


Kuwait Institute for Scientific Research  معهد الكويت للأبحاث العلمية

# Assessment of Dust Storm Sources in Kuwait

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## Outline

1. Introduction
2. Main Goals
3. Methodology
4. Results and Discussion
5. Conclusions

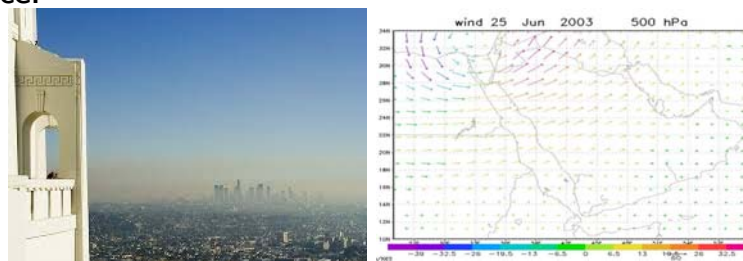
## 1. Introduction

- **Dust storms:** are meteorological phenomena driven by gusty winds that occur when strong pressure gradients develop across a dry arid or semi-arid region where loose sands or soils are more prevalent.



## 1. Introduction

- **Factors that affect dust dispersion are:**
  - Wind speed and direction.
  - Inversion layer.
  - Ambient air temperature.
  - Mixing height which is height where vertical mixing takes place.



## 1. Introduction: Cont.

Classifications for dust storm according to the reduced visibility:

**Blowing dust:** the horizontal visibility is less than 11km.

**Dust storm:** the horizontal visibility is less than 1km.

**Severe dust:** horizontal visibility is less than 0.2km.



## 2. Main Goals

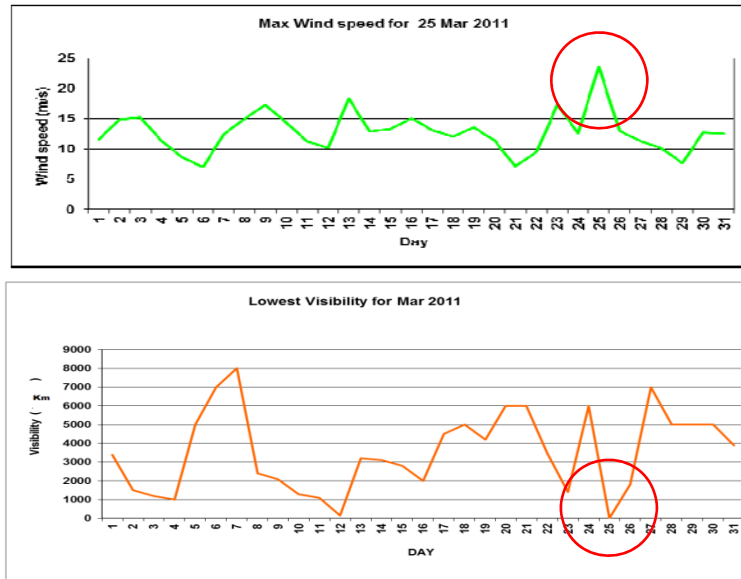
- Assess the impact on air quality.
- Create seasonal climatologies of air parcel trajectories.
- validity of numerical model
- Assess dust storms sources

## 4. Methodology

- a. Collected meteorology data.
- b. Numerical model.
- c. Satellite images.

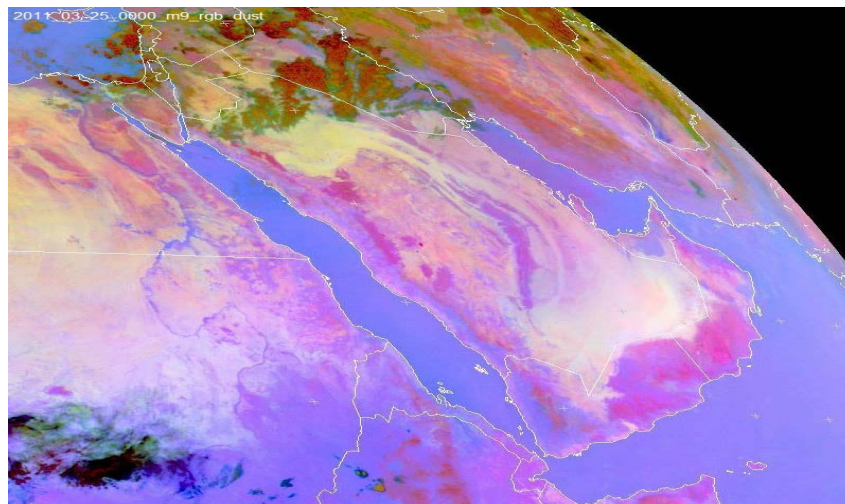
### 1. Case study in Kuwait

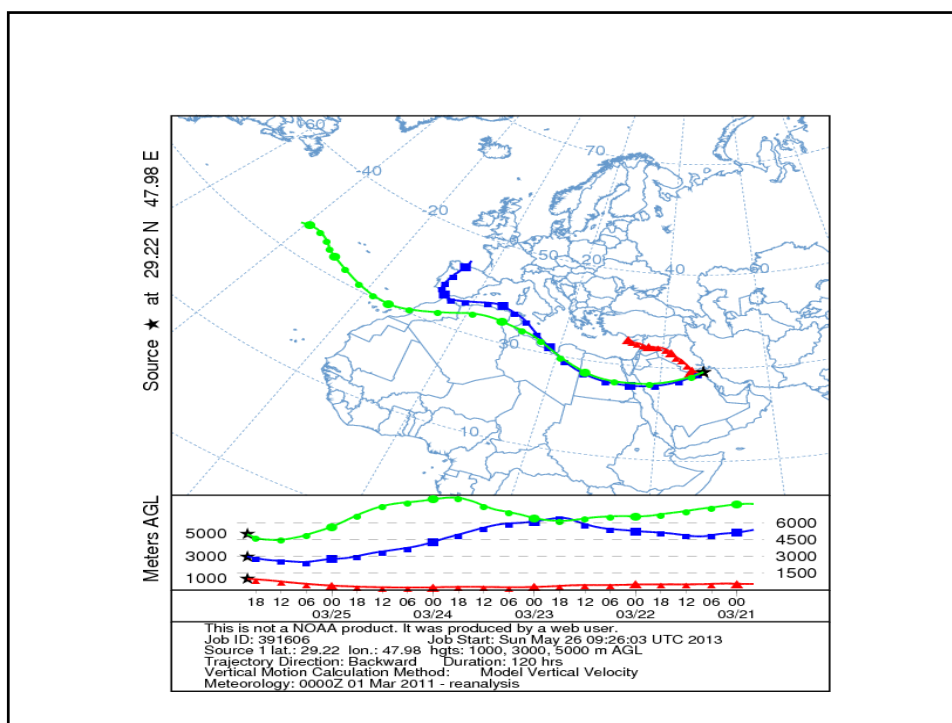




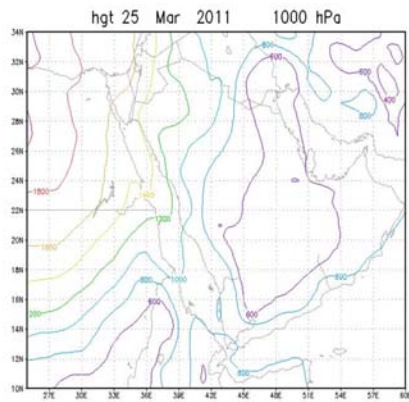
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## Satellite images

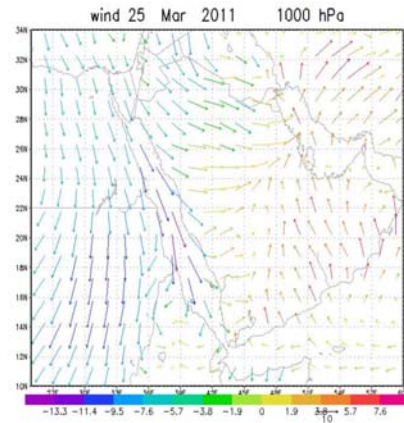




Google Earth for 5 days backward trajectory analysis started at altitudes of 1000, 3000, and 5000 at 20:00 UTC at Kuwait.

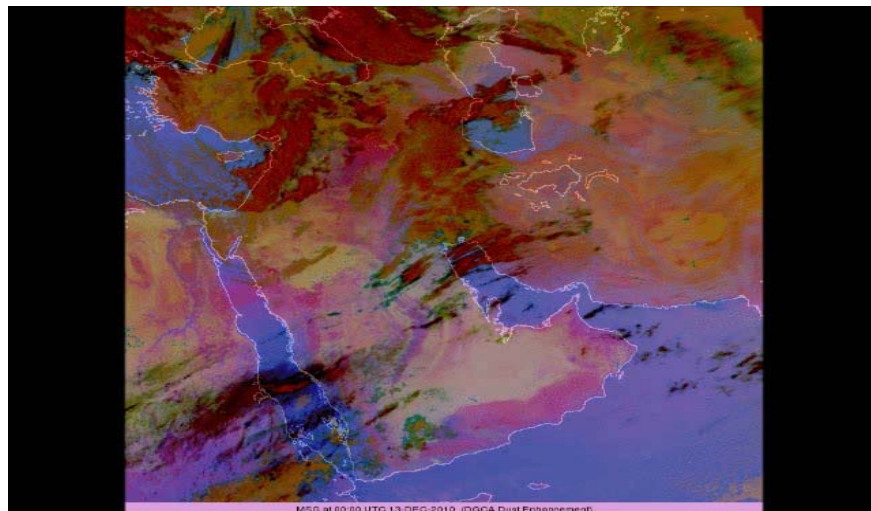


Pressure system for the case study  
at surface (1000hpa)

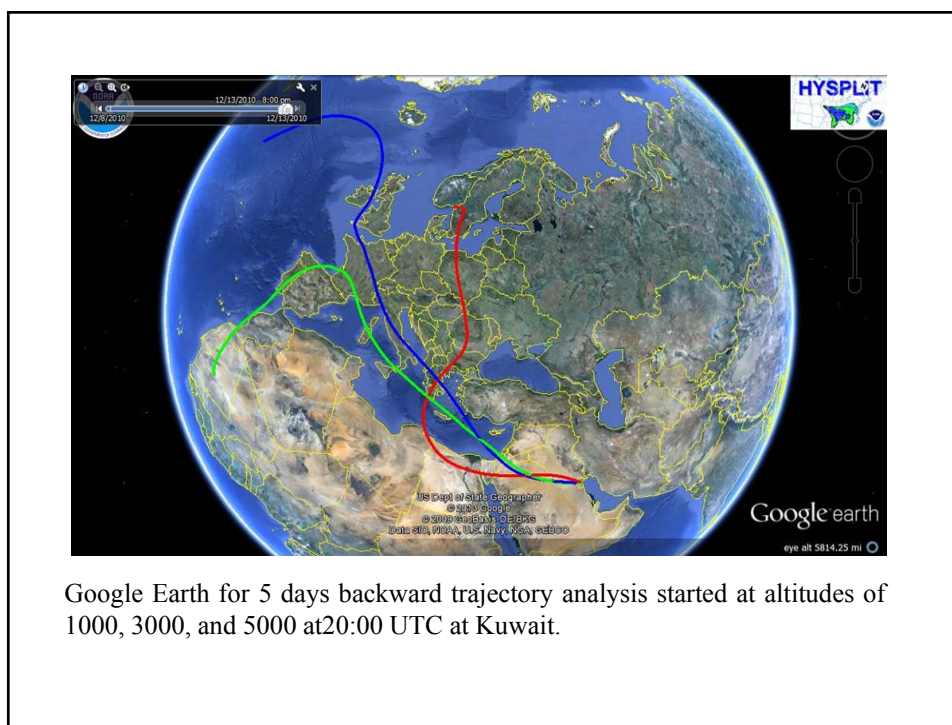
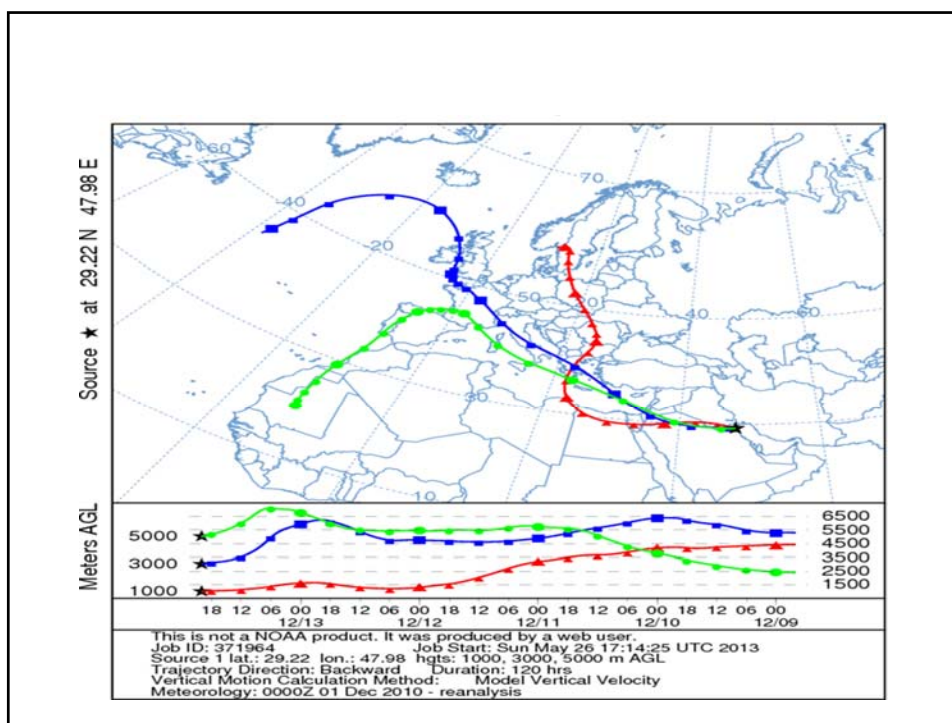


Wind system for the case study at  
surface(1000hpa)

## Satellite images: Winter

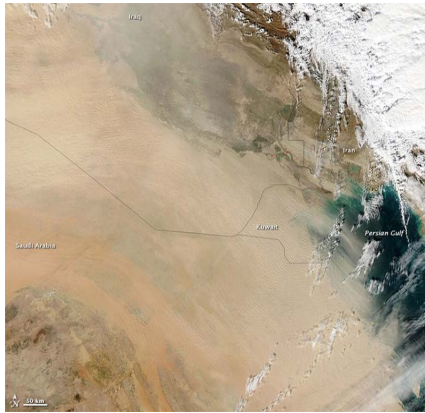




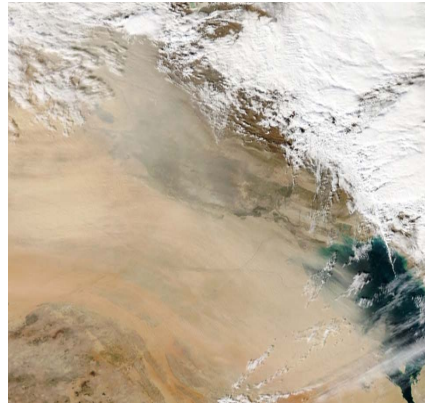




## Satellite images

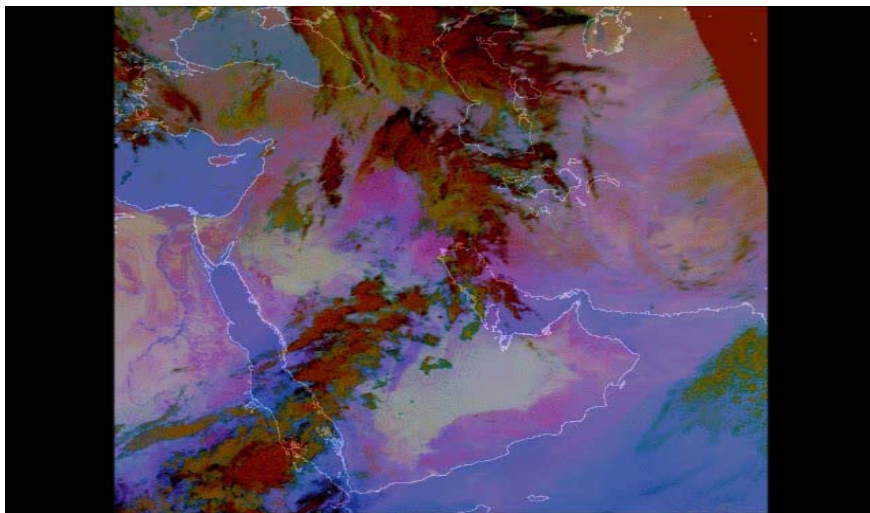


The Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite captured this natural-color image



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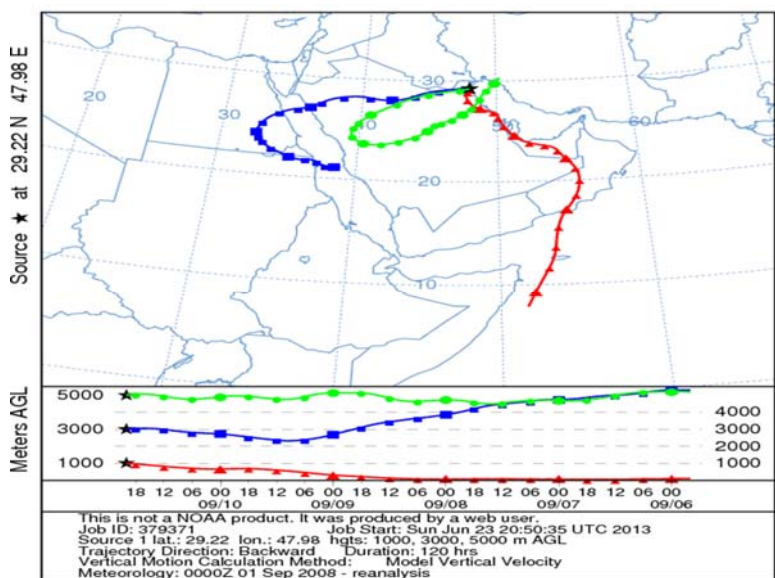
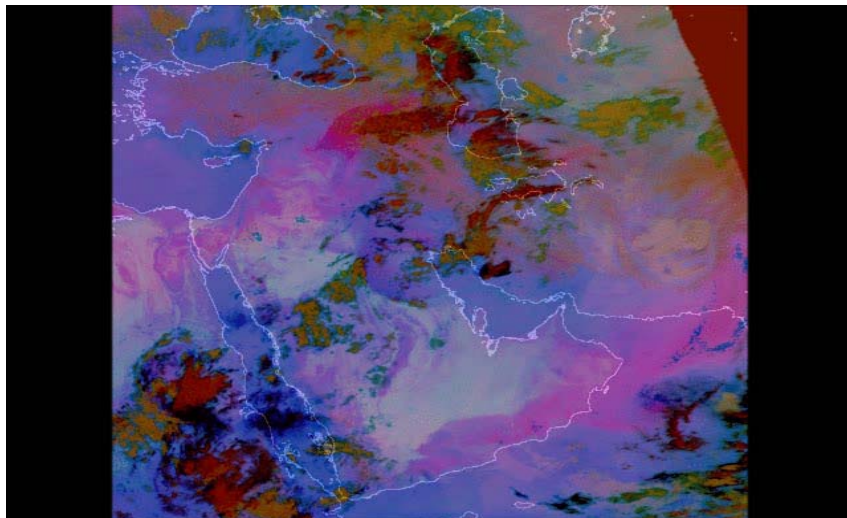
## Satellite images





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## Satellite images

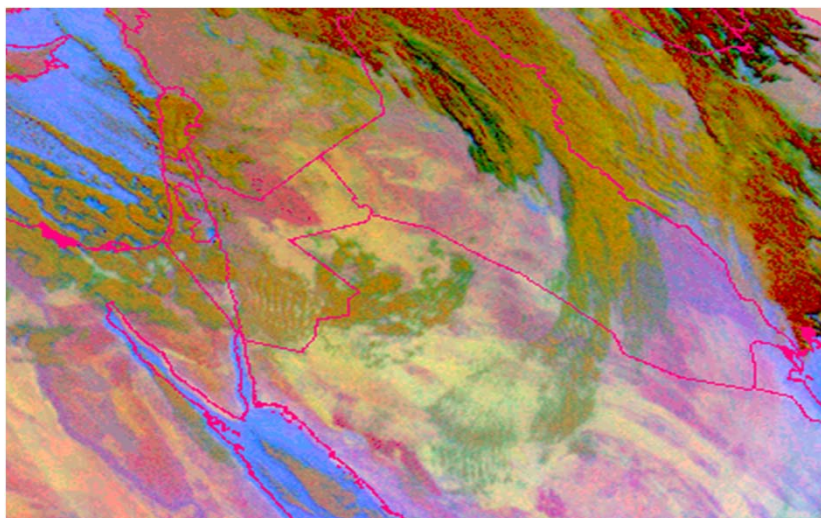


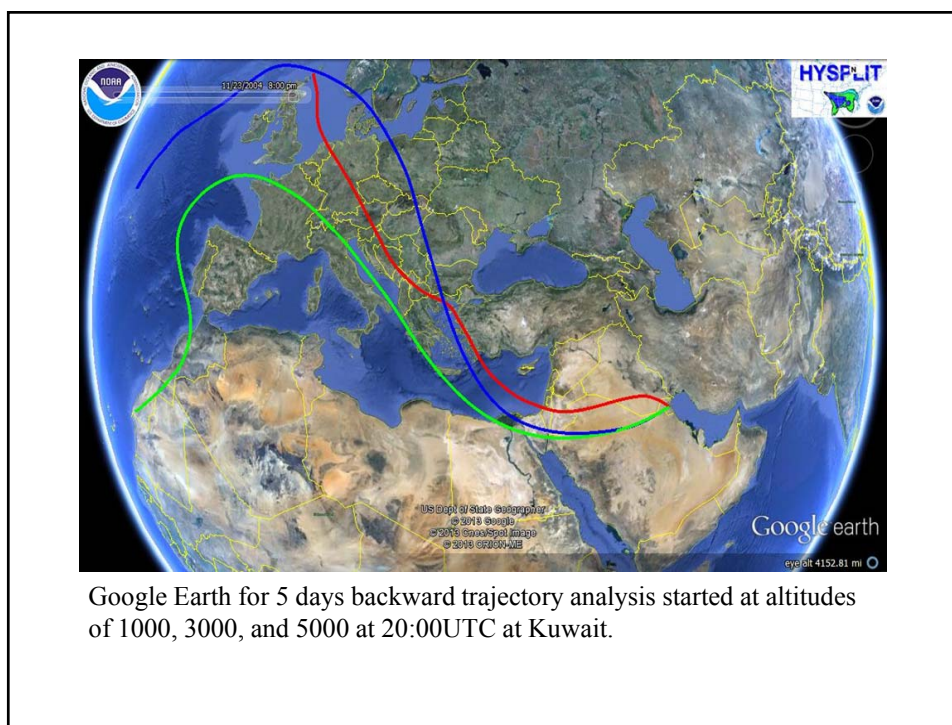
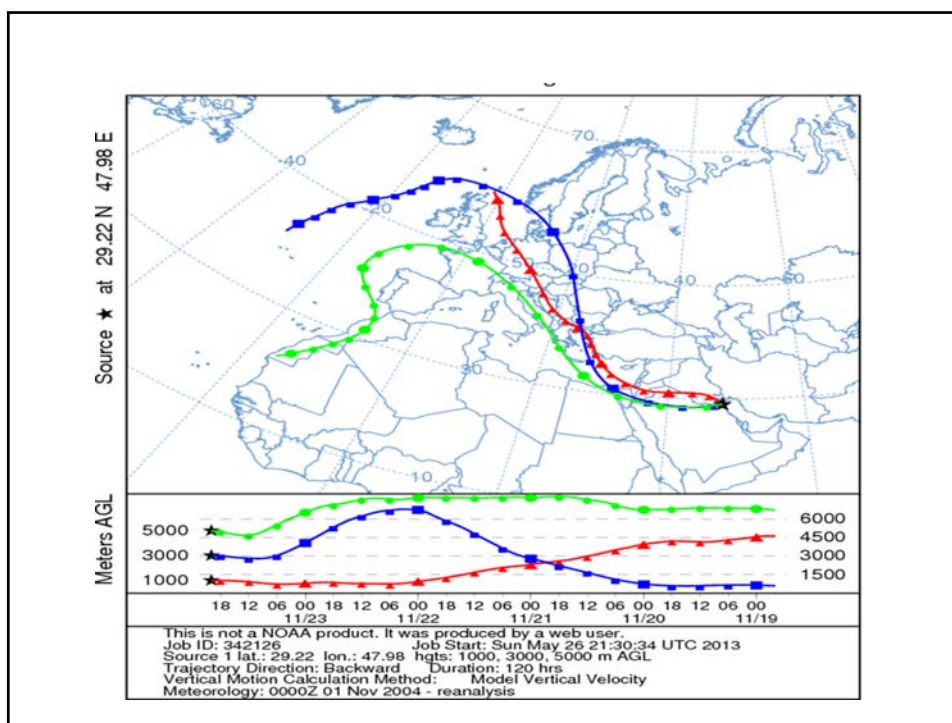




Google Earth for 5 days backward trajectory analysis started at altitudes of 1000, 3000, and 5000 at 20:00 UTC at Kuwait.

## Satellite images





## 6. Conclusion

Main dust storm sources was almost from Sahara Desert and Arabian Desert.

Influencing the visibility come from the north (Winter), the west and southwest (Spring) and the west and northwest directions (Summer & Autumn).

The air mass trajectories originated from south Iraq, north Saudi Arabia, Europe, North Atlantic Ocean, North Africa and Sahara Desert (Winter), Saudi Arabia, Mediterranean Sea, North Africa and North Atlantic Ocean mainly from west- North West sector (Spring), Mediterranean Sea, North Africa and North Atlantic Ocean mainly from west- southwest sector (Summer) and Europe, North Africa and North Atlantic Ocean mainly from west- northwest sector (Autumn).

**THANK YOU FOR YOUR ATTENTION**