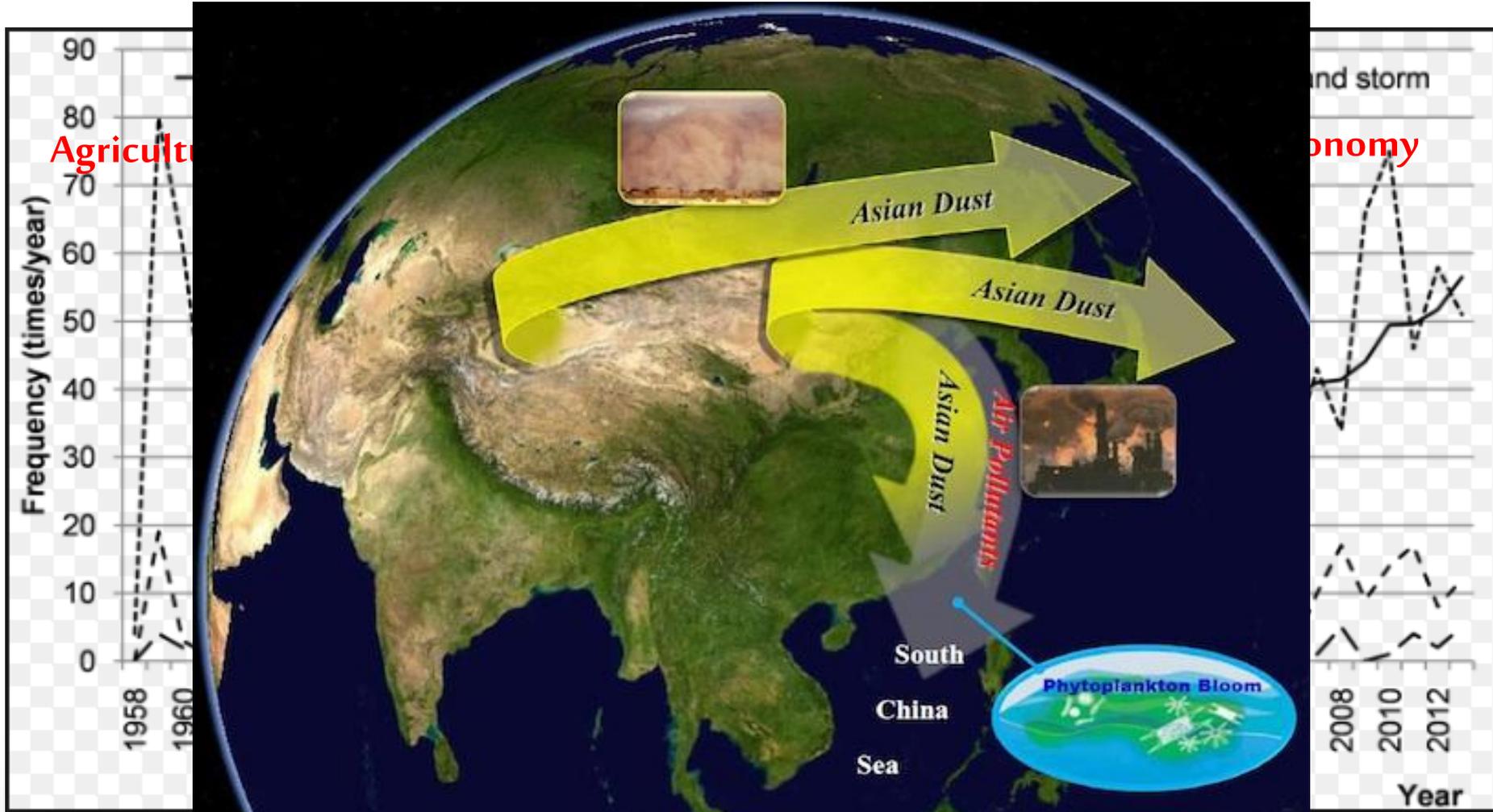


- Dust Bowl States
- Area with most severe dust storm damage
- Other areas damaged by dust storms





(2) Anthropogenic Dust the China

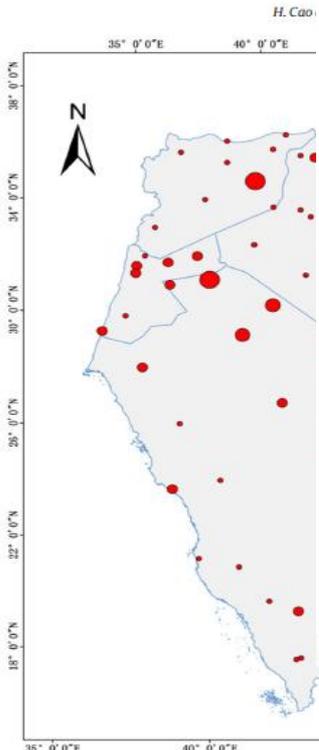
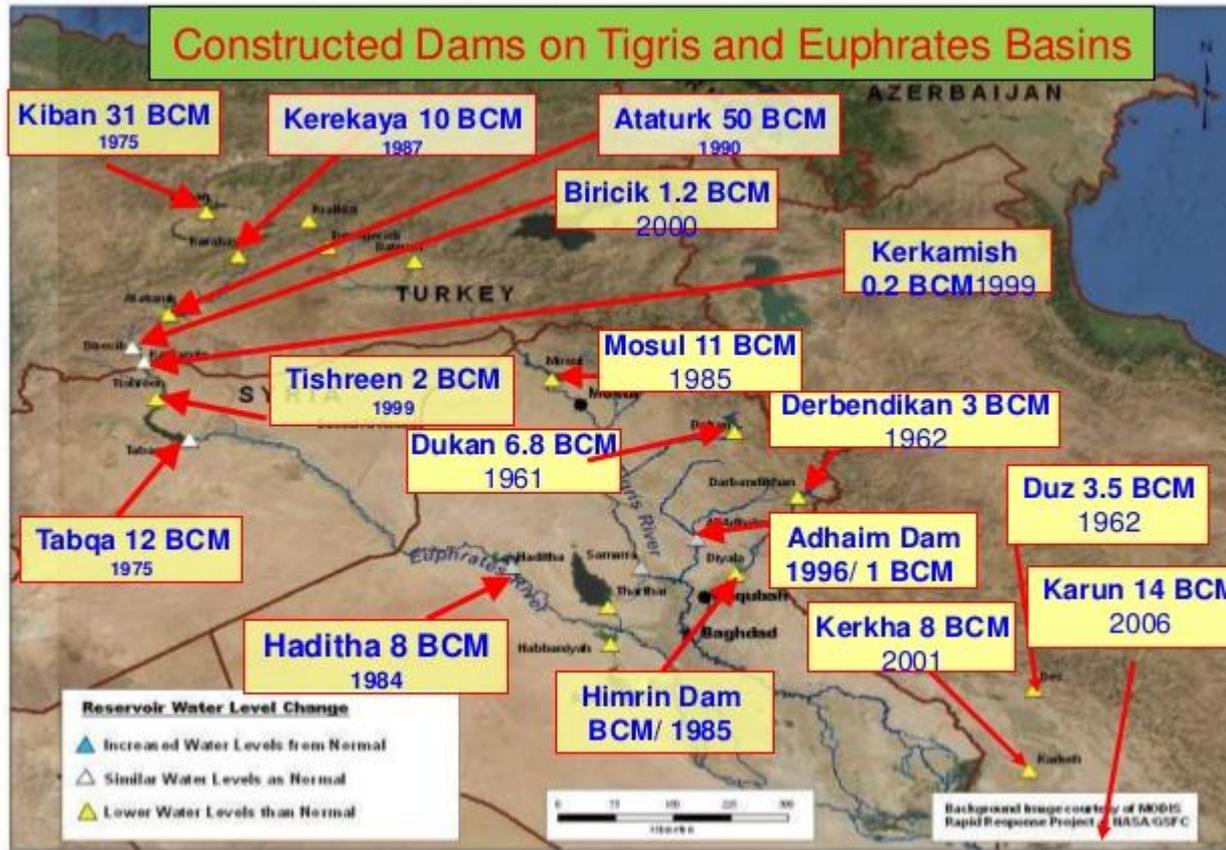




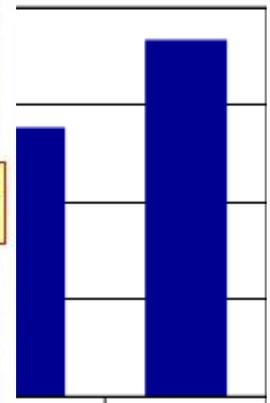
(3) Anthropogenic Dust West Asia



- (1) the decision by the Iraqi government to initiate the 1980-88 war against Iran:
- (2) Iraq's invasion
- (3) The sanctions
- (4) Collapse of Saddam's regime
- (5) After Saddam's regime



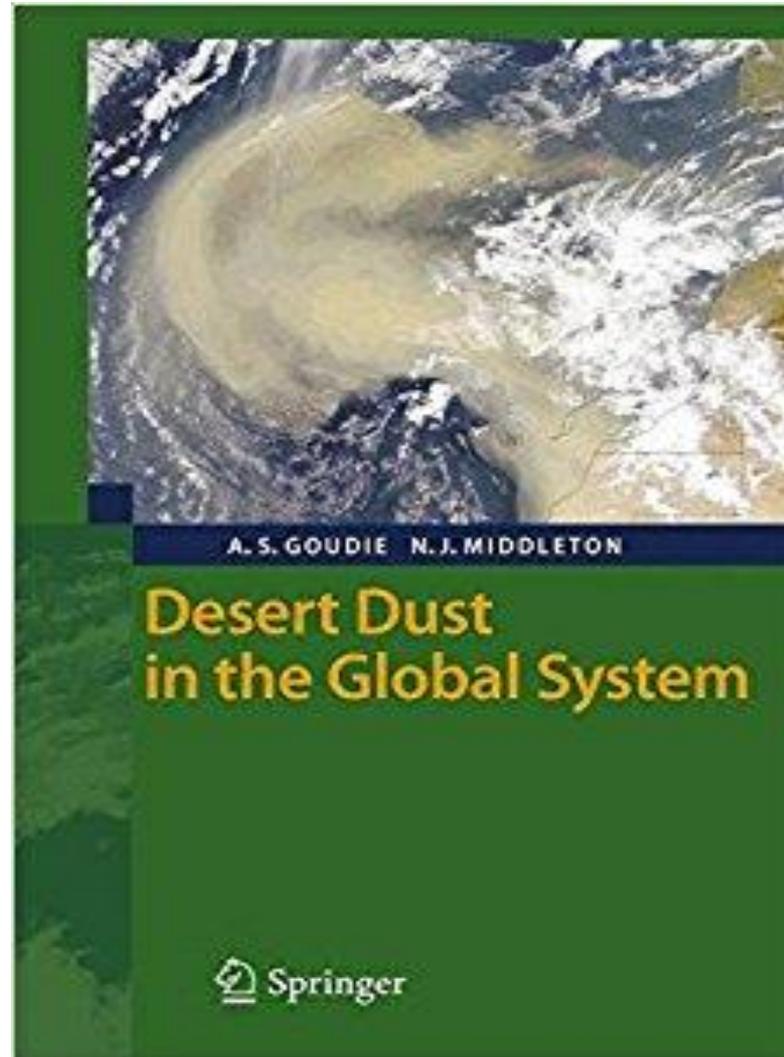
frica



25 2050



Deserts





Agricultural Fields





Dried River Beds, Lakes and Dams





- ❑ **Overgrazing** = over-use of rangeland or pasture
- ❑ 70% of the world's rangeland is degraded, costing \$23.3 billion/year
- ❑ U.S. government subsidies include few incentives to protect rangeland

Degraded Rangelands

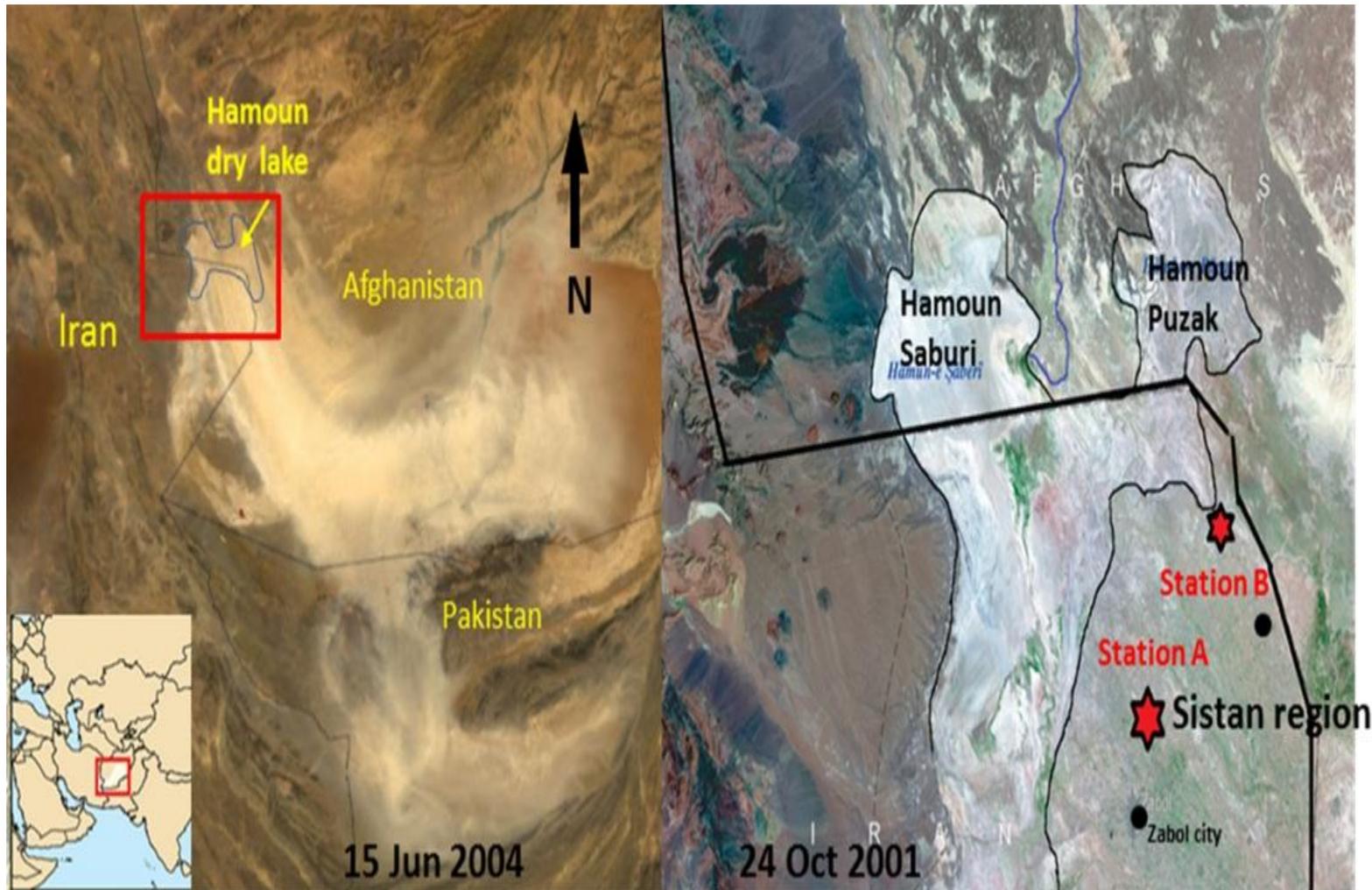


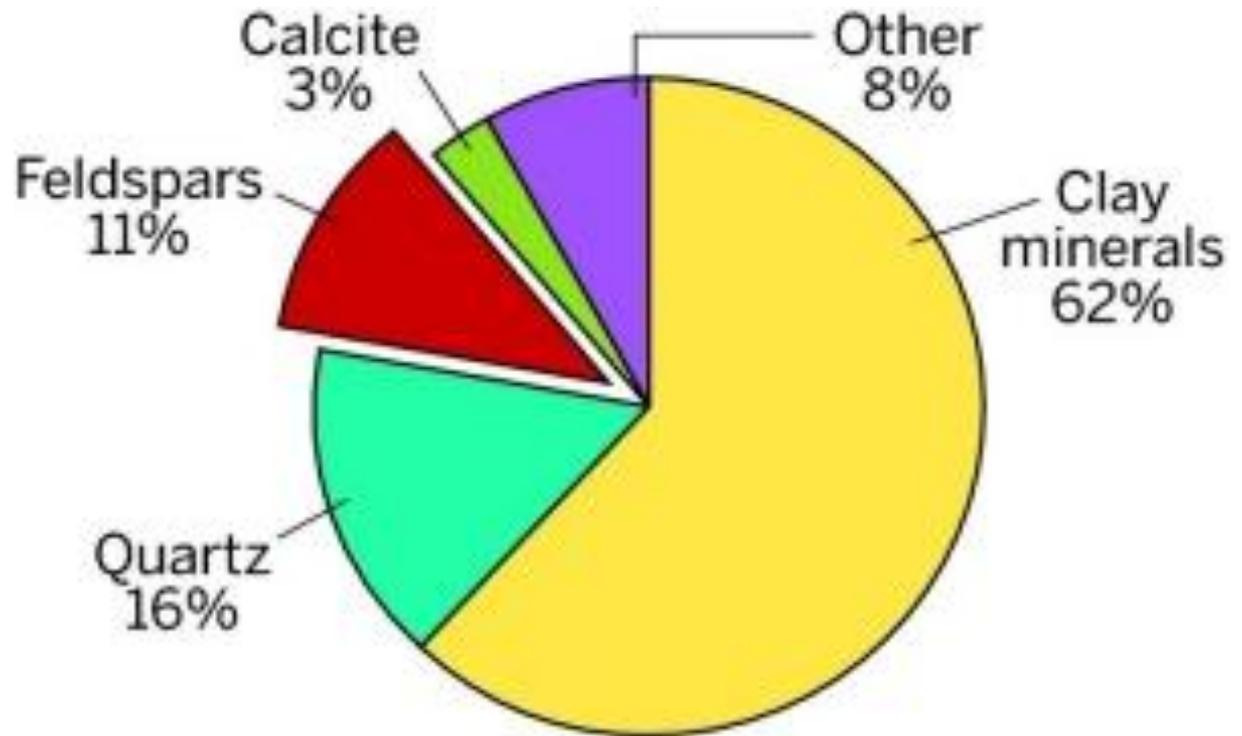


Dust Sources Categorization



Dried Wetlands





Mineral dust composition, by mass

Mineral



Transportation (Road)





Civil Construction





Agricultural

Parameters	Soil content
pH H ₂ O	5.26
Organic matter (%)	18.00
Organic C (%)	10.50
Olsen P (mg kg ⁻¹)	2.00
K (cmol _c kg ⁻¹)	0.13
Na (cmol _c kg ⁻¹)	0.05
Ca (cmol _c kg ⁻¹)	0.73
Mg (cmol _c kg ⁻¹)	0.30
Al (cmol _c kg ⁻¹)	0.17
Al saturation %	12.32
Al Ext. (mg kg ⁻¹)	2097
Cu (mg kg ⁻¹)	0.94
Mo (μg kg ⁻¹)	23



**Industrial
(Factories)**

CEMENT CHEMISTRY

CHEMICAL COMPOSITIONS

Cement chemistry notation based on oxides

- The properties of cement during hydration vary according to:
 - Chemical composition
 - Degree of fineness
- It is possible to manufacture different types of cement by changing the percentages of their raw materials.

Oxide	Notation
CaO	C
SiO ₂	S
Al ₂ O ₃	A
Fe ₂ O ₃	F
SO ₃	\bar{S}
H ₂ O	H
MgO	M
Na ₂ O	N



Dust storm is a complex and multidisciplinary and global phenomenon which is difficult to be described by a simple theoretical physical or mathematical models. Therefore we have to work multidimensionally



Methodology Framework for SDS Sources Identification: The First Experiment, 2013

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Mohsen Bakhtiari, Naser Moghadasi, Amir-Fateh Vahdati and Farzaneh Moshaiedi

1. Mechanisms on dust sources

- ❖ Land degradation mechanisms
- ❖ Intensity level of dust storm activities (sever, middle and low)
- ❖ Ecology & Ecosystem type
- ❖ Climate conditions
- ❖ Spatial Expansion and Temporal Characteristics
- ❖ Scope of activity (Global, Regional, and Local)
- ❖ Socioeconomic and population conditions

2. Beneficiaries and stakeholders (from national to local)

- ❖ Capability in combat, management, measurement, and monitoring of the activities



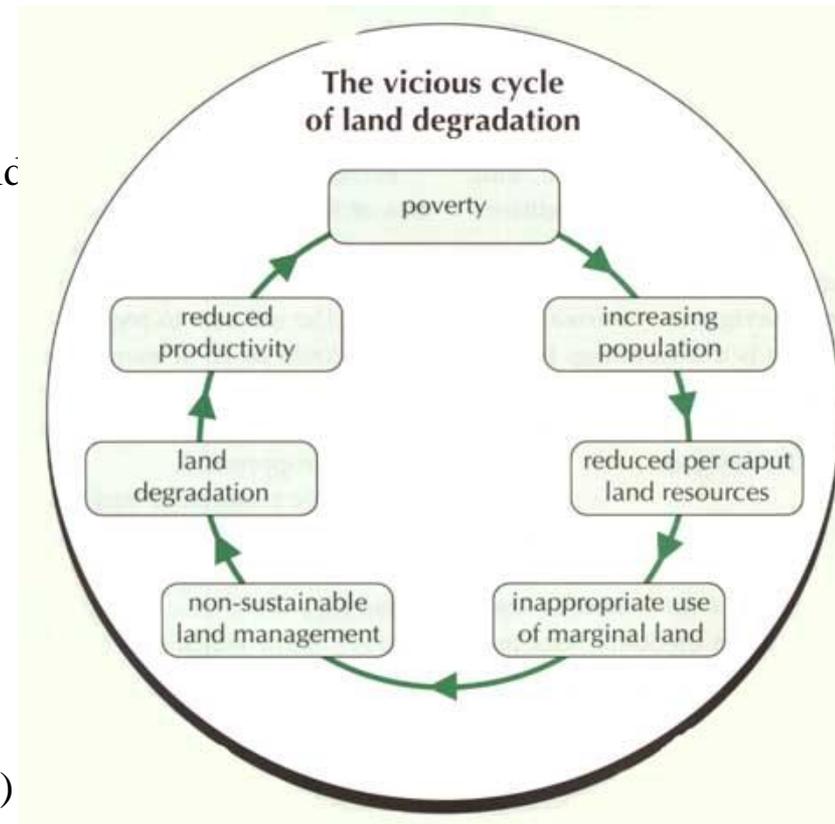
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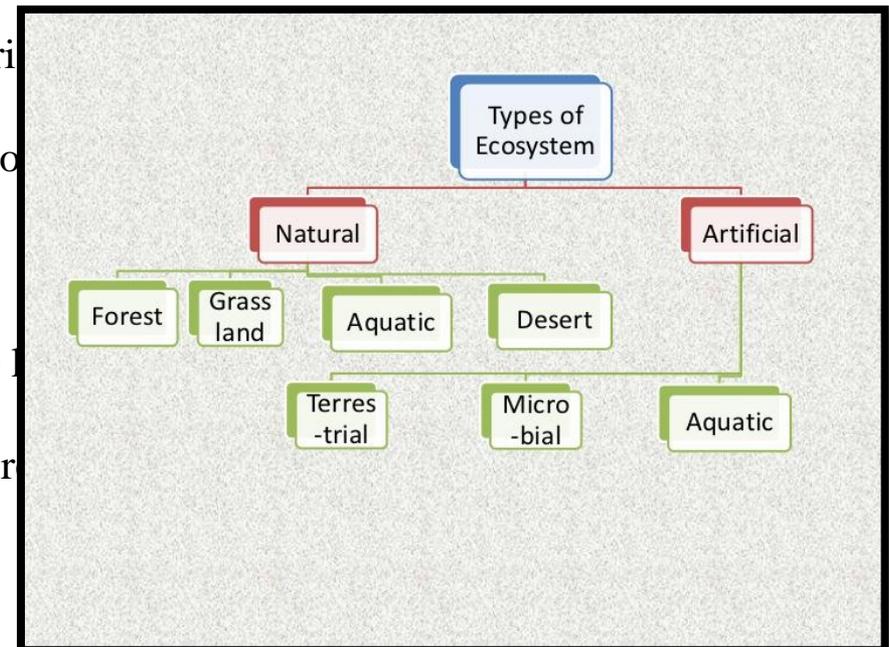
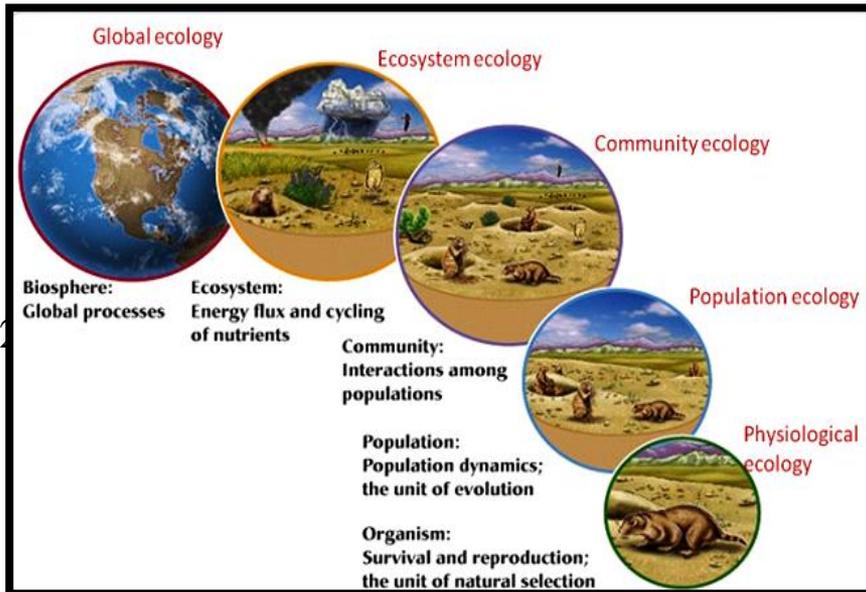
- ❖ Capability in combat, management, measurement, and n

- Microgram per cubic meter
- Dust Frequency over time
- Dust events duration of stay
- Dust Particle size
- Dust spatial expansion
- Dust composition
- Visibility
- AOD



1. Mechanisms on dust sources

- ❖ Land degradation mechanisms
- ❖ Intensity level of dust storm activities (sever, middle and low)
- ❖ **Ecology & Ecosystem type**
- ❖ Climate conditions



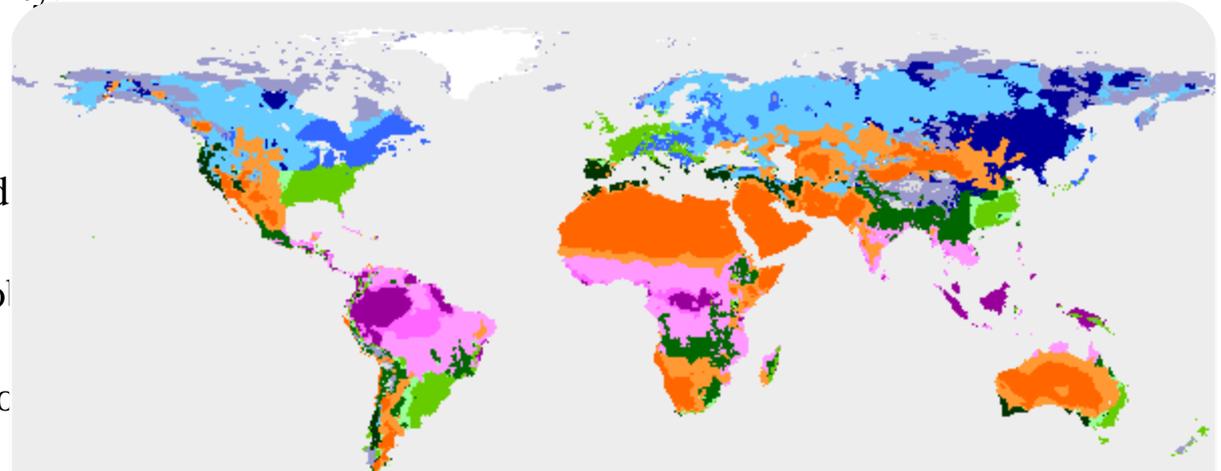


Criteria for Dust storms Source Identification



1. Mechanisms on dust sources

- ❖ Land degradation mechanisms
- ❖ Intensity level of dust storm activities (sever, middle and low)
- ❖ Ecology & Ecosystem type
- ❖ **Climate conditions**
- ❖ Spatial Expansion and
- ❖ Scope of activity (Glo
- ❖ Socioeconomic and po



Koeppen's Climate Classification
by FAO - SDRN - Agrometeorology Group - 1997



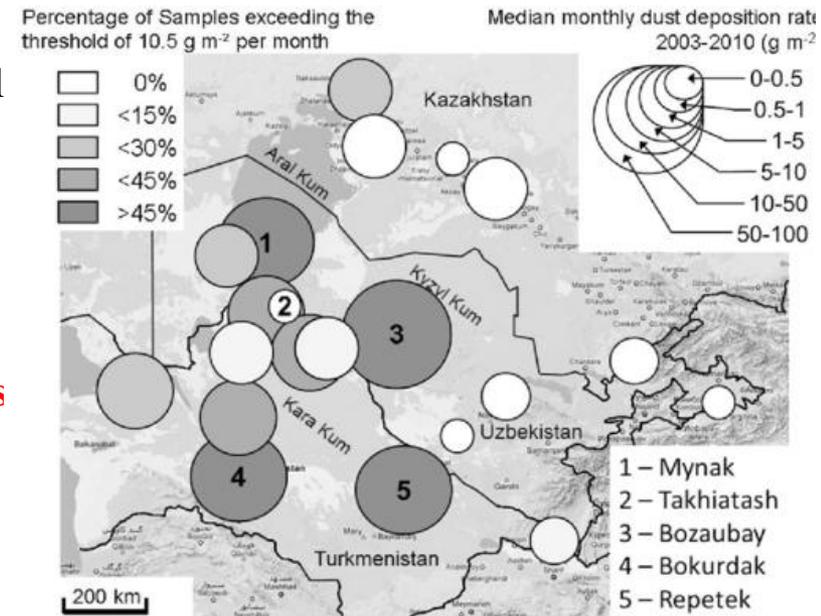
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- ❖ Capability in combat, management, measurement, and monitoring of the activities



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- ❖ Ecology & Ecosystem type
- ❖ Climate conditions
- ❖ **Spatial Expansion and Temporal Characteristics**
- ❖ Scope of activity (Global, Regional, and Local)
- ❖ Socioeconomic and population conditions



2. Beneficiaries and stakeholders (from national to local)

- ❖ Capability in combat, management, measurement, and monitoring of the activities



1. Mechanisms on dust sources

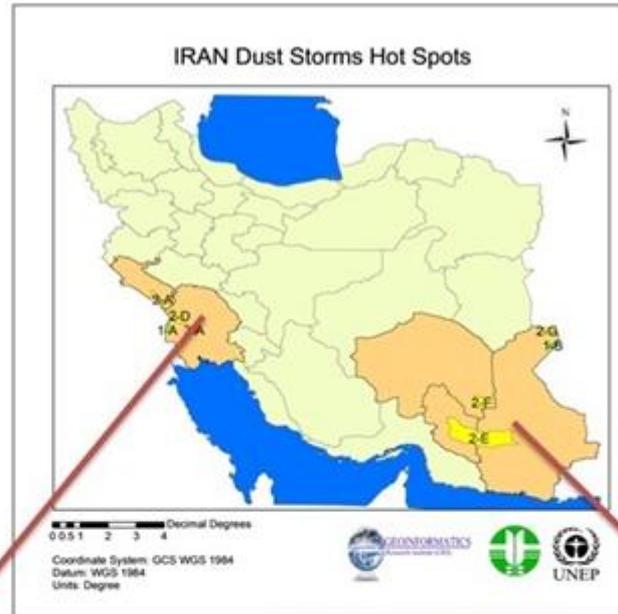
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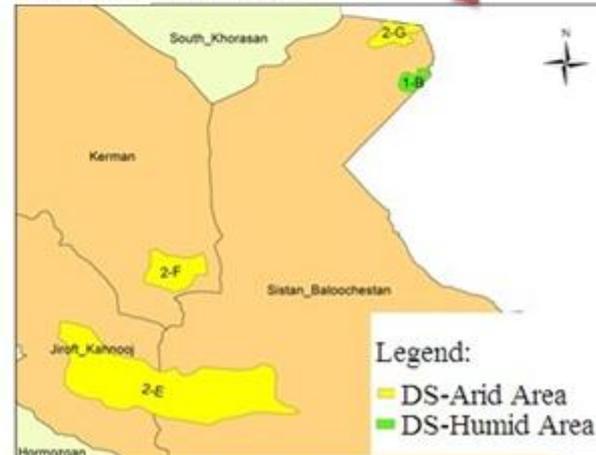
Criteria for Dust storms Source Identification: the results



Southwest DS Cluster



Southeast DS Cluster





Remote sensing-based Land Degradation Index for Dust Sources (LDIDS): The Second Experiment, 2017

Ali Darvishi Bolorani*, Mohsen Bakhtiari,
and Yasin Kazemi

[*ali.darvishi@ut.ac.ir](mailto:ali.darvishi@ut.ac.ir)



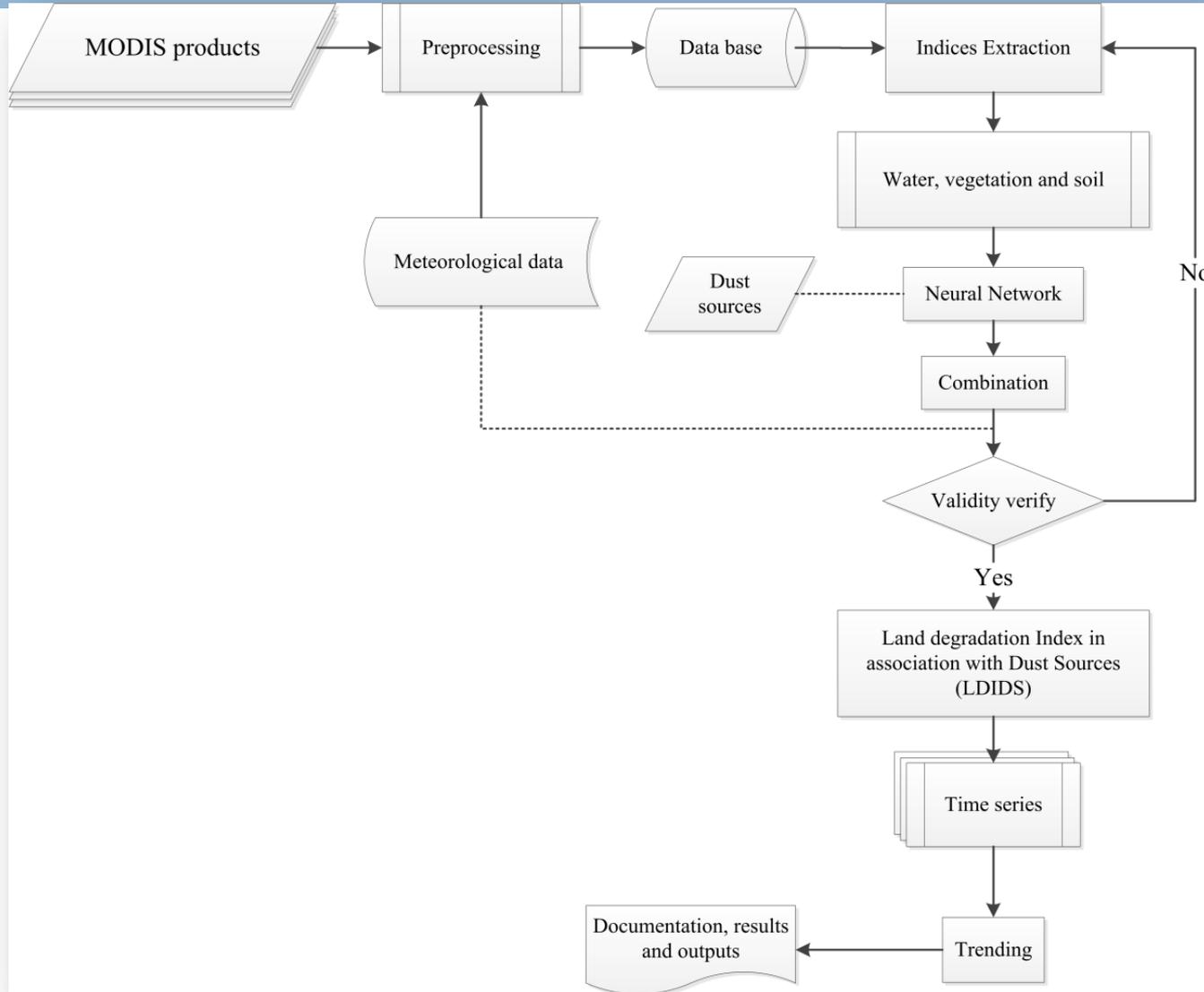
Introduction

- Wind Erosion Index (**WEI**),
- Normalized Environment Health Index (**NEHI**) and
- Modified Vegetation Water Supply Index (**MVWSI**)

are developed as inputs into Artificial Neural Network (**ANN**) algorithm to developing **Land Degradation Index** in association with **Dust Sources (LDIDS)** using MODIS time-series in Khuzestan province (2000-2014)



LDIDS Procedure





1. MVWSI: Modified Vegetation Water Supply Index was developed for **drought monitoring** by Men-xin and Hou-quan (2015)

$$MVWSI = \frac{RNDVI}{RLST^2}$$

$$RLST = \frac{LST}{LST}$$

$$RNDVI = \frac{NDVI}{NDVI}$$

MVWSI is between 0 and 1: the smaller value, the less vegetation water supply and the more severe drought (Men-xin and Hou-quan, 2015).

2. NEHI: Normalized Environmental Health index developed for **modeling health environment in** regional scale as follows:

$$NEHI = -1 \times \left(\frac{LST_{(0-255)} - NDVI_{(0-255)}}{LST_{(0-255)} + NDVI_{(0-255)}} \right)$$

NEHI is between of **-1 to 1**, the smaller values indicate the more critical condition of the environment and ecosystem.



3. WEI: Wind Erosion Index was developed for modeling wind erosion potential as follows:

$$WEI = W (P - E)^2 \quad P - E = \frac{R + 1}{T + 2}$$

WEI is wind erosion potential

W is mean monthly speed of wind at 10 meter above ground (km/h)

P-E is evapotranspiration index of Thornthwaite–Mather

R is mean monthly of precipitation (mm) and

T is mean monthly of air temperature (°C)



Data and Study Area

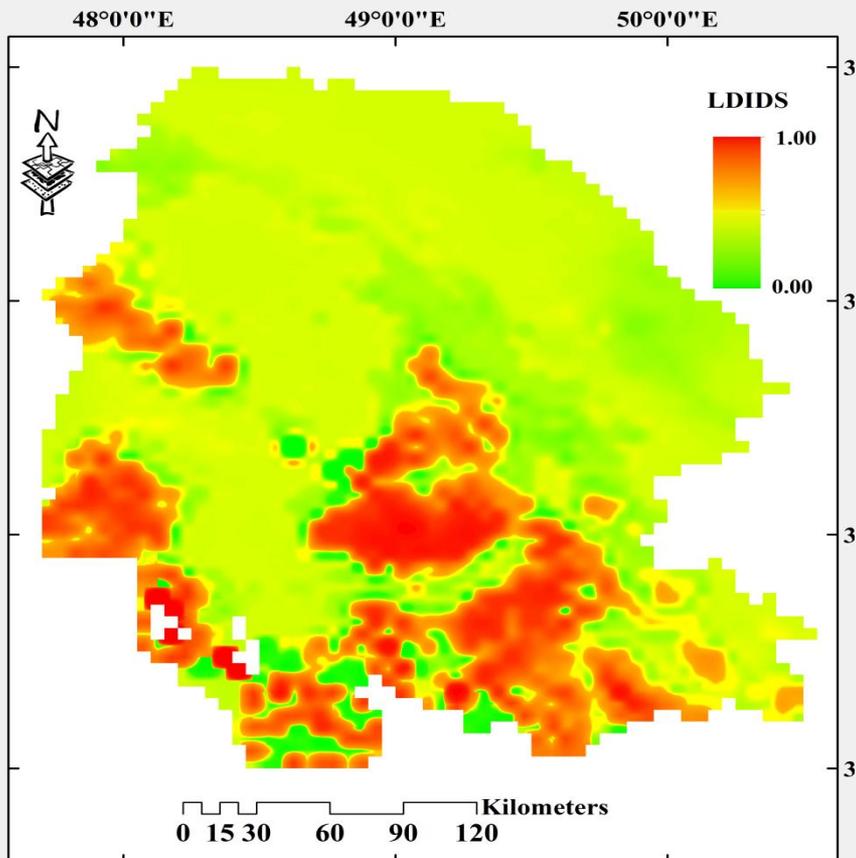


data	Description	Source	Type
LST	Land surface temperature	products MODIS	Surface
NDVI	Normalized difference vegetation index	products MODIS	Surface
R	Mean precipitation	Meteorological data	Point
T	Mean air temperature	Meteorological data	Point
W	Mean wind speed	Meteorological data	Pont

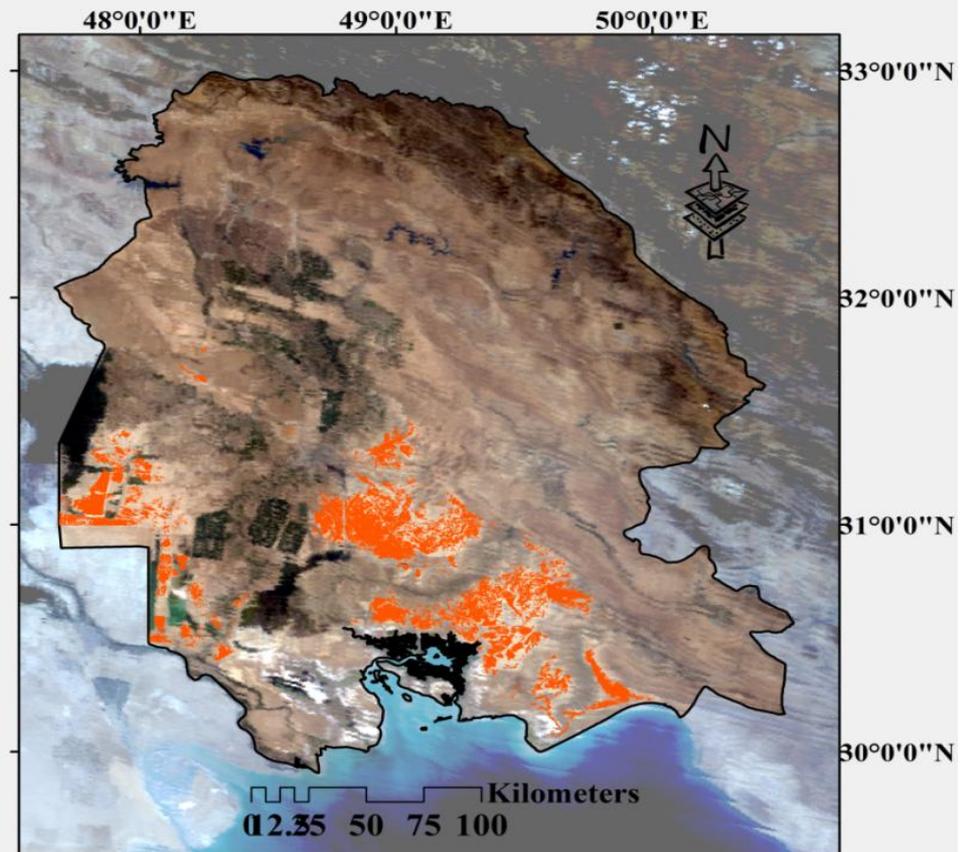


Khuzestan Province

LDIDS Map



Ground Truth Map



The map of LDIDS for 2014, Greater values (red color) present more degraded lands in association with dust sources



- (i) How two mentioned methodologies can be combined for a more precise Dust Sources Identification?**
- (ii) How to develop LDIDS with more sophisticated methodologies and other remote sensing and metrology data?**
- (iii) How to use the results for SDS Economical Impact Assessment, SDS Vulnerability Mapping and SDS planning for competing, etc?**

What is Next?

Iran National Space Administration will support a International Remote Sensing Based Project/Program on SDS and Looking for the Participants of the Regional and International Cooperation and Collaborations.



Thank You!

Questions?

Comments?

Suggestions?