Application of Remote Sensing Technology in Dust Detection and Air Quality Monitoring: A Case Study of the Middle East

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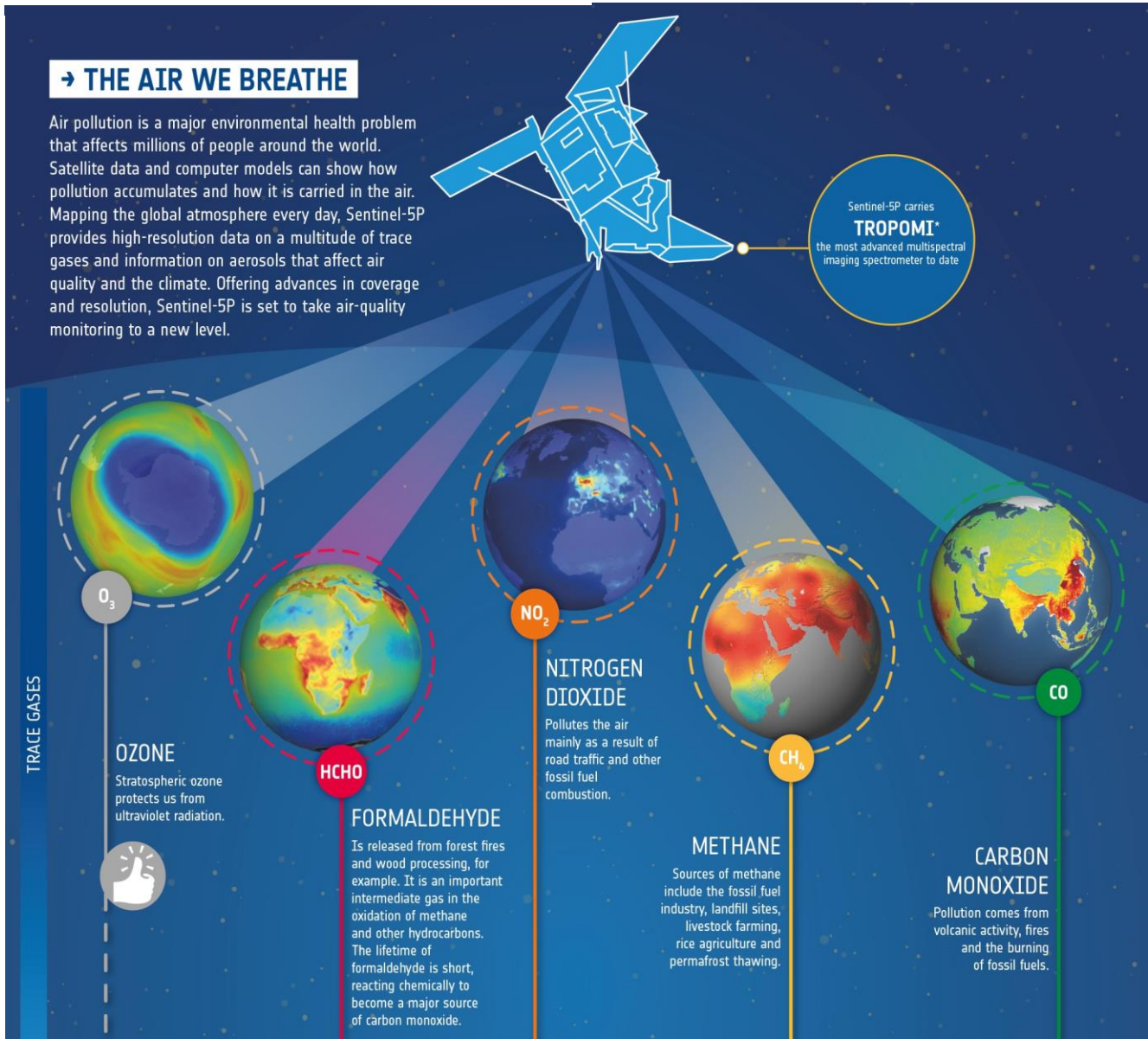
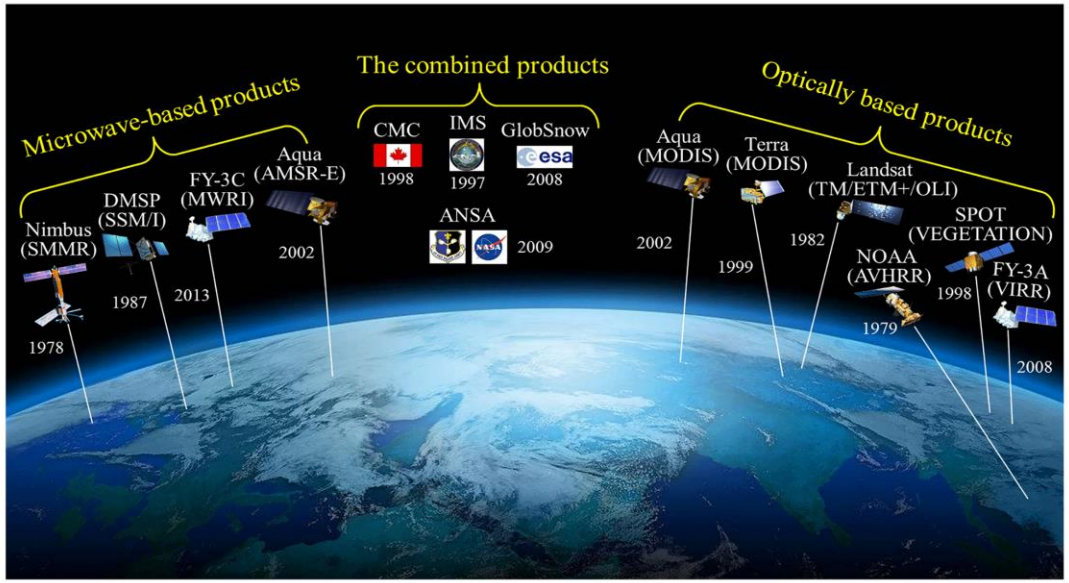
Atmospheric composition satellite data for air quality

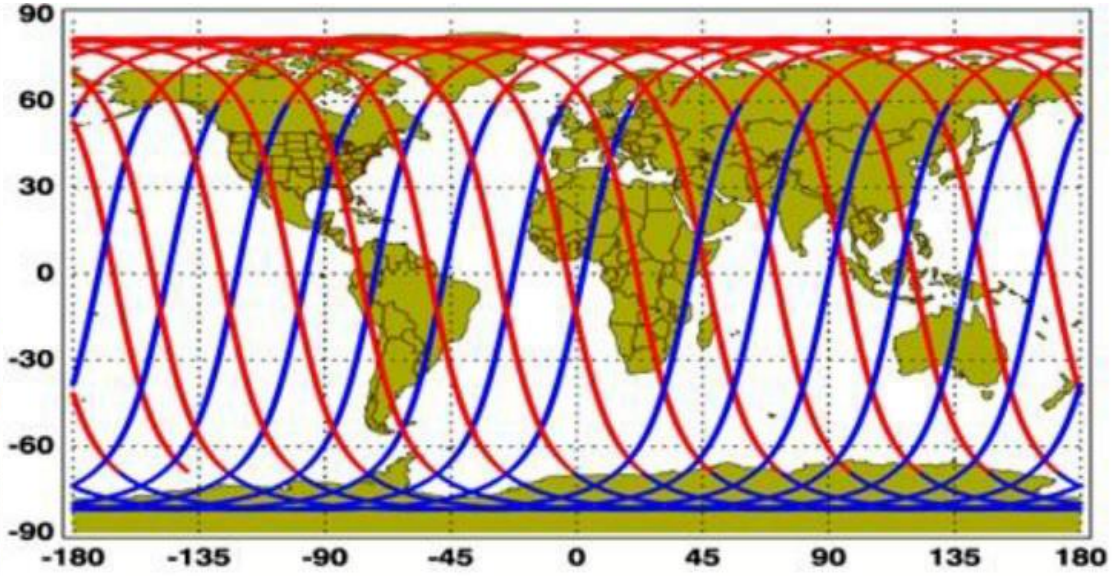
- Nitrogen Dioxide (NO2)
- Tropospheric Ozone (O3)
- Sulfur Dioxide (SO2)
- Ammonia (NH3)
- Carbon Monoxide (CO)
- Some Volatile Organic Compounds (VOCs)
- Aerosol Optical Depth (AOD), which surface particulate matter (PM2.5) can be inferred.
- Ultra Violet Aerosol Index (UVAI)



Satellite data application in air quality monitoring

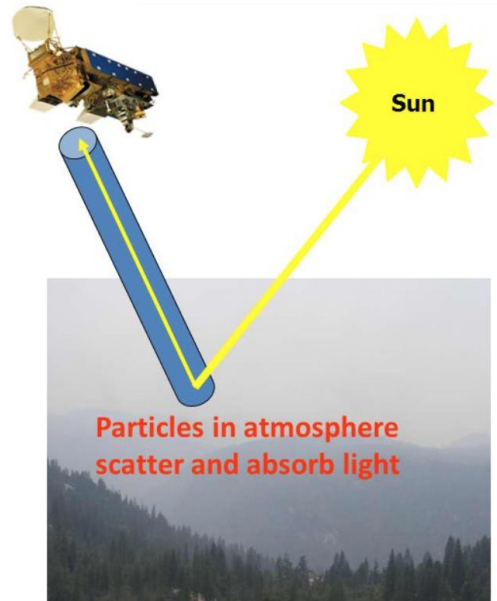
- **Tracking pollutant plumes**
- **Support for air quality forecasting**
- **Evidence for exceptional event demonstrations**
- **Evaluating output of models and providing input to models**

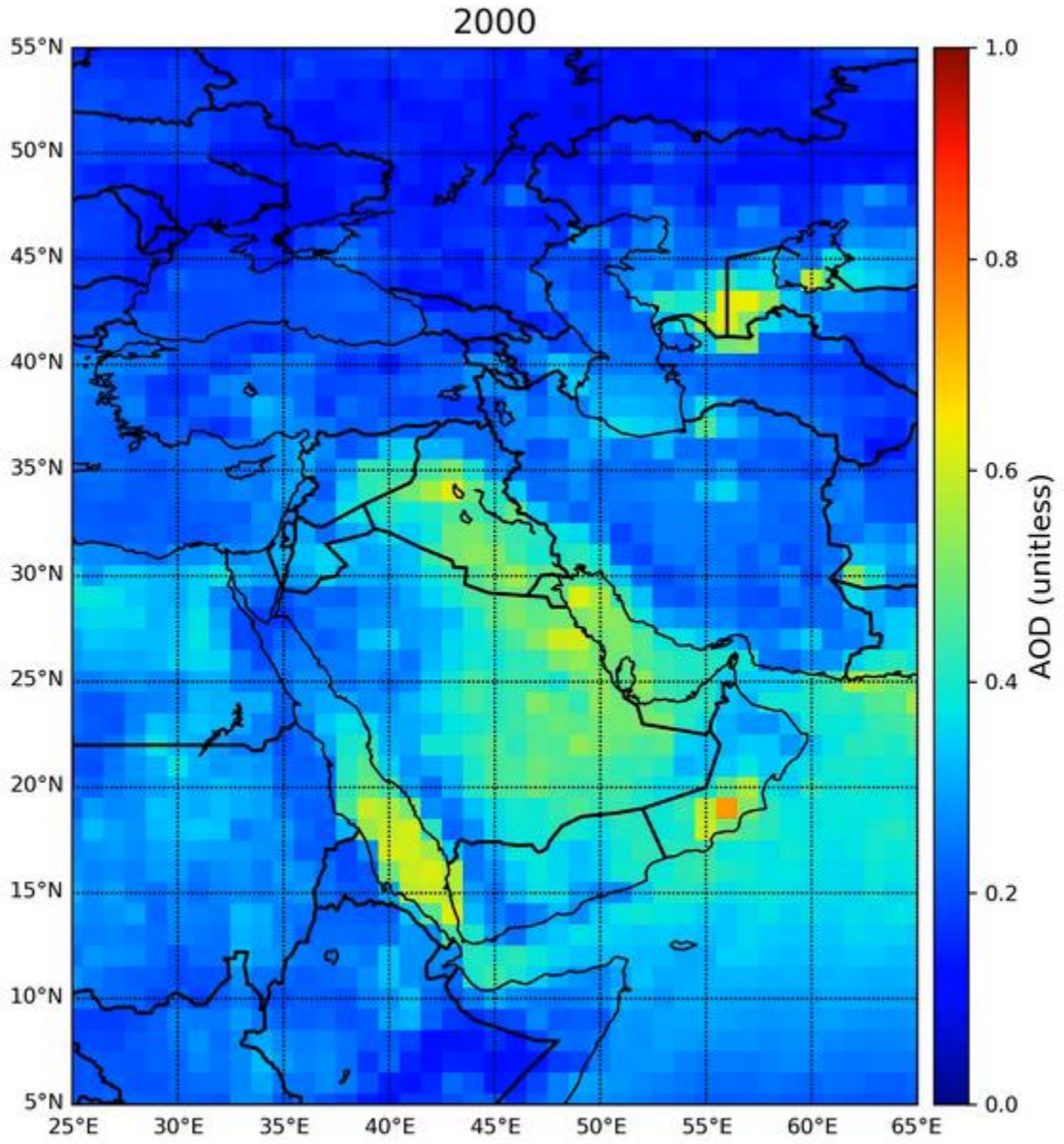




Data used in this study

- **Daily level 2 Aerosol Optical Depth data (at 550 nm) of Aqua MODIS (MYD04) and Terra MODIS (MOD04), collection 6.1, at 10 × 10 km spatial resolution**
- **Monthly mean level 3 Aerosol Optical Depth data (at 550 nm) of Aqua MODIS (MYD08) and Terra MODIS (MOD08), collection 6.1, at 1 × 1 degree spatial resolution**
- **Daily Level 3 UV Aerosol Index data of Aura OMI (OMTO3d), at 1 × 1 degree spatial resolution**
- **CALIPSO Level 2 LIDAR Vertical Feature Mask (VFM) data**
- **Hourly ground-level PM10 concentration of Turkey**




2000
55°N
50°N
45°N
40°N
35°N
30°N
25°N
20°N
15°N
10°N
5°N
25°E
30°E
35°E
40°E
45°E
50°E
55°E
60°E
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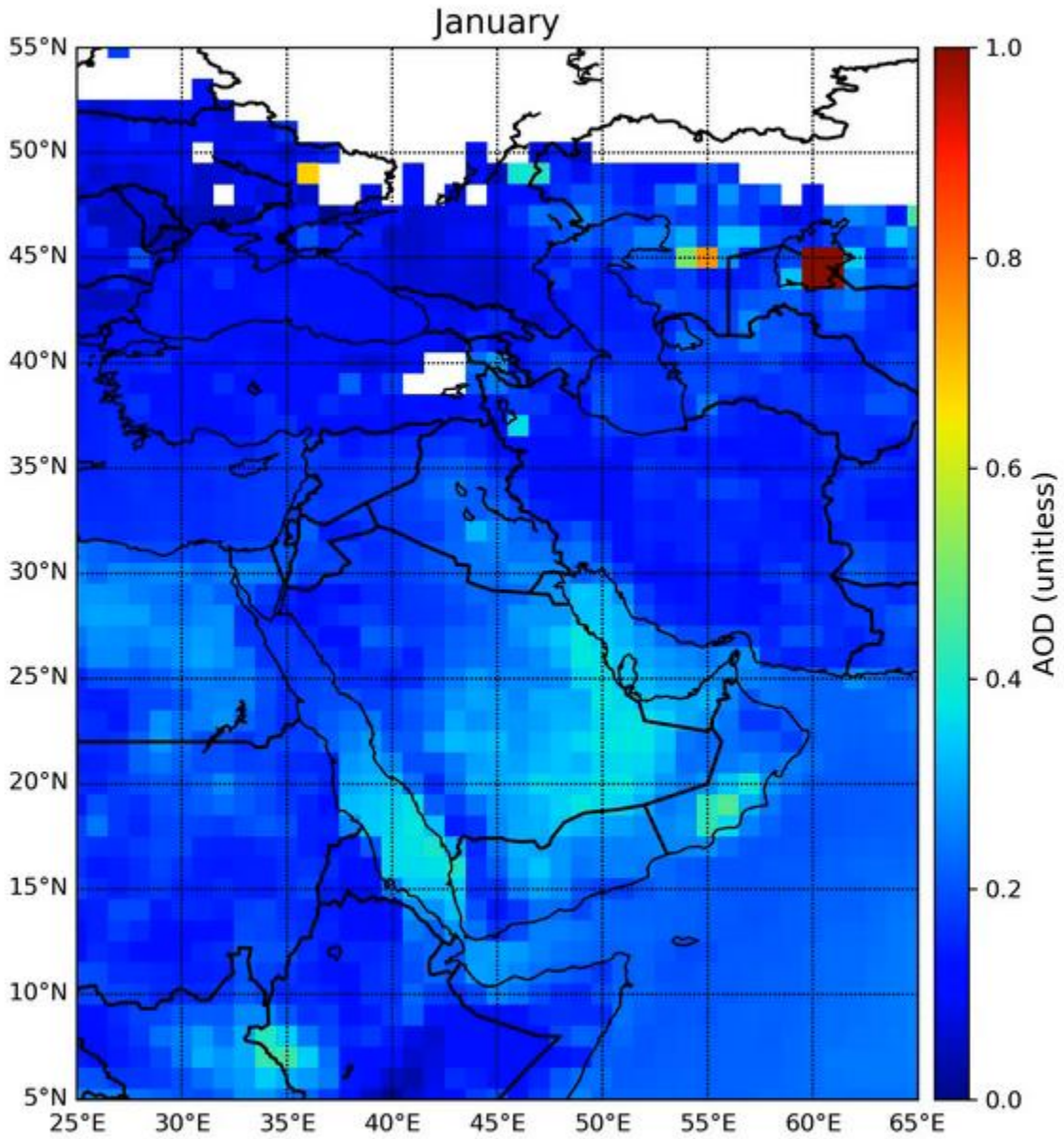
1.0
0.8
0.6
0.4
0.2
0.0
AOD (unitless)


January
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25°E
30°E
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40°E
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0.8
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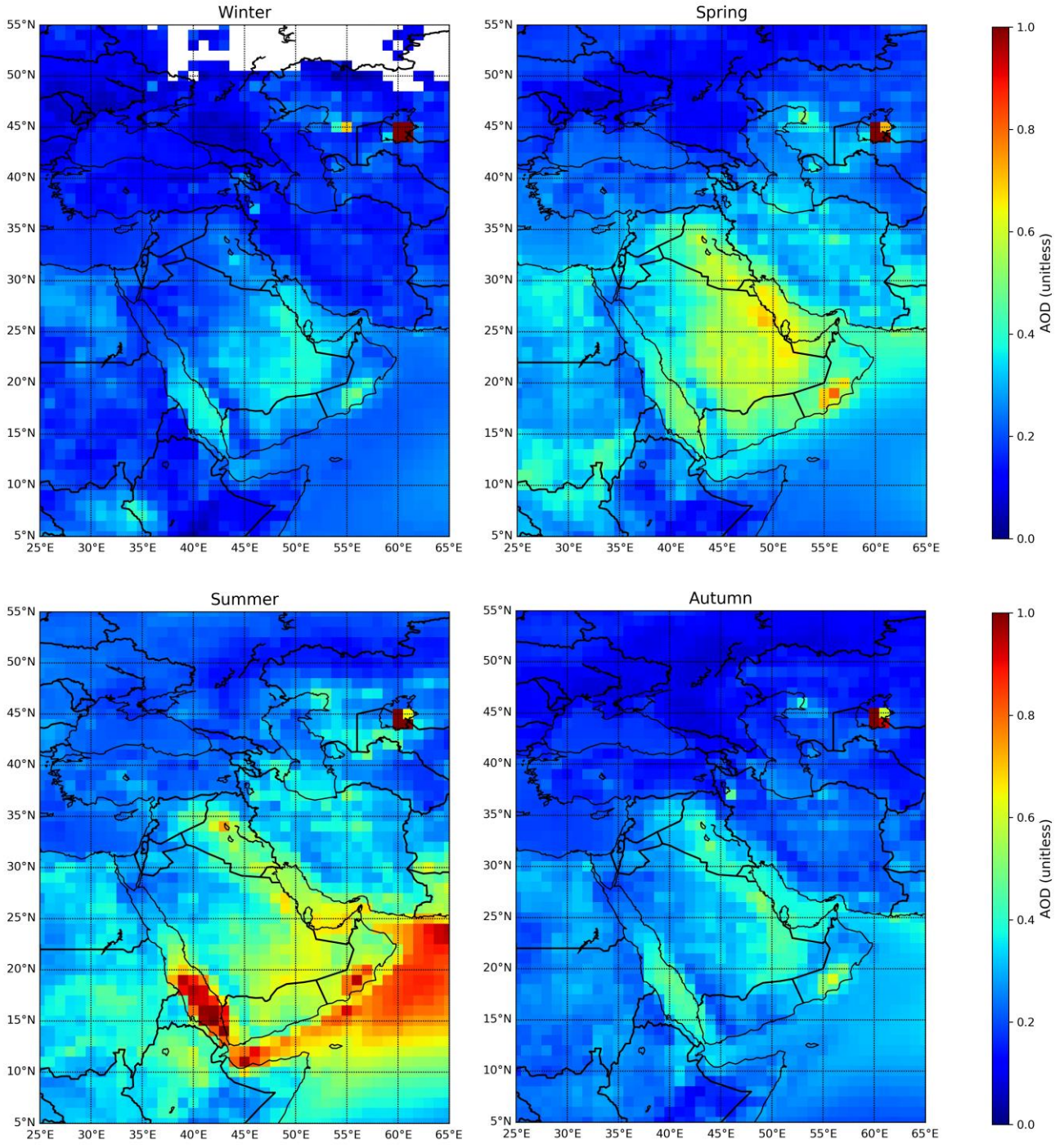
AOD (unitless)


Winter
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Summer
Autumn
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40°E
45°E
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AOD (unitless)
0.0
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0.4
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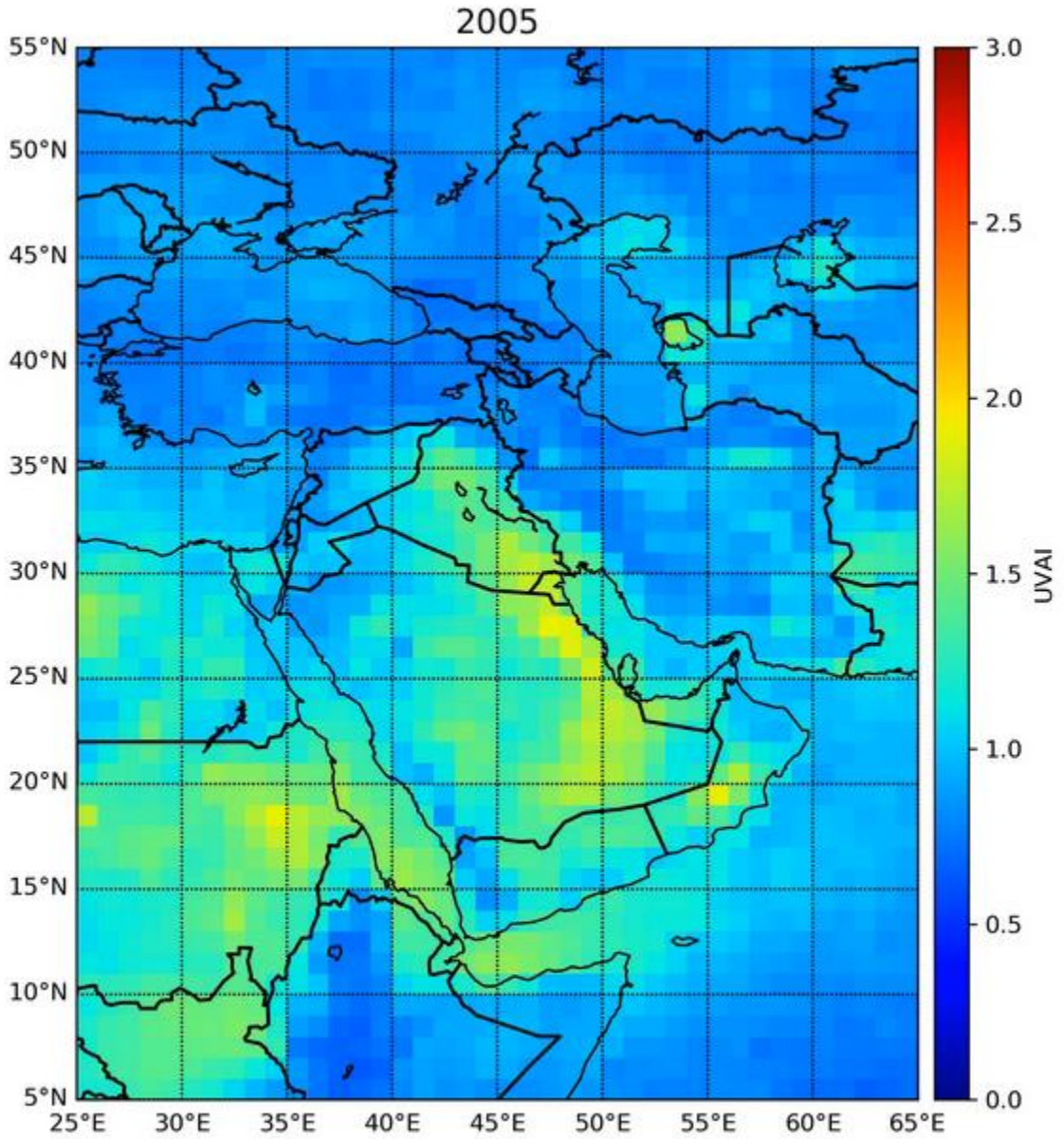
2005
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25°E
30°E
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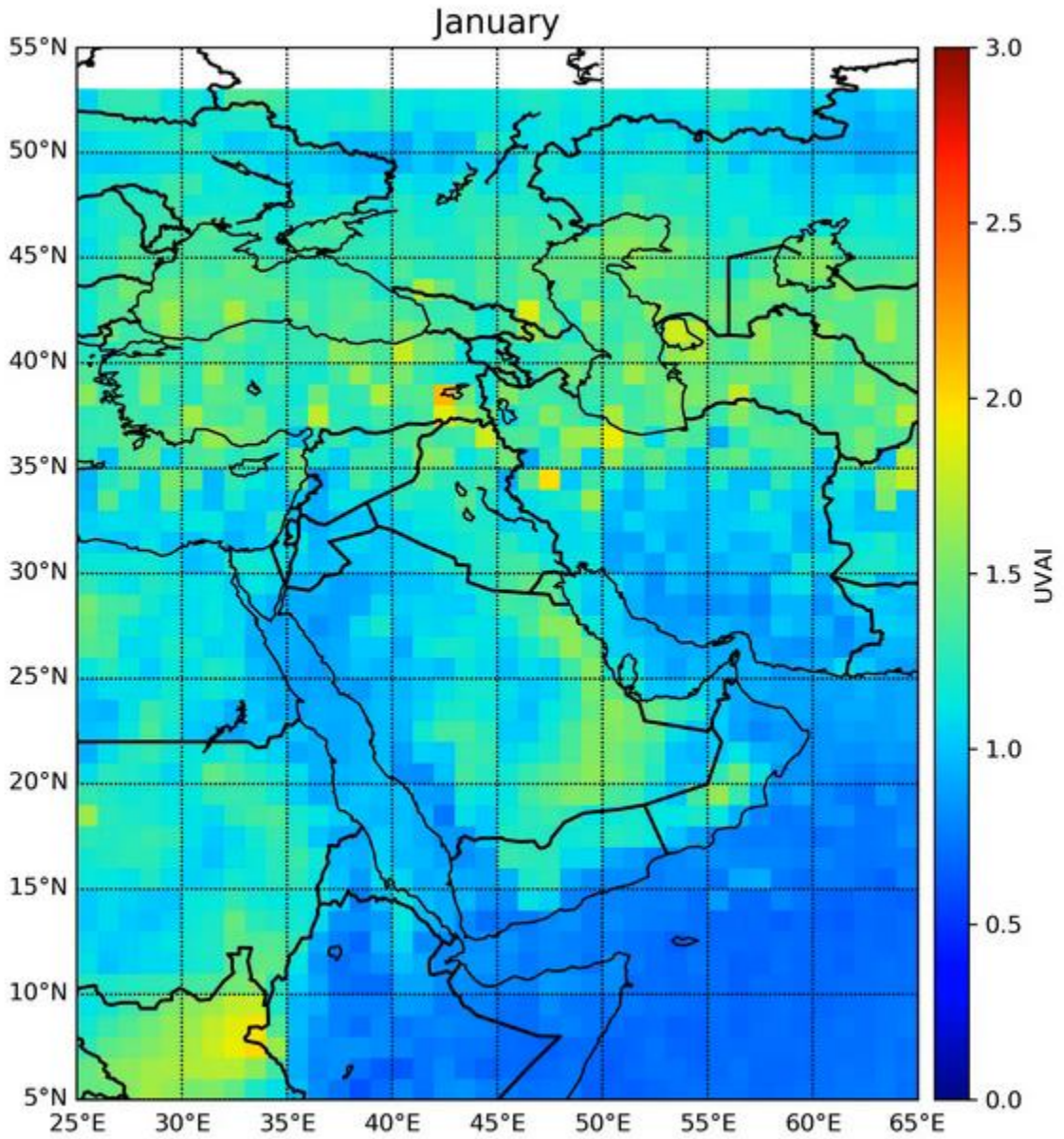
40°E
45°E
50°E
55°E
60°E
65°E
3.0
2.5
2.0
1.5
1.0
0.5
0.0
UVAI


January
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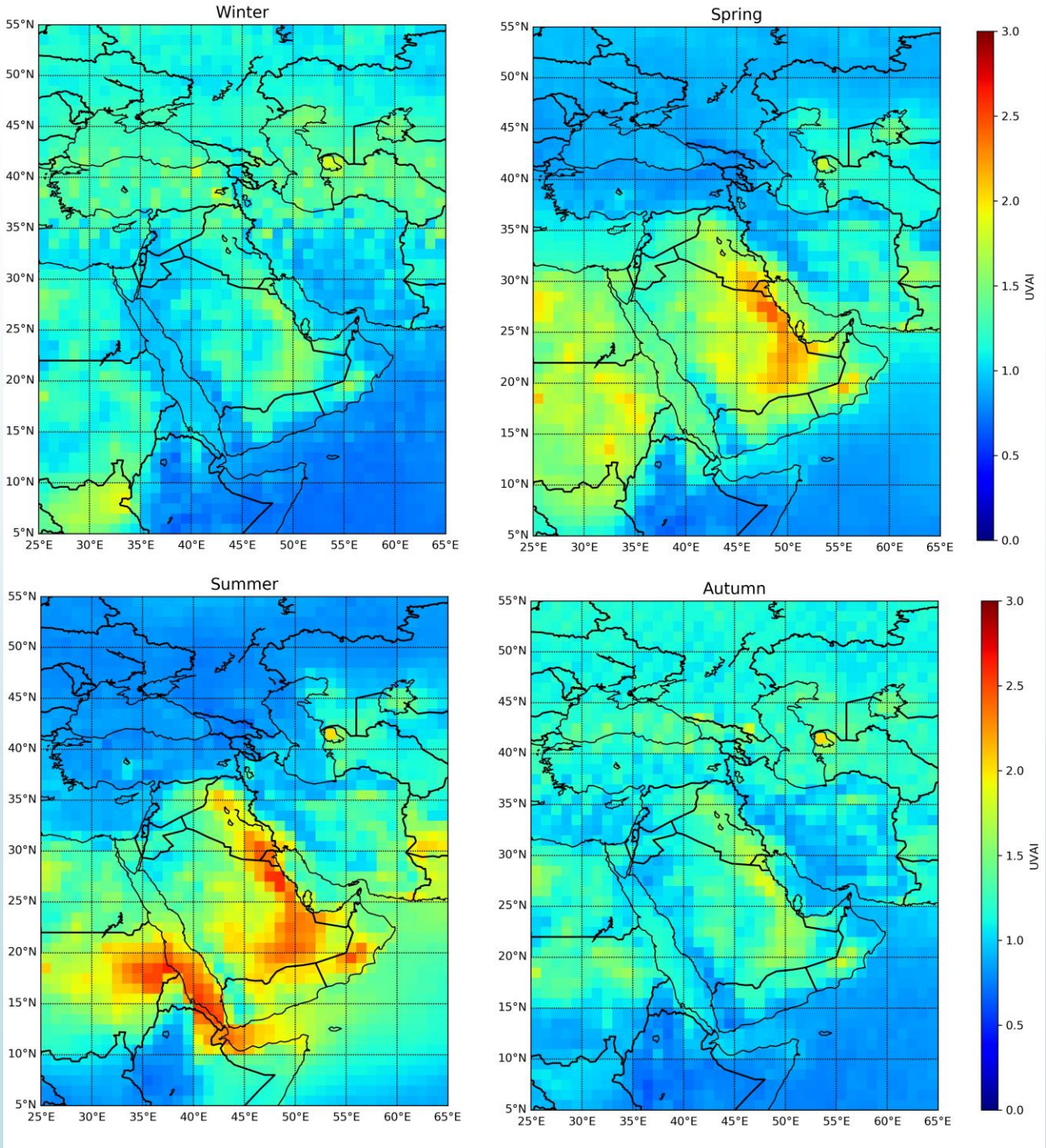
UVAI


Winter
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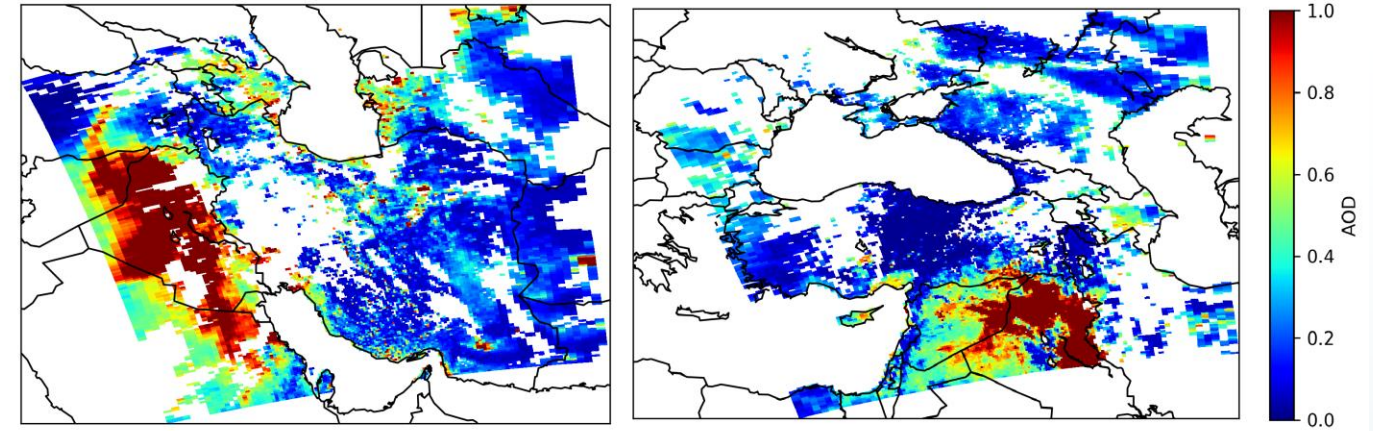
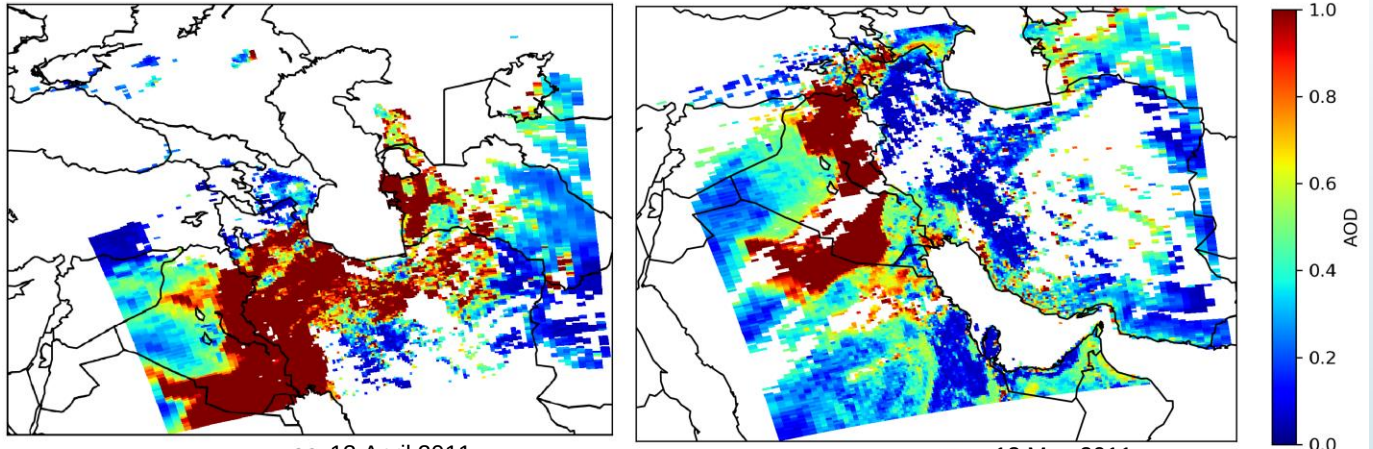


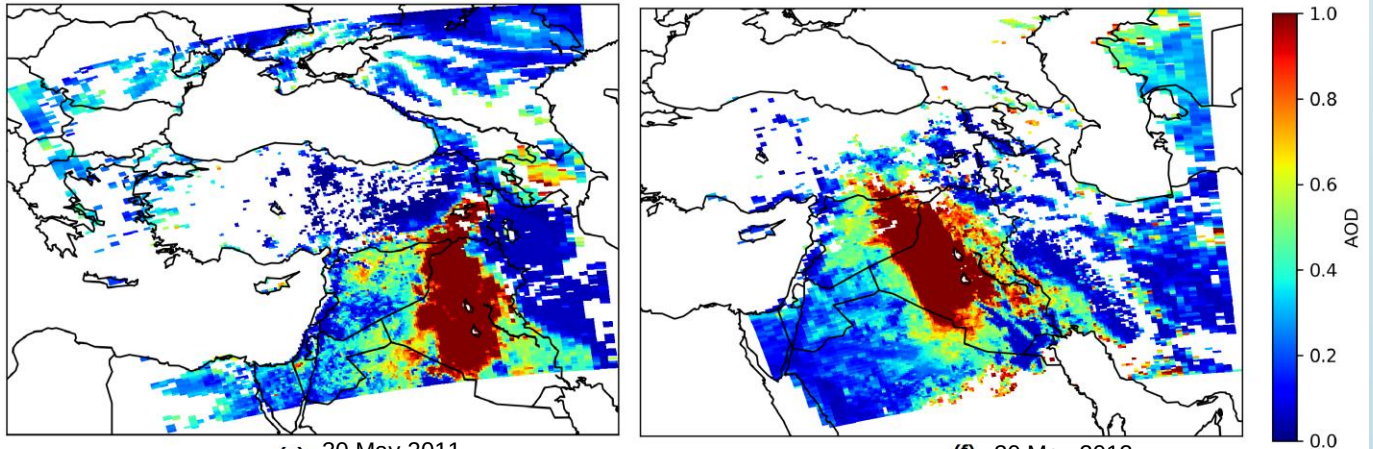
(a) 11 May 2010

(b) 28 May 2010



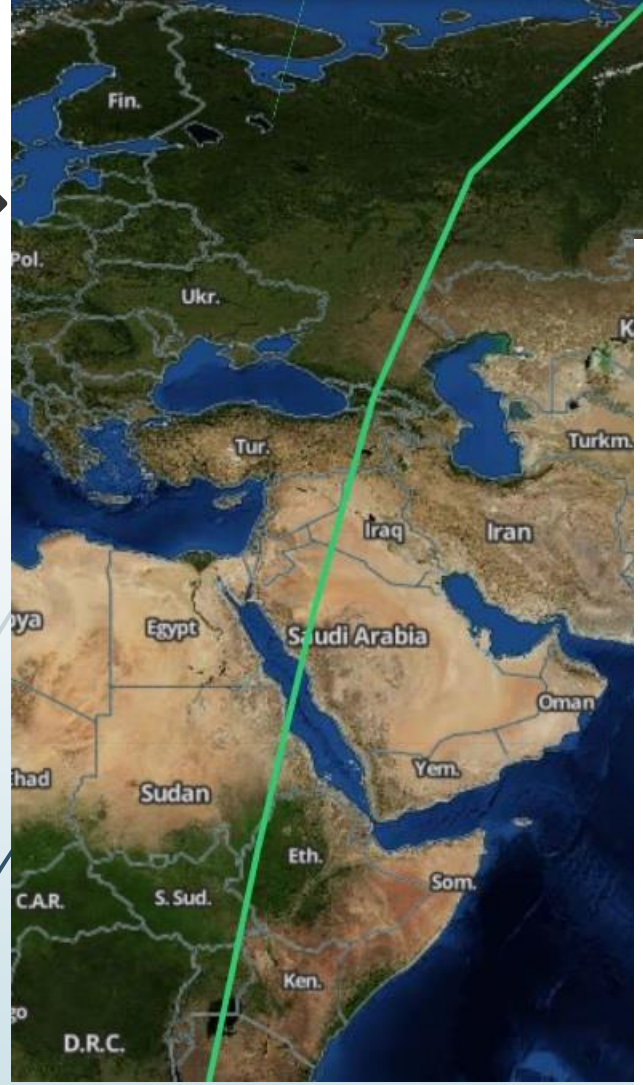
(c) 13 April 2011

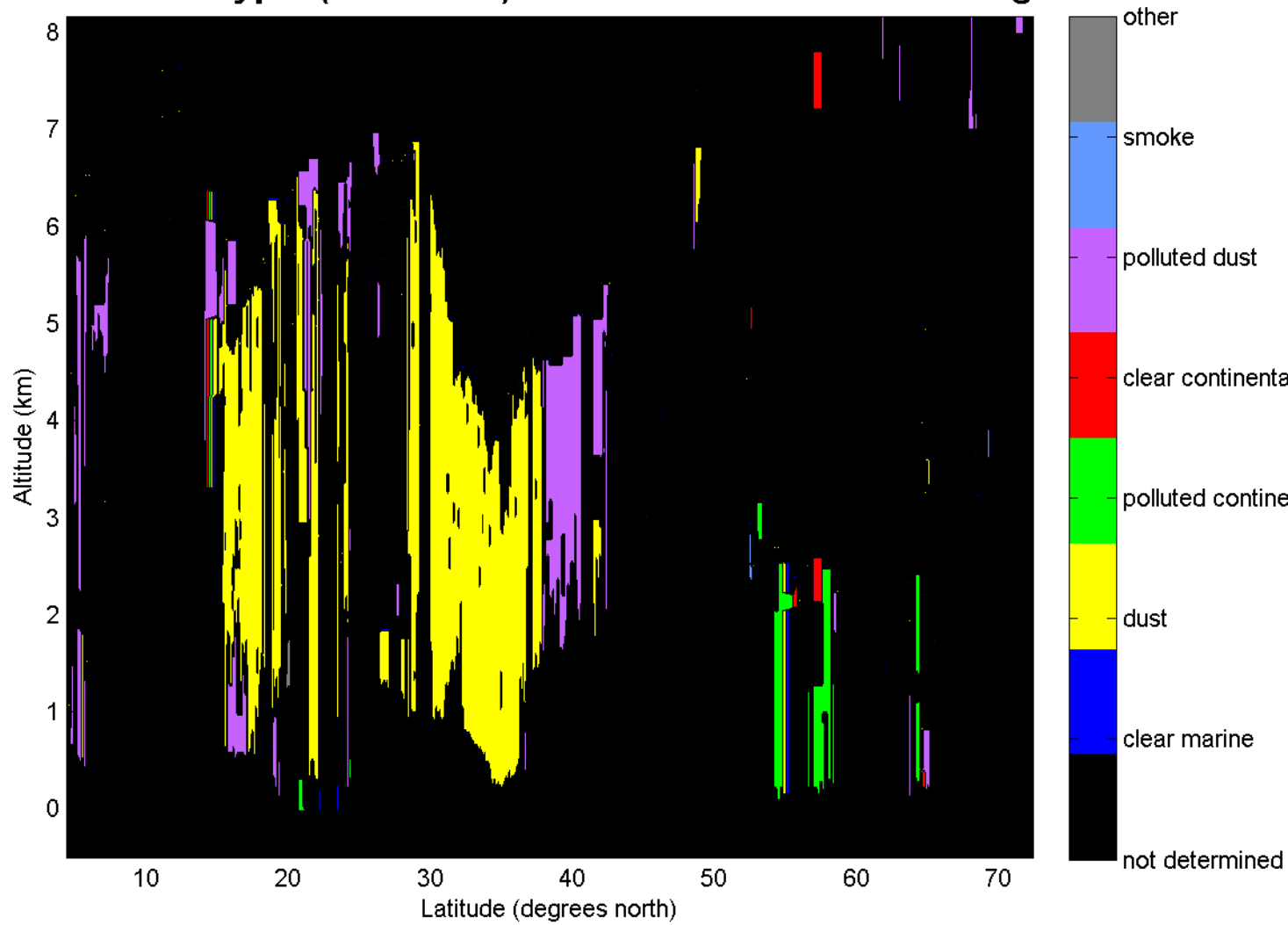
(d) 13 May 2011



(e) 30 May 2011

(f) 20 May 2012





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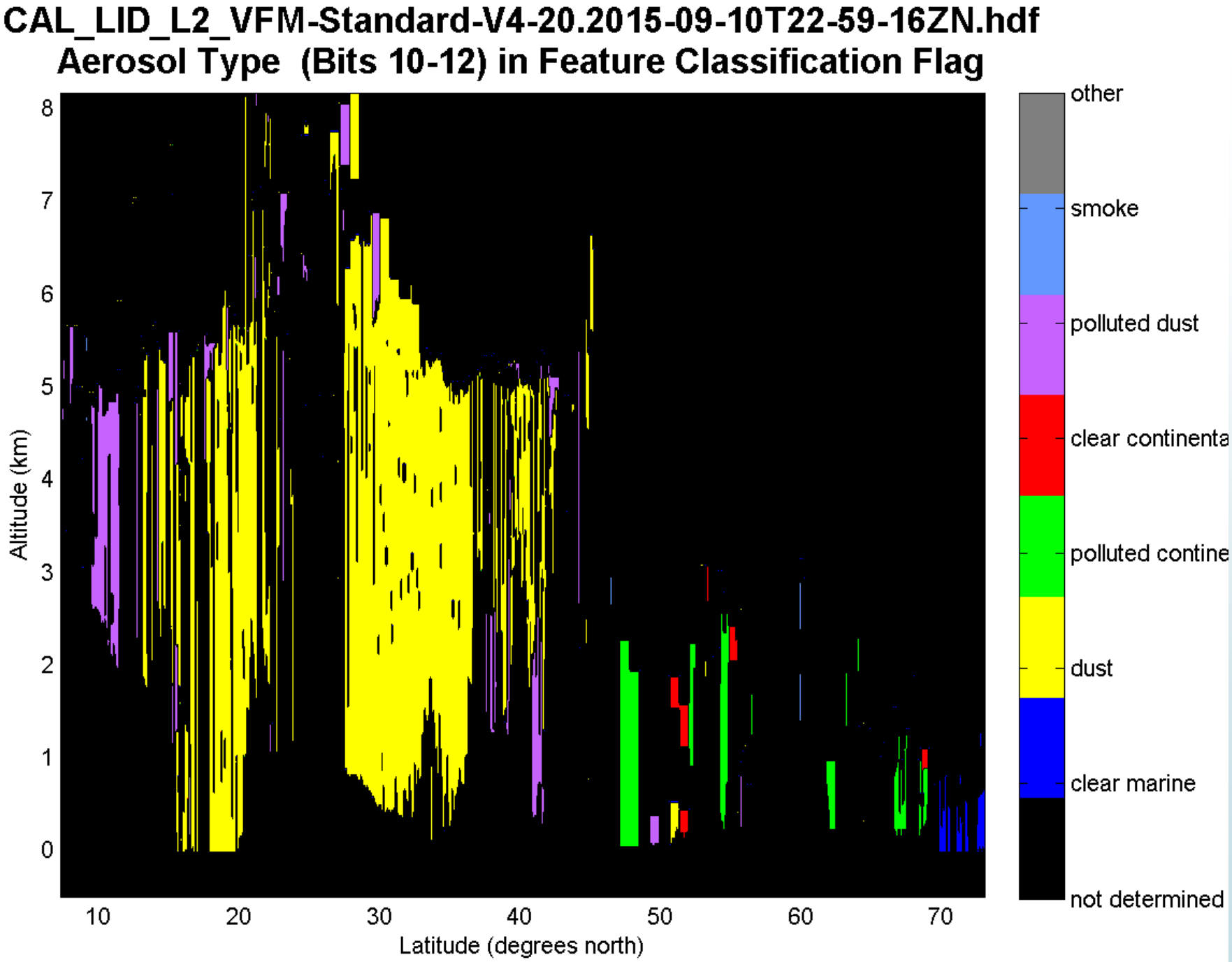
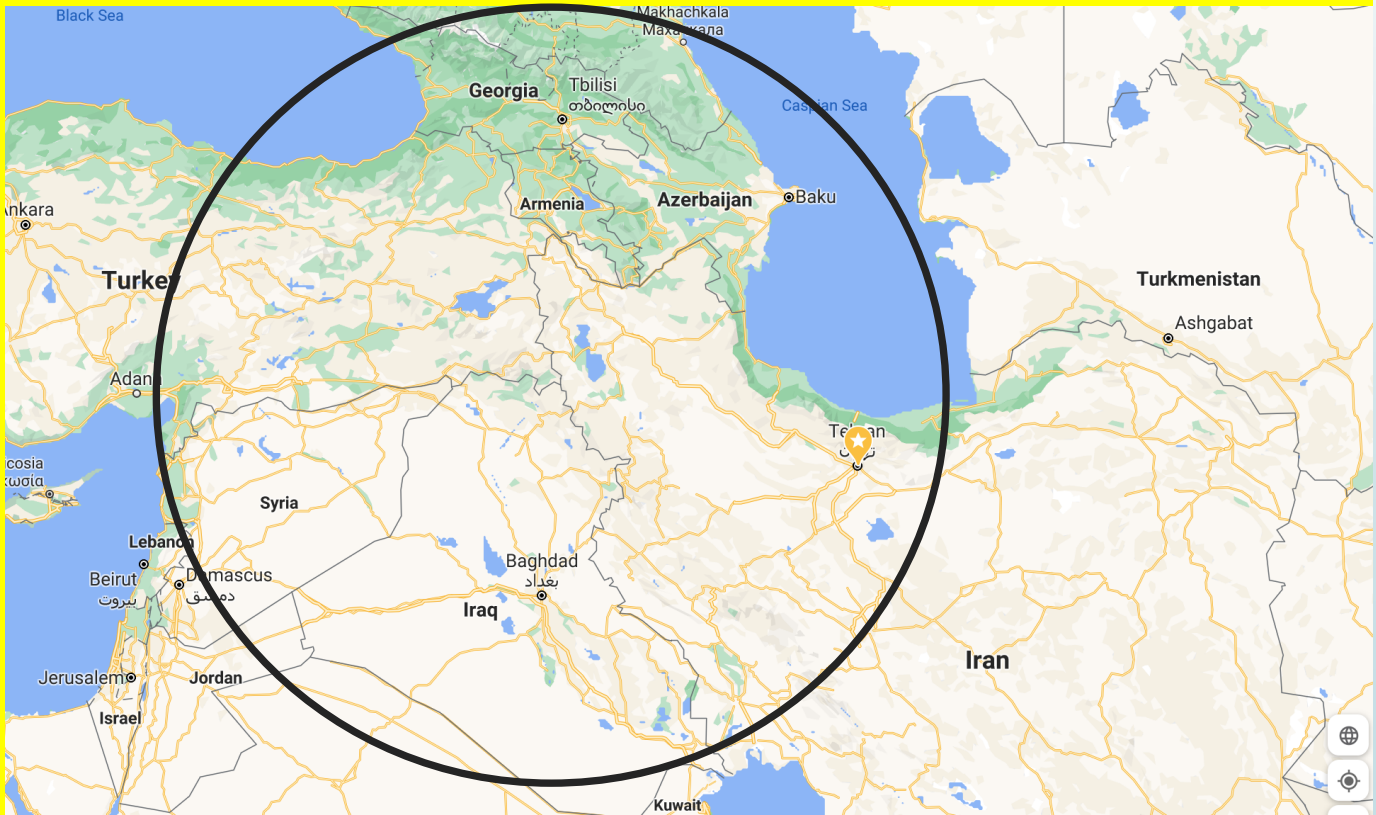


10 September 2015

Future work:

Investigating the use of atmospheric transportation model (CMAQ) to understand the mechanics of dust transportation in the region.

Investigating the possible transportation of dust from other regions such as Urmia Lake in the northwestern Iran and Hour-al-Azim wetland in the southwestern Iran and southeastern Iraq to neighbouring regions and countries.



Conclusion

- During spring and summer seasons, aerosol amounts rise dramatically around the Arabian Peninsula and nearby oceans due to dust storms.
- The results indicated that dust storms mostly occur during spring and summer and local emission sources like fuel combustion account for air pollution, especially during winter.
- Transported dust from the Arabian Desert affects the air quality of Turkey and causes high aerosol concentration in the southern part of the country.
- Aerosol pollution and particulate concentration in the South and East parts of Turkey is very high than other parts.
- In addition to the Arabian Desert, Urmia Lake and Hour-al-Azim can be known as a new sources of dust in the study area.

Do you have any question?