

2nd TRAINING COURSE ON WMO SDS-WAS
(SATELLITE AND GROUND OBSERVATION AND
MODELLING OF ATMOSPHERIC DUST)

ANTALYA, TURKEY, 21-25 NOVEMBER, 2011

DUST / SAND STORMS
EFFECTING YEMEN

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YEMEN METEOROLOGICAL SERVICE

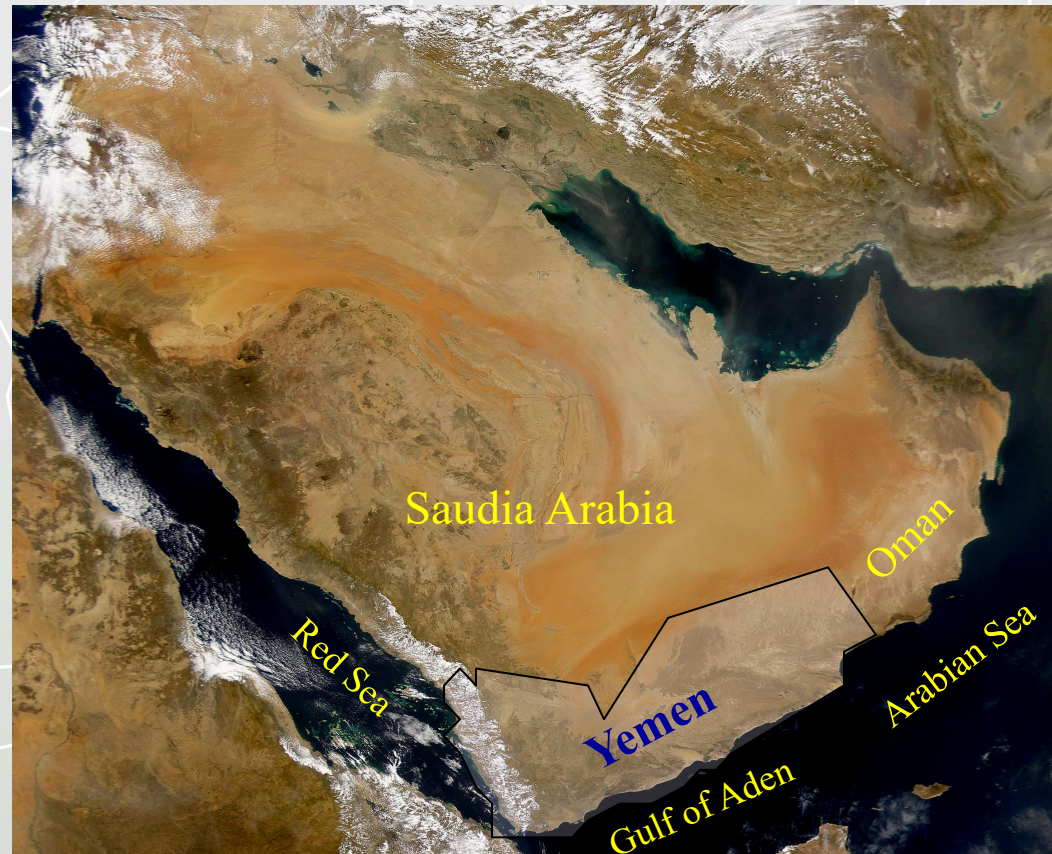
CIVIL AVIATION & METEOROLOGY AUTHORITY
SANA'A , REPUBLIC OF YEMEN

Introduction

- Dust and Sand Storms are natural events that occur widely around the world in arid and semi-arid regions, especially in subtropical latitudes.
- The Sahara and drylands around the Arabian peninsula are the main dust sources affecting Middle East .

Geography of Yemen

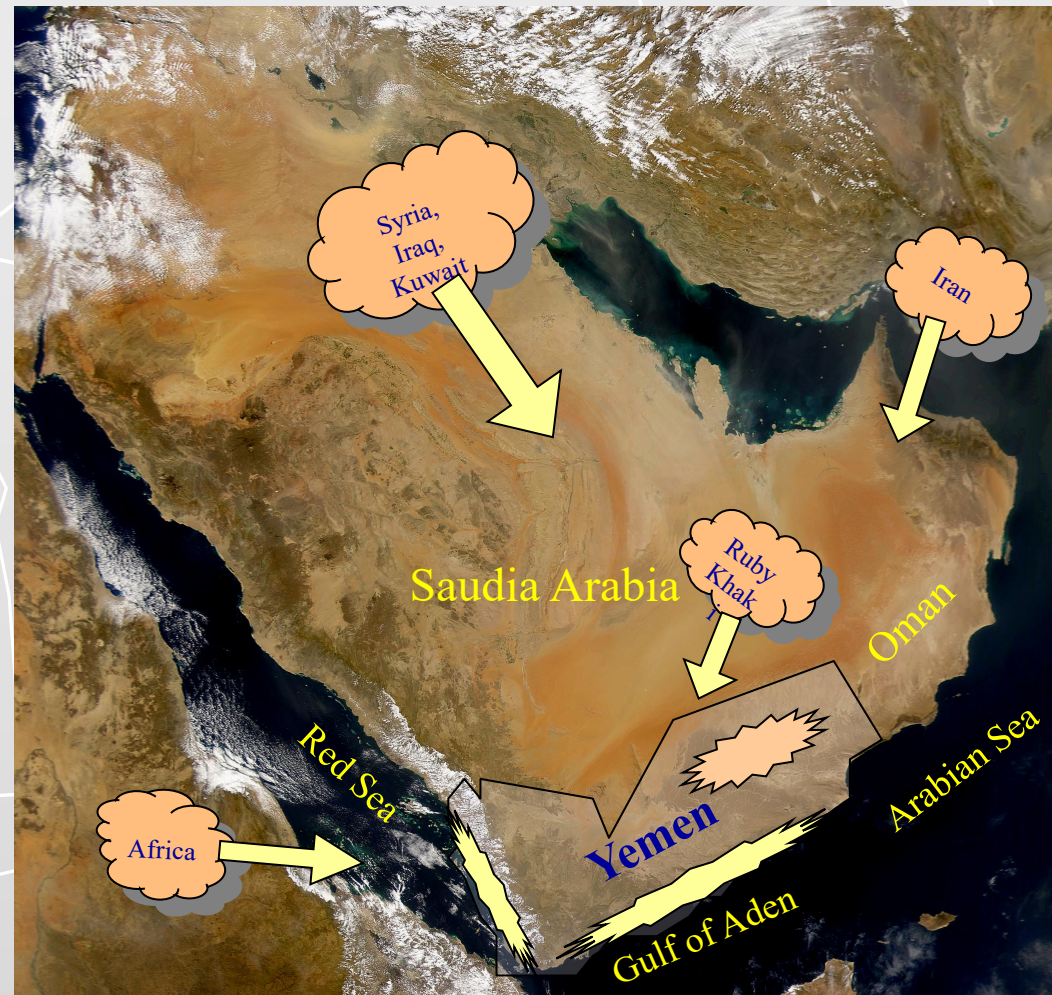
- Yemen located in the Middle East, occupying the southwestern to southern end of the Arabian Peninsula between latitudes 12° and 19° N and longitudes 42° and 55° E
- It is bordered by Saudi Arabia to the north, the Red Sea to the west, Oman to the east and Gulf of Aden and Arabian Sea to the south.
- The country land area is about 555,000 square kilometers which includes mountains, ridges, valleys, wadies and desert areas.



Main Dust / Sand Storms sources affecting Yemen

The main dust/sand sources affecting Yemen are;

- ✓ Iraq desert,
- ✓ Arabia Peninsula coastal areas and desert.
- ✓ Iran desert,
- ✓ Africa deserts
- ✓ Yemen coastal and desserts areas.



Type of Dust/Sand Storms effecting Yemen

Two types of dust storms effecting Yemen ;

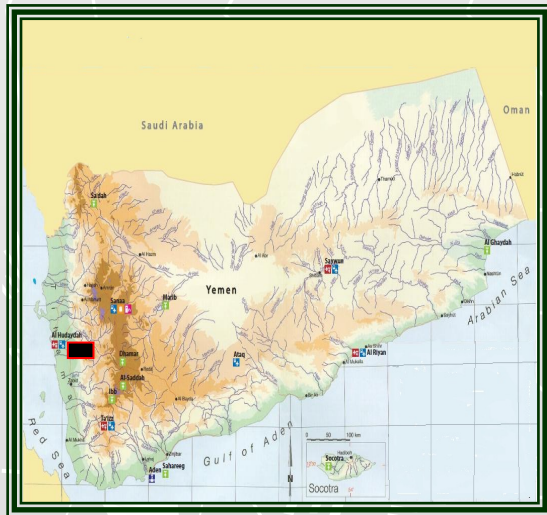
- Small Scale Dust Storm (convective events): This type normally associated with strong convective storm such as thunderstorm outflow winds or downburst.
- Large Scale Dust Storms (non convective events): This type normally caused by strong synoptic pressure gradient.

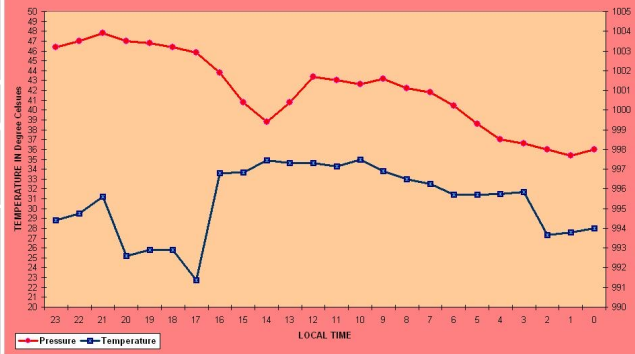
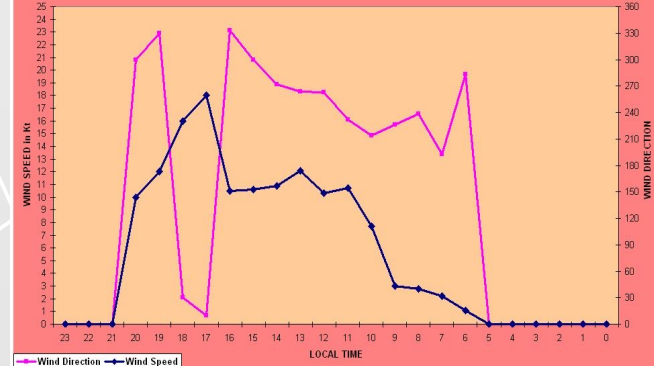
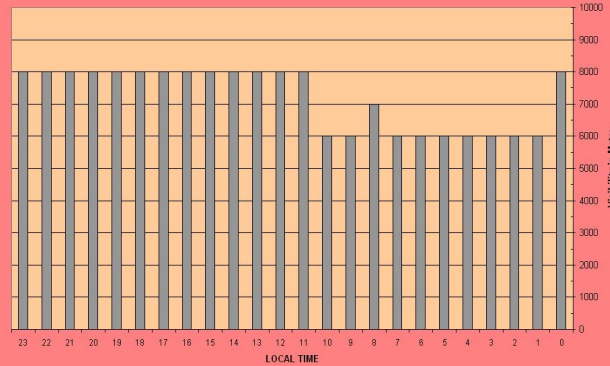
Small Scale Dust/Sand Storms

- Normally caused by localized high winds associated strong convective storm events such as a thunderstorm outflow winds or downbursts.
- In summer and during the interaction between tropical and subtropical period, convective clouds develop in the interiors of Yemen especially in the mountainous regions producing the up and down drafts, and lifting the small particles of dust from the arid land and eventually the dust storm or sand storm is created.
- Usually form during the late afternoon in the spring and summer when daytime heating is at its peak.
- Scale : 5 – 10 km

Small Scale Dust Storm, effecting Hodeidah on, 8th July, 2008

Started at 16:30 LT



[illegible]

Large Scale Dust/Sand Storms

- Normally, associated with sustained high winds at the surface that are often associated with strong synoptic pressure gradient or frontal System at the sources causing blowing dust to Yemen, such as the blowing dust from Iraq, Arabian Peninsula Deserts, and African Deserts.
- Generally occur in early Spring or Summer when extreme pressure gradients produce high wind speeds and surfaces are often dry and bare at the sources.
- The wind speed in Yemen normally increases during the SW monsoon, thus causing the sand/dust particles to rise and lowering visibility to its minimum value specially over the deserts, coastal and dryland.
- AL-GHOBA: is the local name in Yemen for strong SW dray and hot wind raises a lot of dust from the costal areas to the interior lands of Yemen. It caused by Khamsin low coming from south Egypt, or Northeastward shift of Sudan low, most frequent in March and April over east cost of the red sea including Yemen.

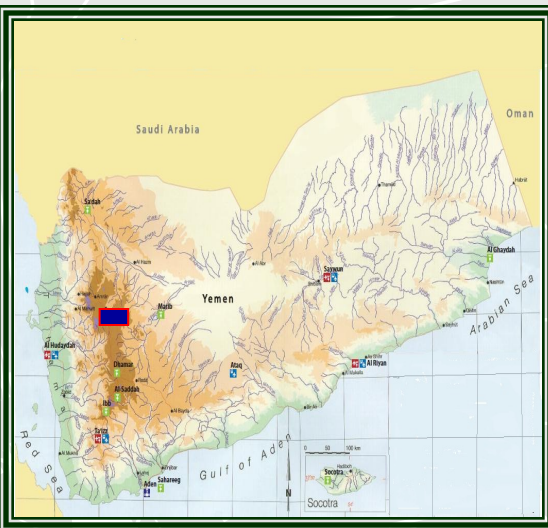
Case for Large Scale Dust Storm, effecting Yemen, (26-29) March, 2011



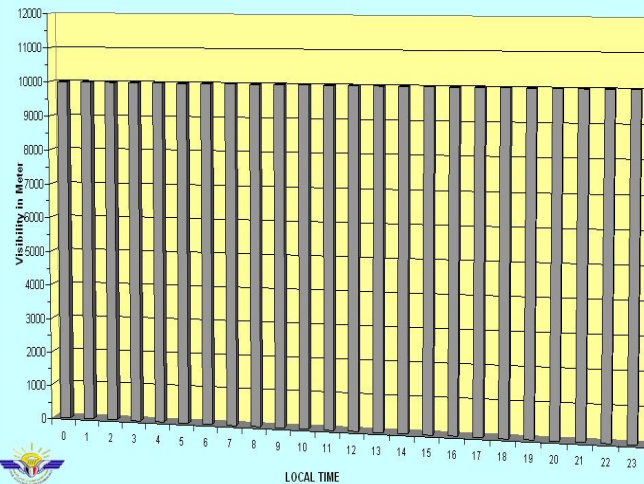
Dust Storm, effecting
Sana'a, (27-29) March,
2011, Visibility < 150 m

YMS/ Stations records of Visibility, Wind, Pressure and Temperature

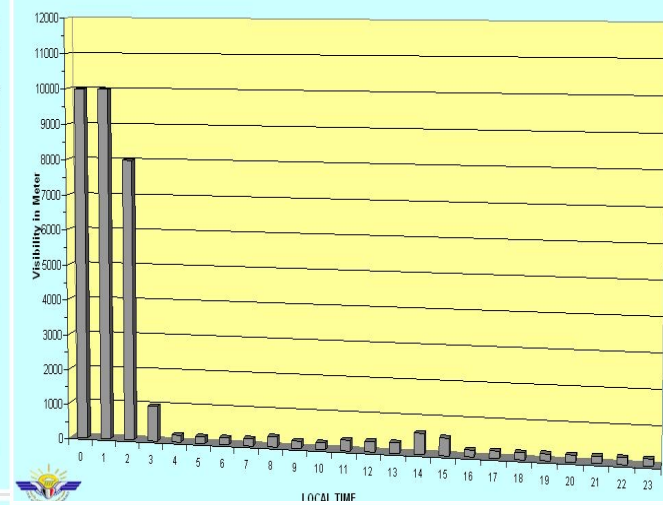
(Visibility) for Sana'a (h:2100m) , (26-29) March 2011



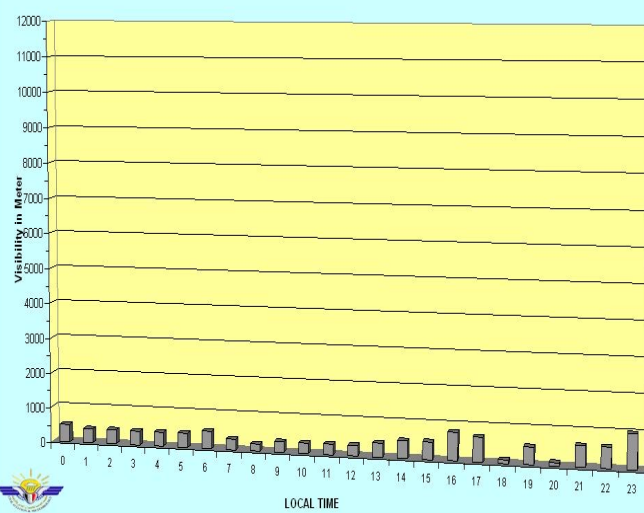
HOURLY VISIBILITY 26, March 2011 for SANA'A



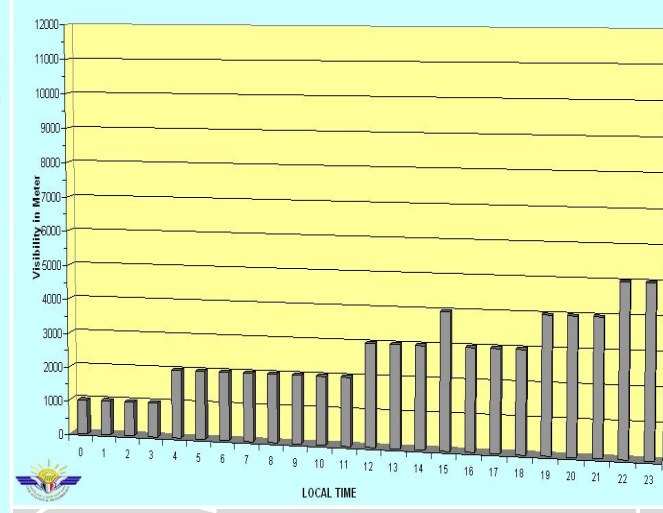
HOURLY VISIBILITY 27, March 2011 for SANA'A



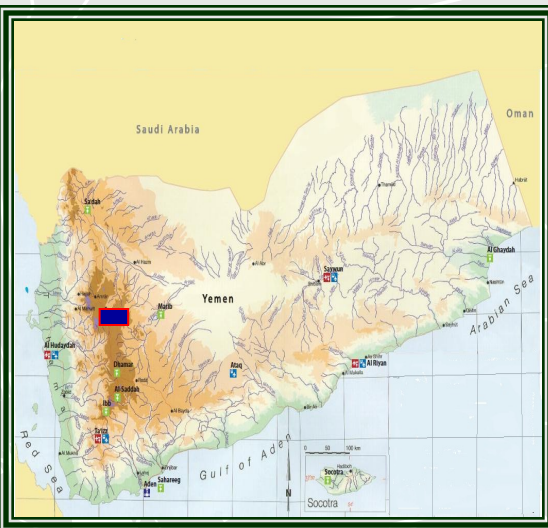
HOURLY VISIBILITY 28, March 2011 for SANA'A



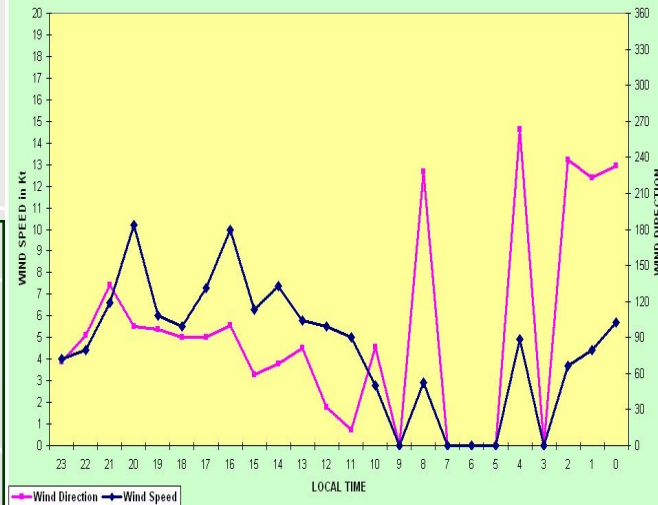
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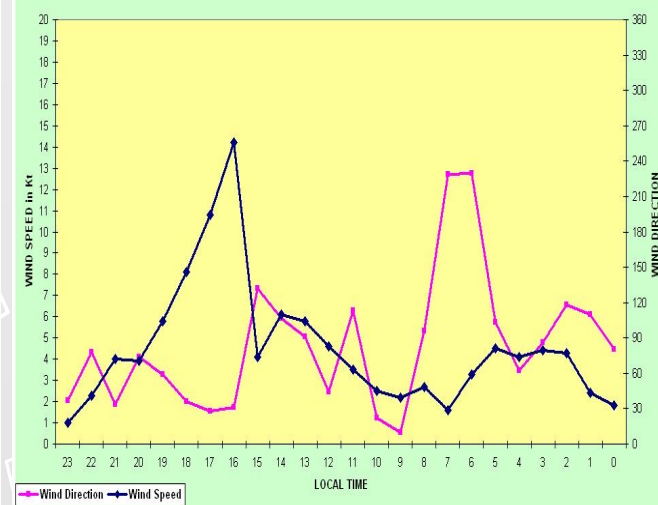
YMS/ Stations records of Visibility, Wind, Pressure and Temperature (Wind speed & Direction) for Sana'a (h:2100m) , (26-29) March 2011



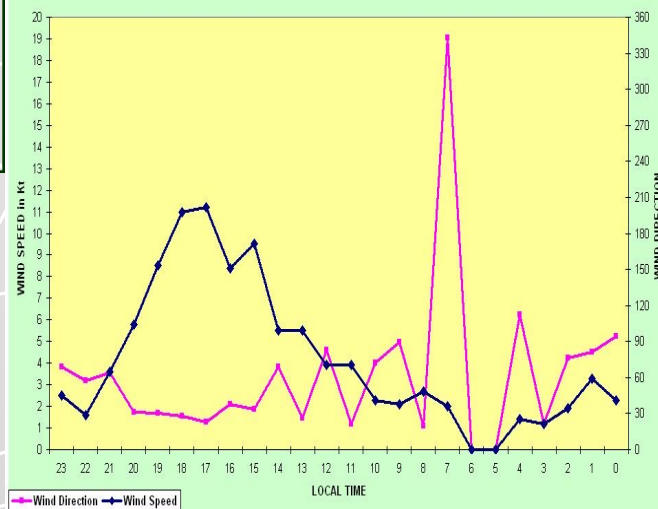
HOURLY WIND SPEED & DIRECTION 26, March 2011 FOR SANA'A



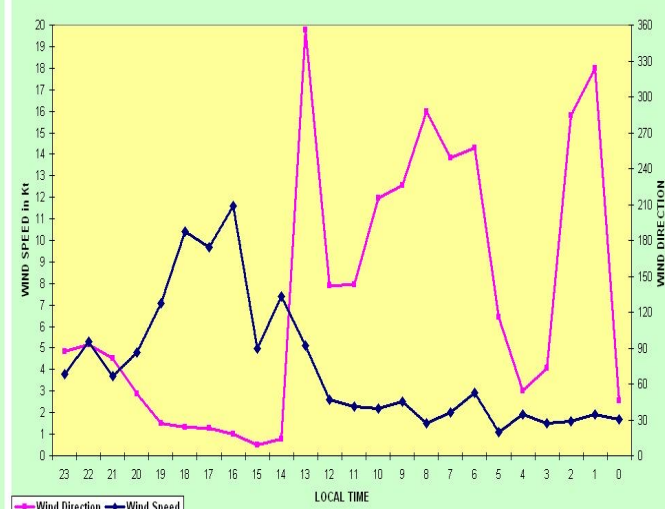
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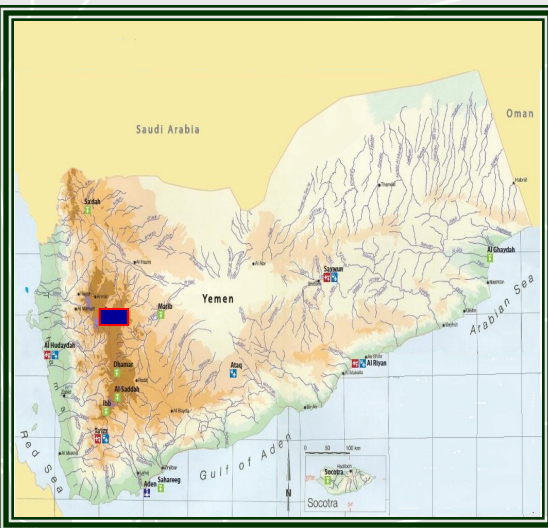
HOURLY WIND SPEED & DIRECTION 28, March 2011 FOR SANA'A



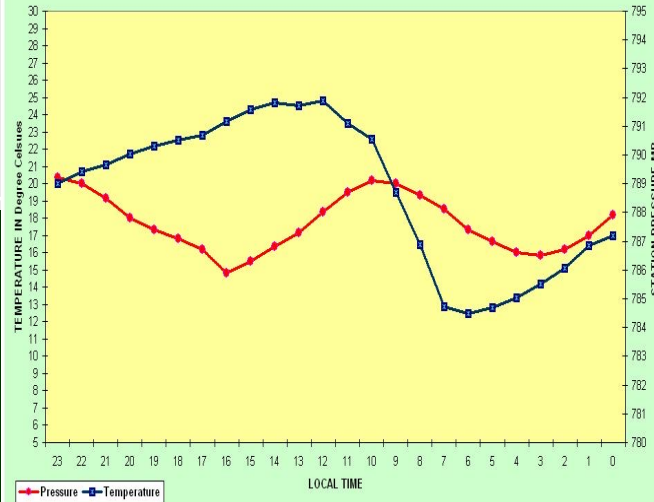
HOURLY WIND SPEED & DIRECTION 29, March 2011 FOR SANA'A



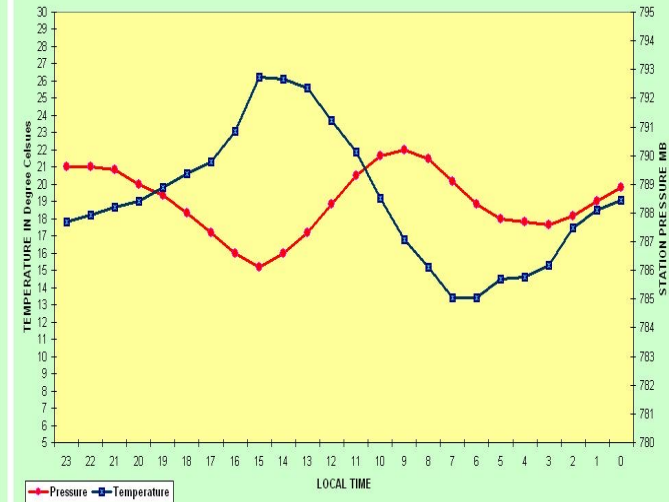
YMS/ Stations records of Visibility, Wind, Pressure and Temperature (Temperature & Pressure) for Sana'a (h:2100m), (26-29) March 2011



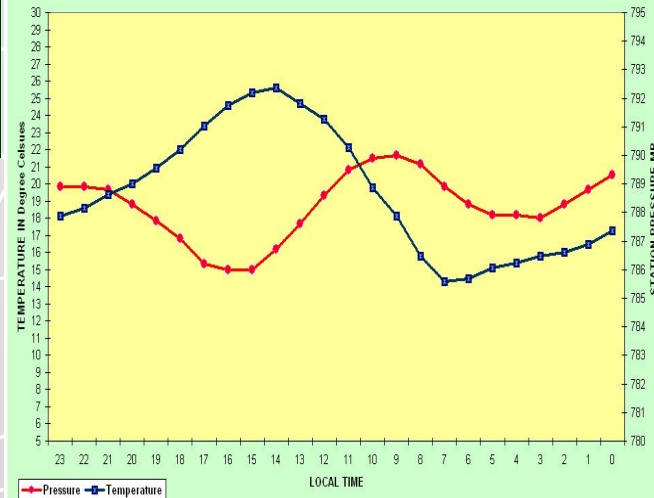
HOURLY PRESSURE & TEMPERATURE 26, March 2011 FOR SANA'A



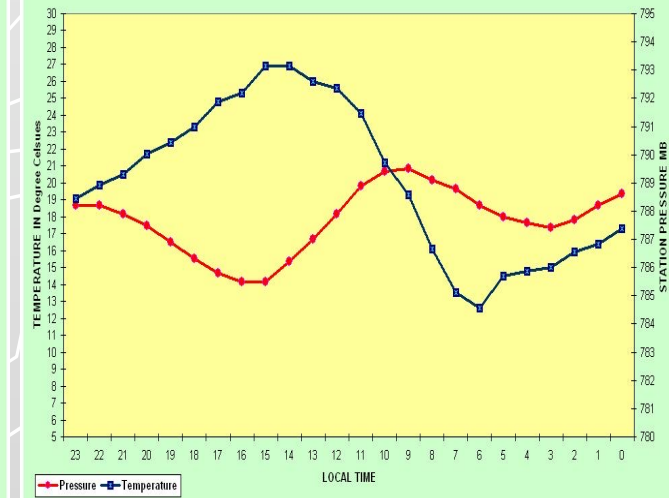
HOURLY PRESSURE & TEMPERATURE 27, March 2011 FOR SANA'A



HOURLY PRESSURE & TEMPERATURE 28, March 2011 FOR SANA'A

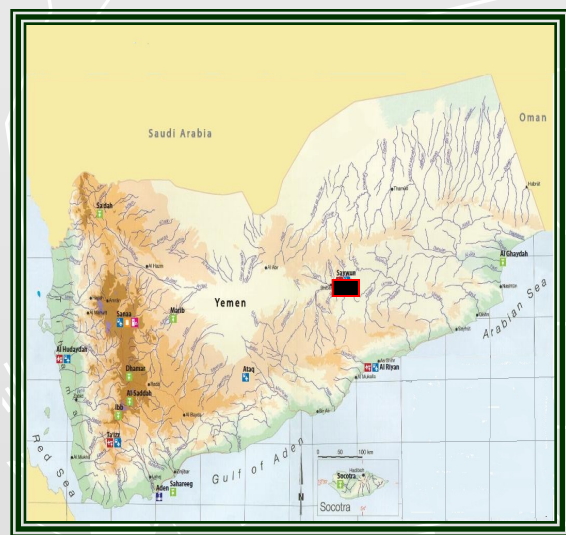


HOURLY PRESSURE & TEMPERATURE 29, March 2011 FOR SANA'A

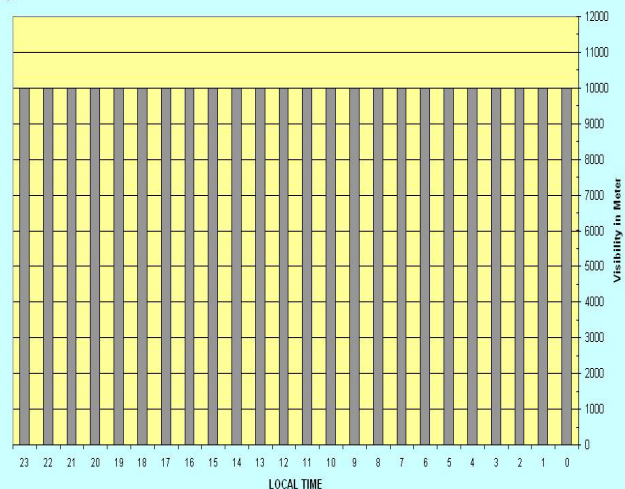


YMS/ Stations records of Visibility, Wind, Pressure and Temperature

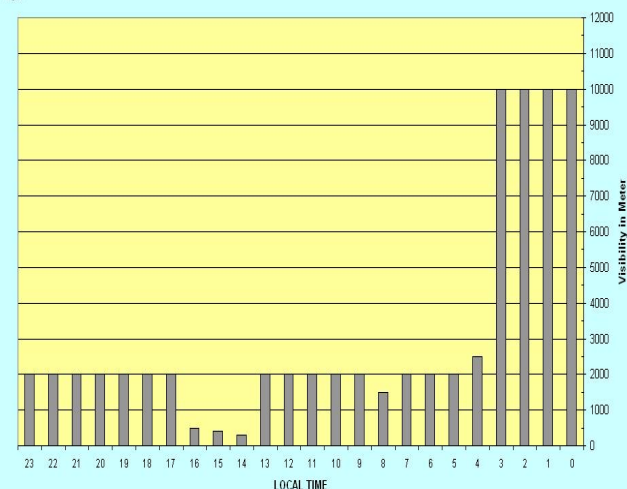
(Visibility) for Seiyun (h:580m) , (26-29) March 2011



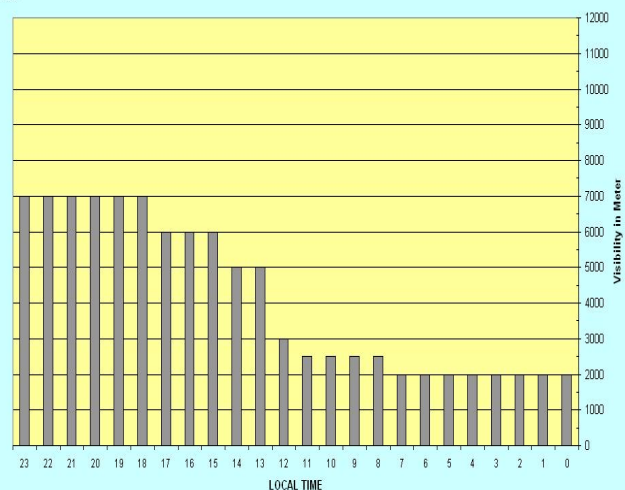
HOURLY VISIBILITY 26, March 2011 for SEIYUN



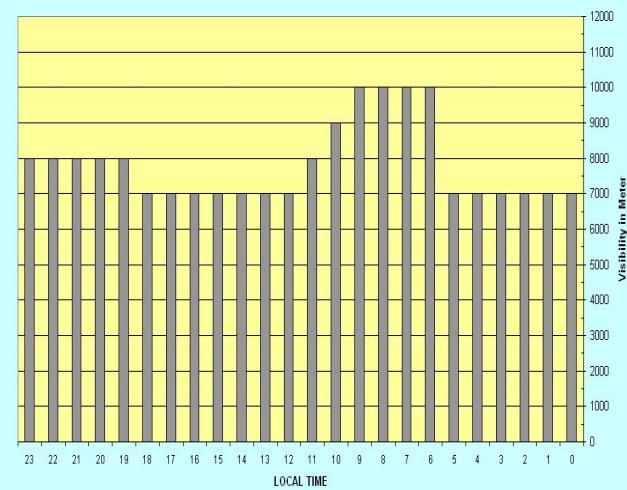
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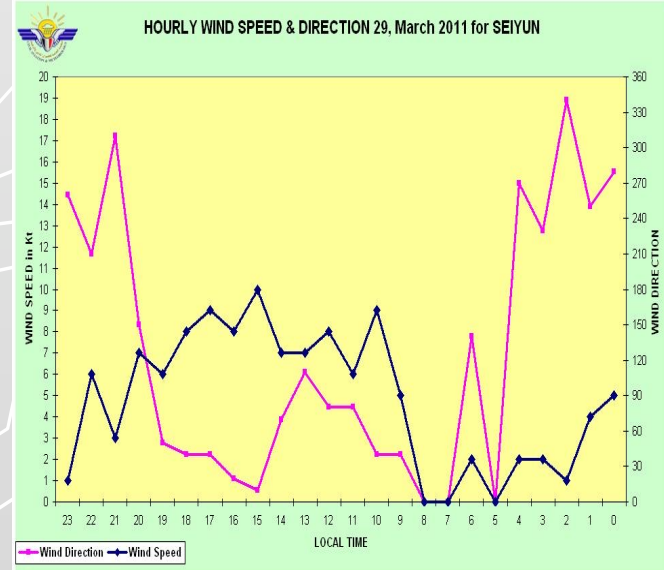
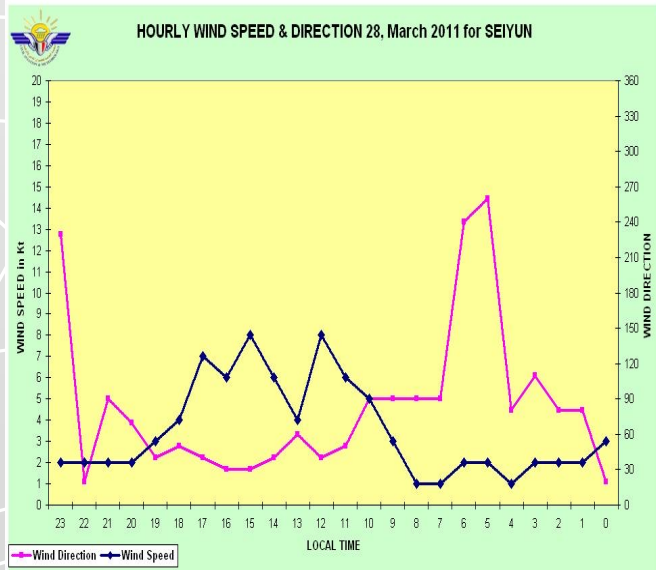
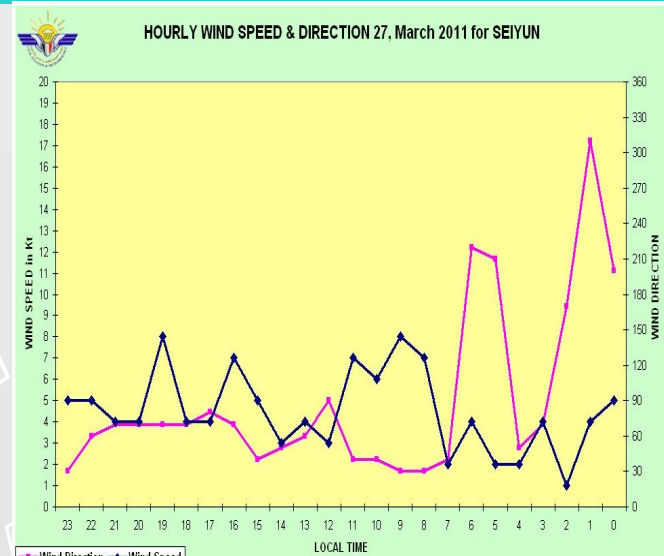
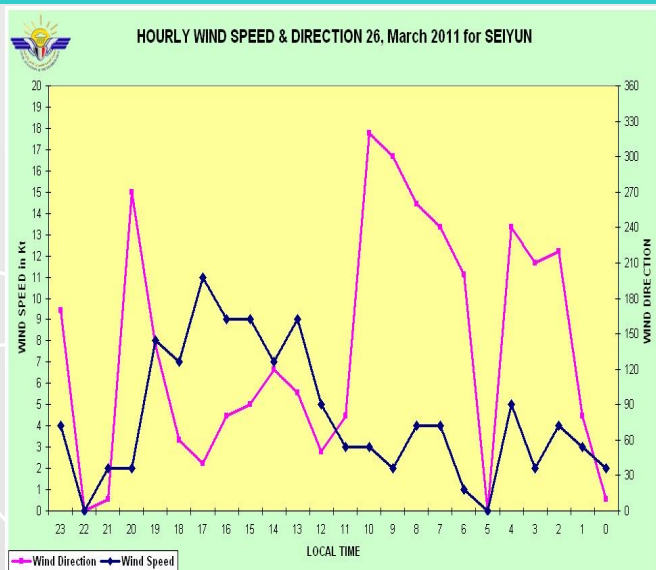
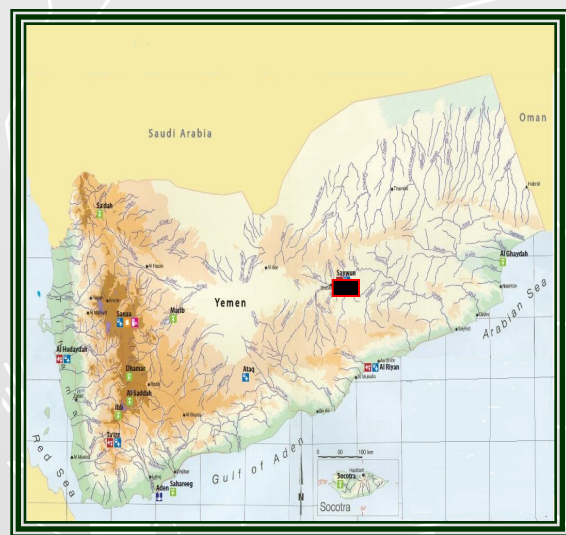
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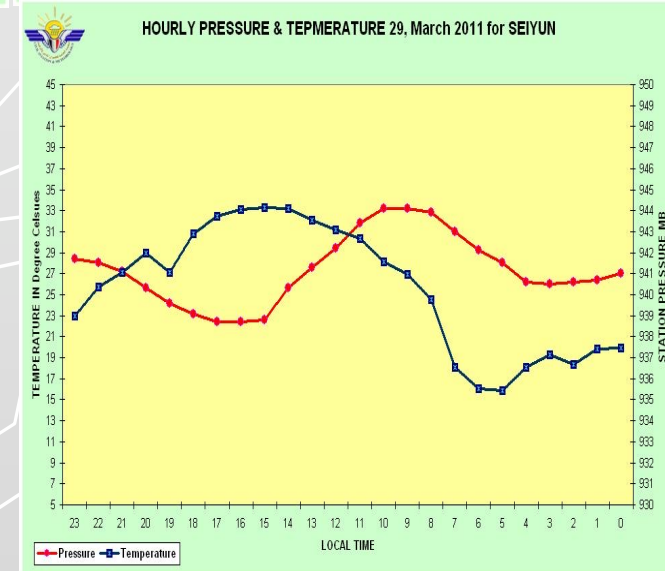
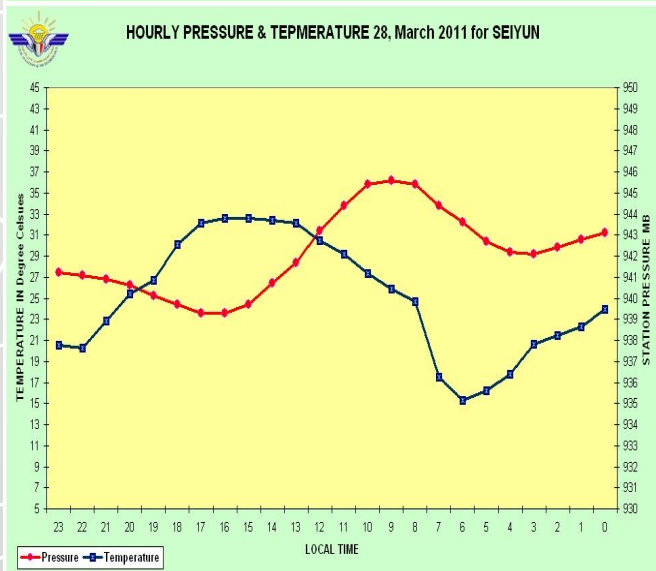
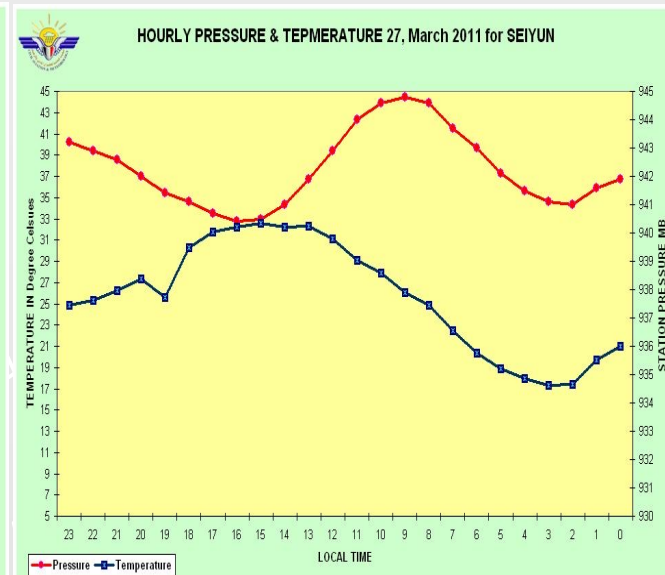
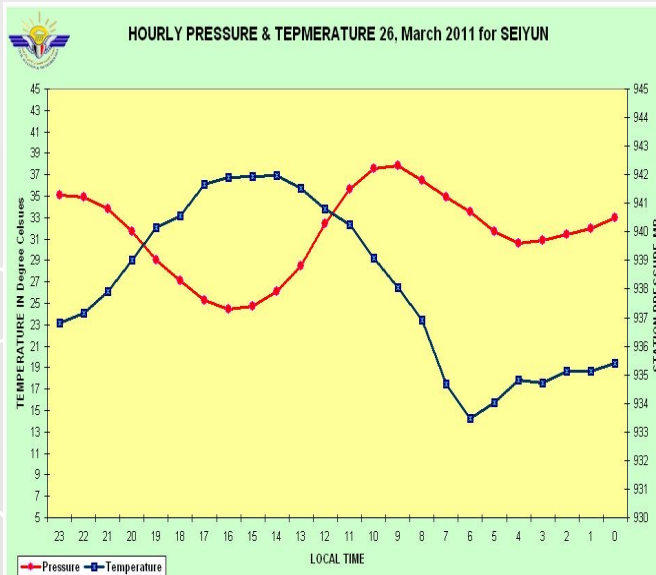
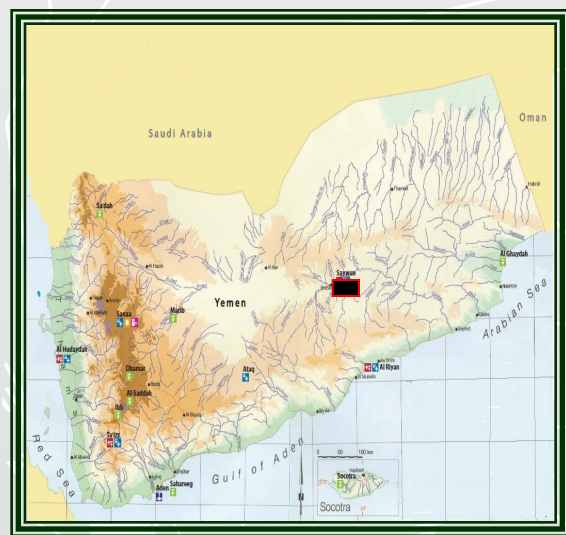
HOURLY VISIBILITY 29, March 2011 for SEIYUN



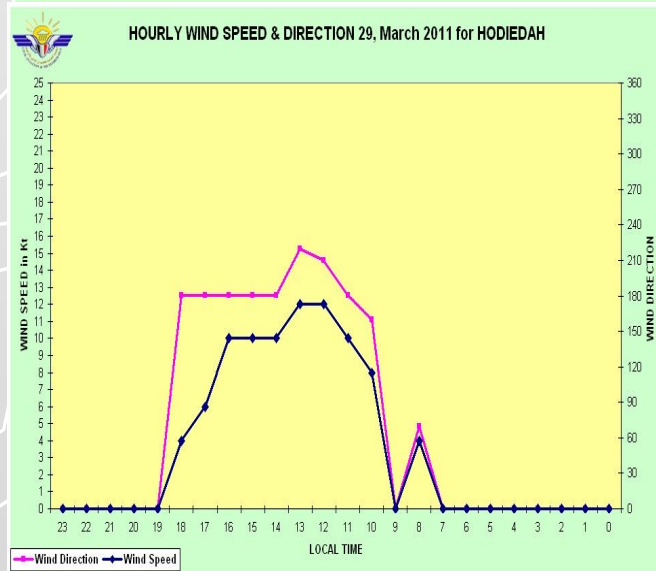
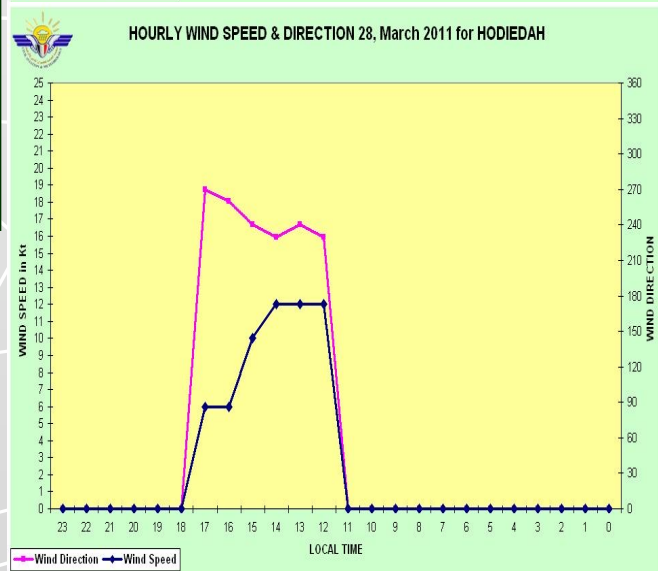
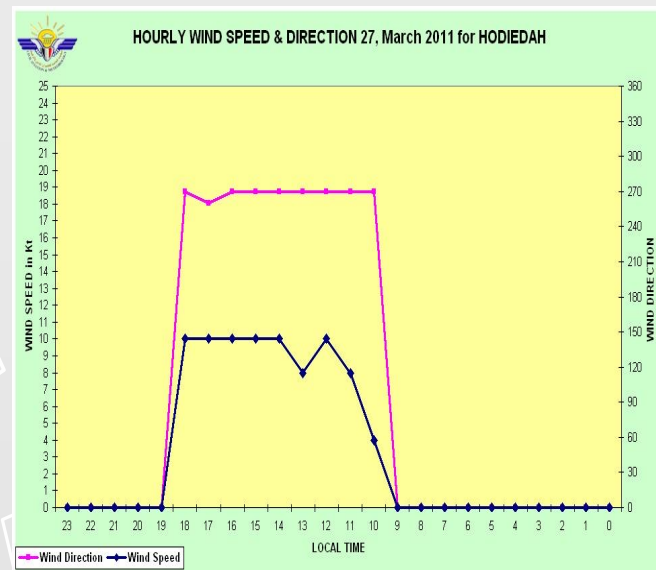
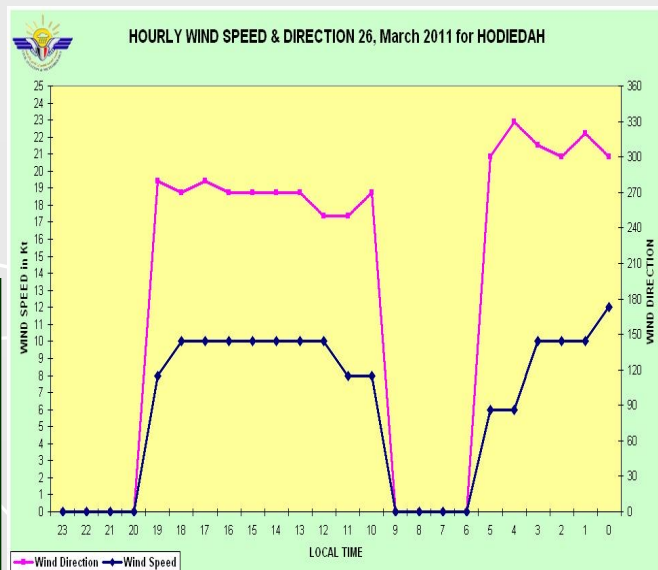
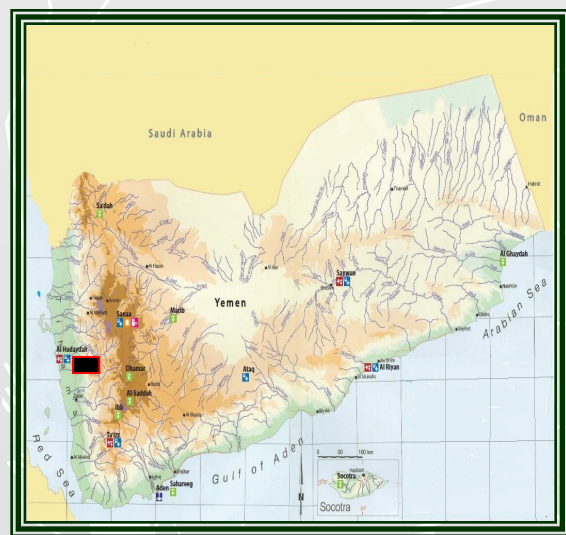
YMS/ Stations records of Visibility, Wind, Pressure and Temperature (Wind speed & Direction) for Seiyun (h:580m) , (26-29) March 2011



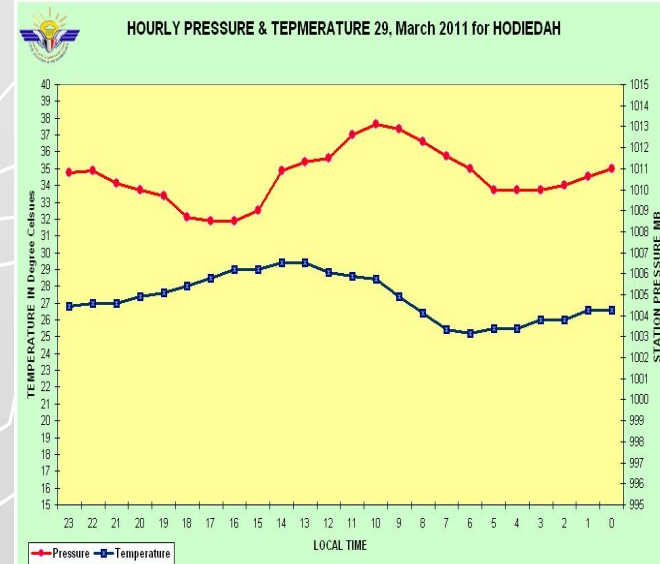
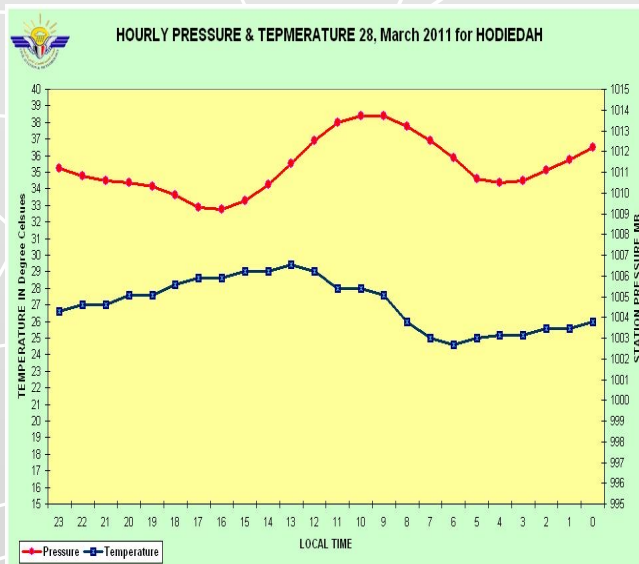
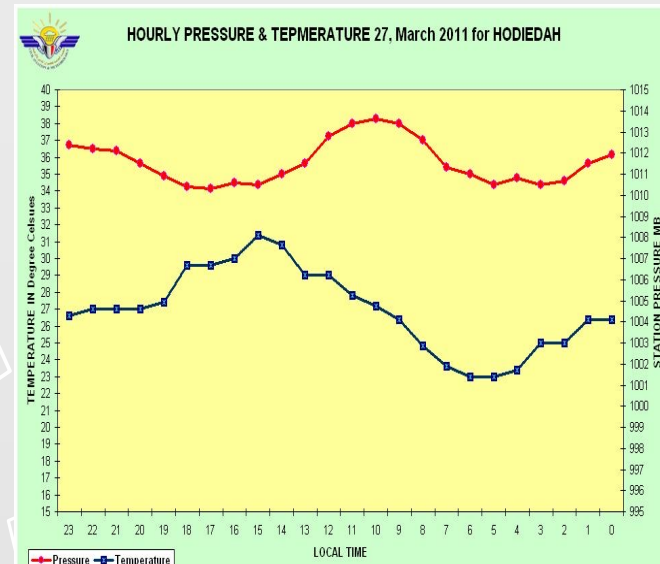
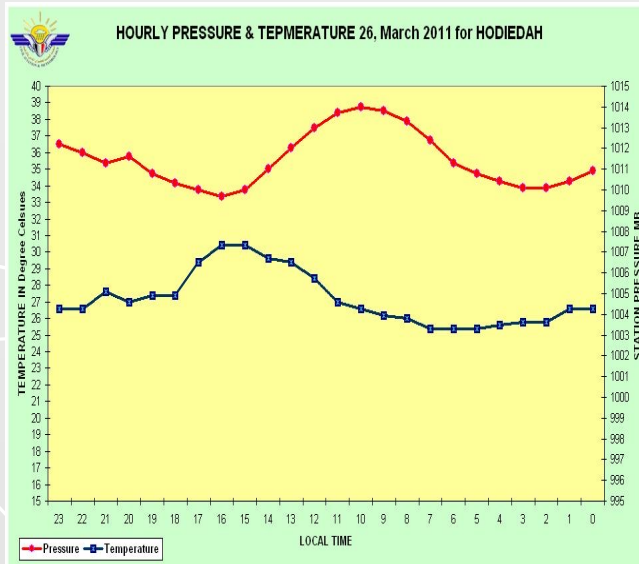
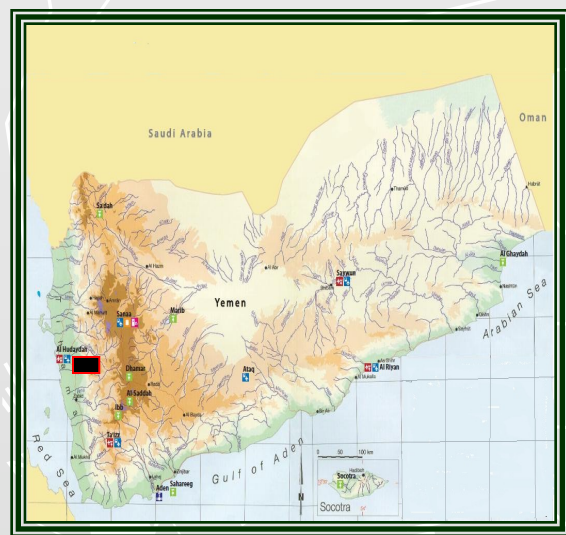
YMS/ Stations records of Visibility, Wind, Pressure and Temperature (Temperature & Pressure) for Seiyun (h:580m), (26-29) March 2011



YMS/ Stations records of Visibility, Wind, Pressure and Temperature (Wind speed & Direction) for Hodeidah (h:9m) , (26-29) March 2011

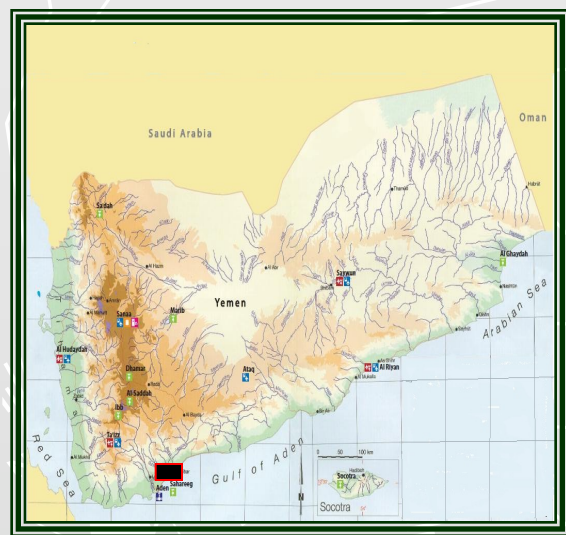


YMS/ Stations records of Visibility, Wind, Pressure and Temperature (Temperature & Pressure) for Hodeidah (h:9m), (26-29) March 2011

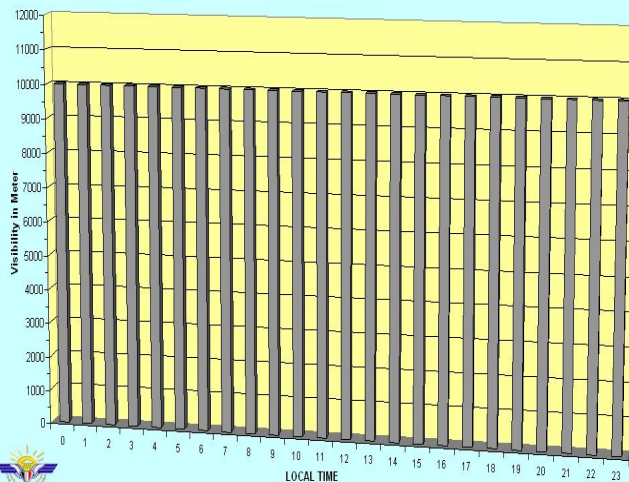


YMS/ Stations records of Visibility, Wind, Pressure and Temperature

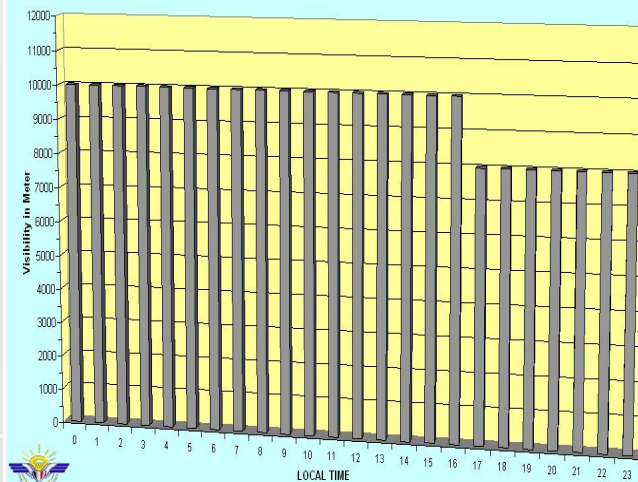
(Visibility) for Aden (h:3m) , (26-29) March 2011



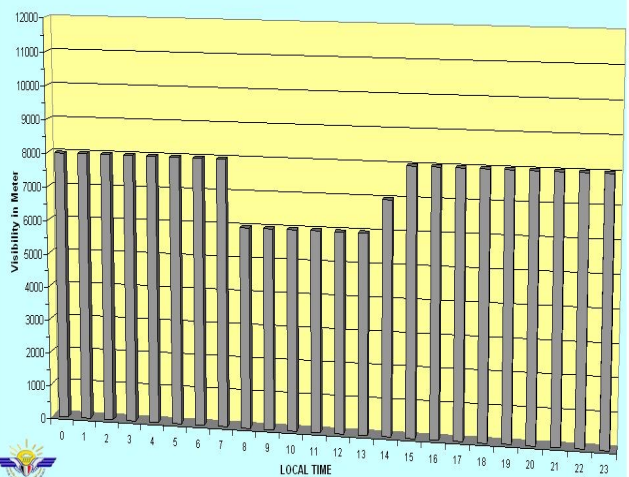
HOURLY VISIBILITY 26, March 2011 for Aden



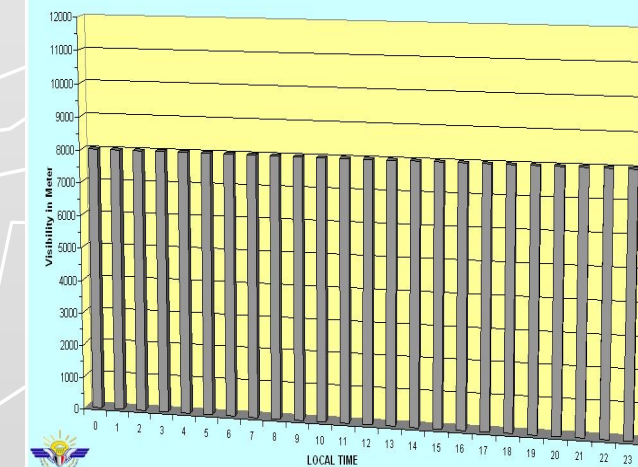
HOURLY VISIBILITY 27, March 2011 for Aden



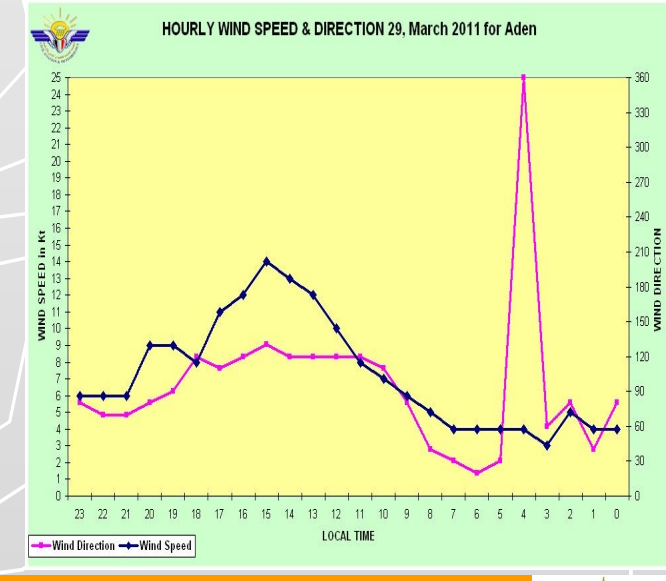
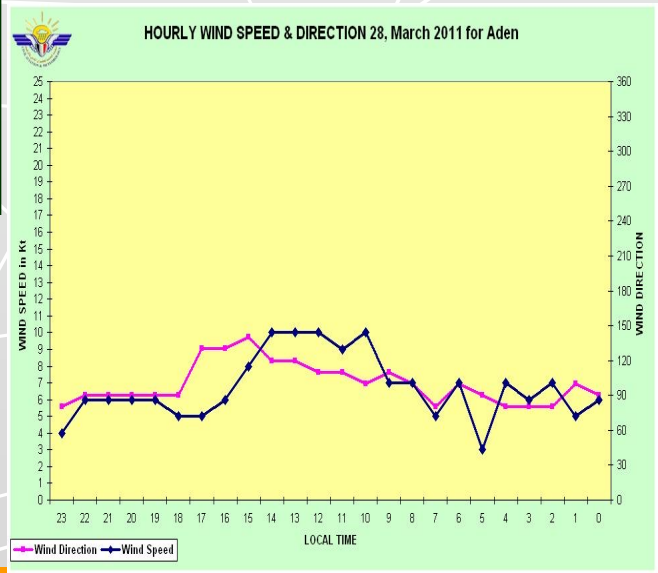
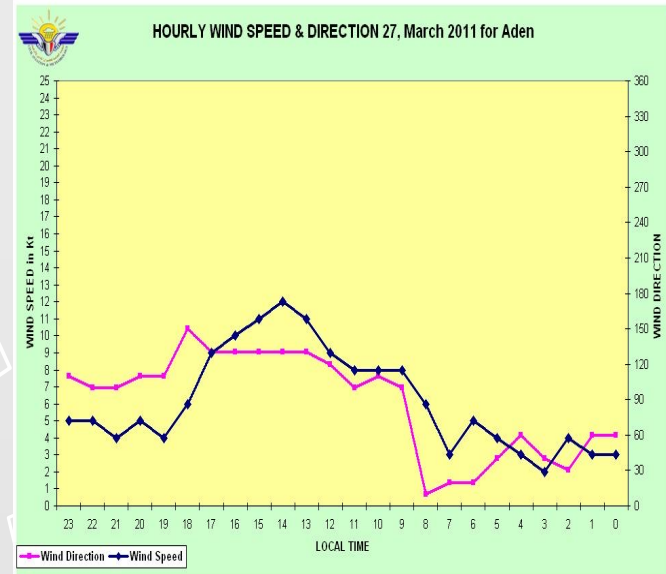
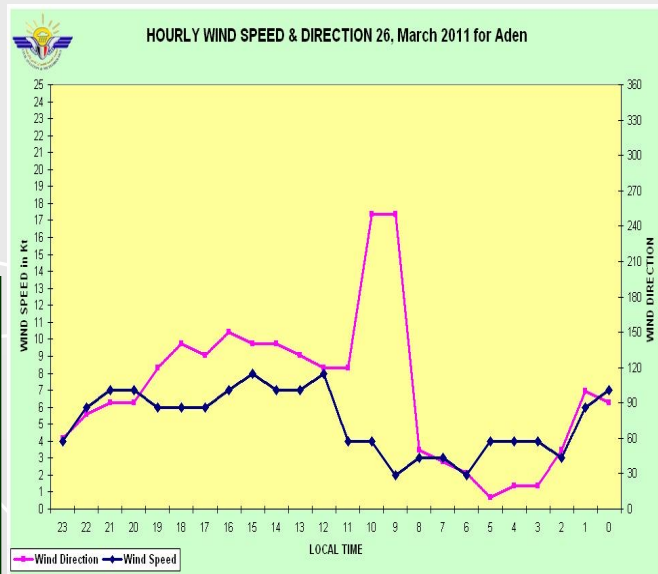
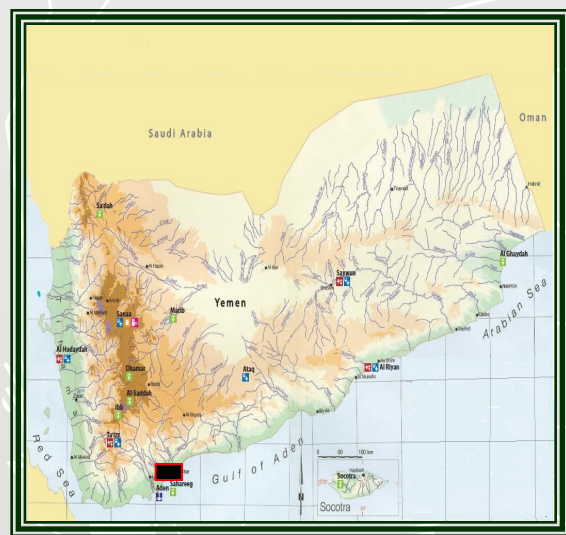
HOURLY VISIBILITY 28, March 2011 for Aden



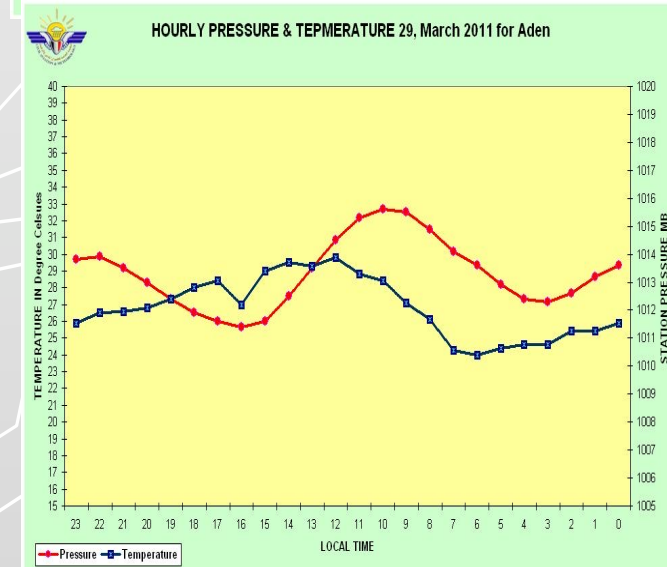
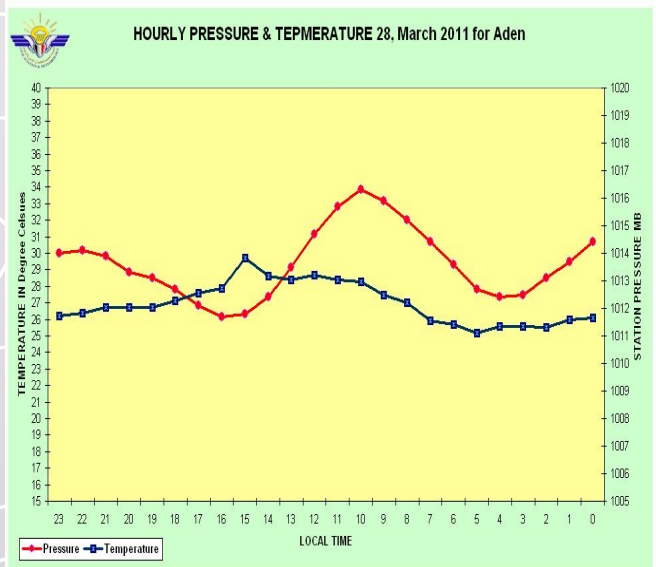
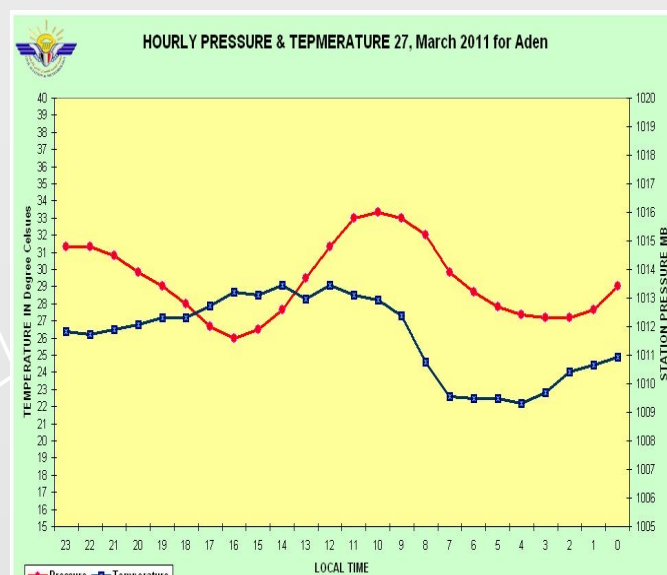
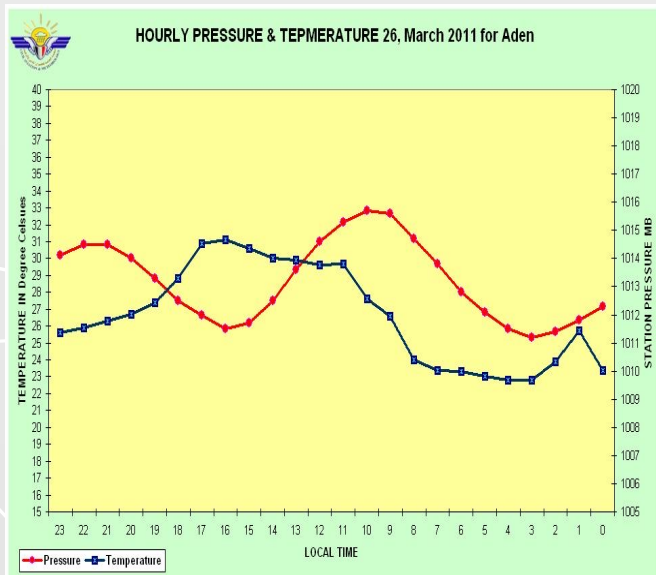
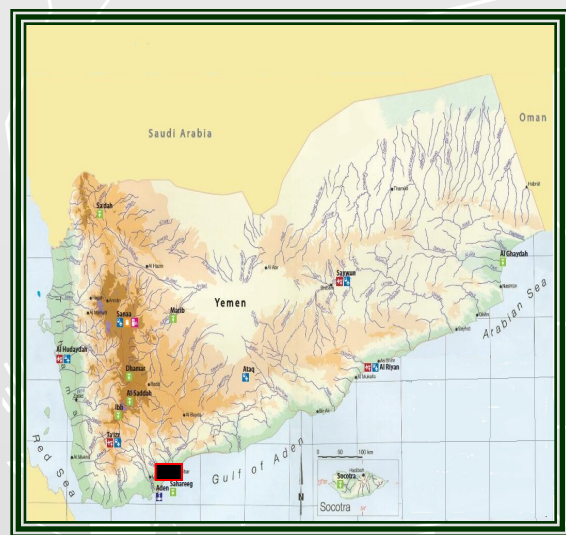
HOURLY VISIBILITY 29, March 2011 for Aden



YMS/ Stations records of Visibility, Wind, Pressure and Temperature (Wind speed & Direction) for Aden (h:3m) , (26-29) March 2011



YMS/ Stations records of Visibility, Wind, Pressure and Temperature (Temperature & Pressure) for Aden (h:3m), (26-29) March 2011

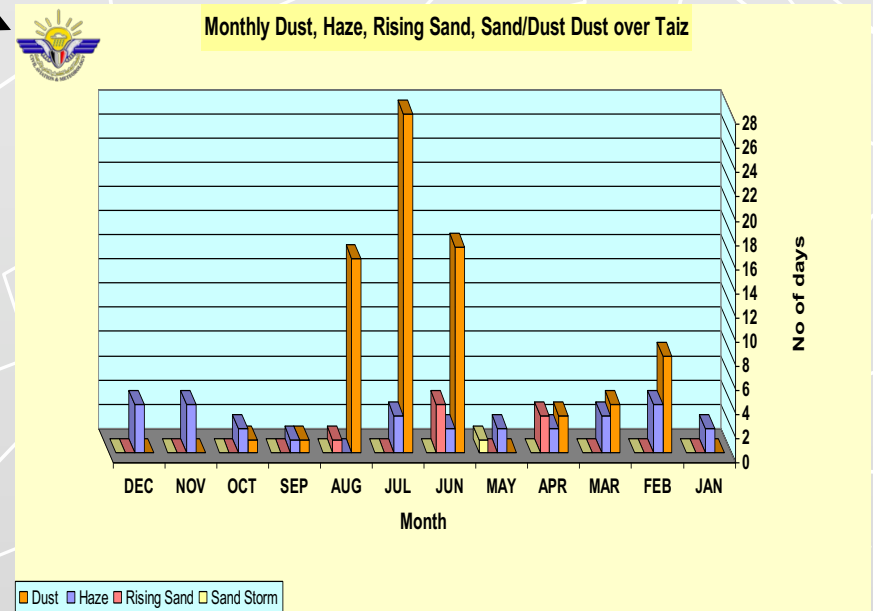
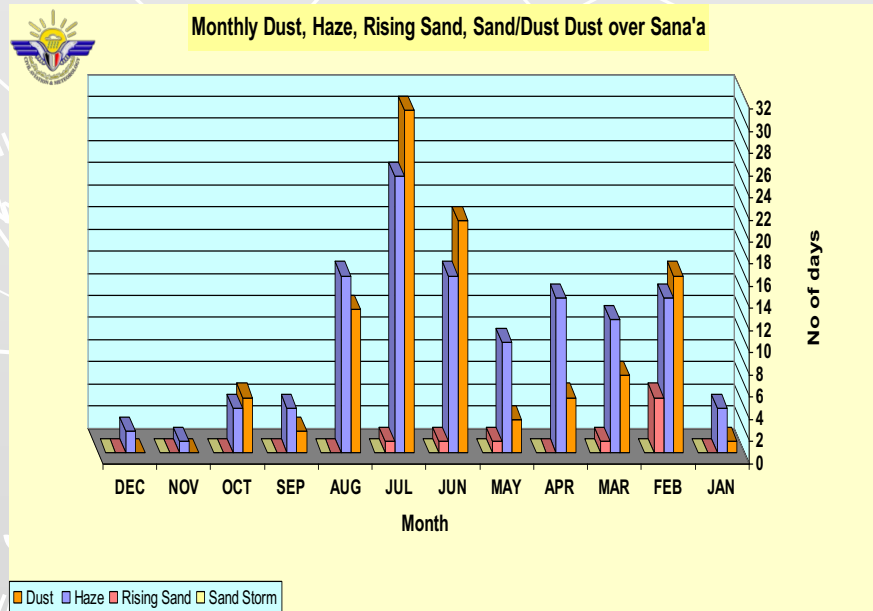
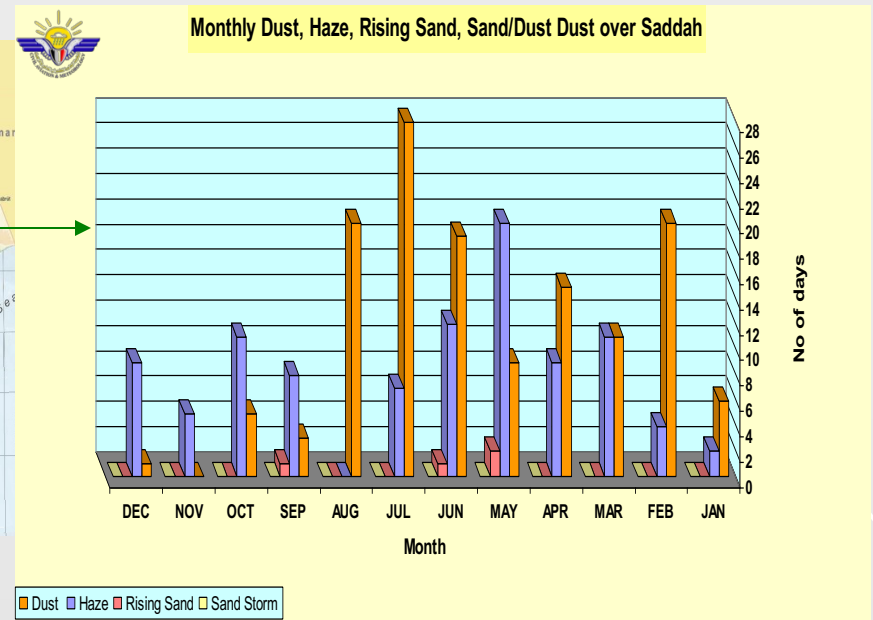
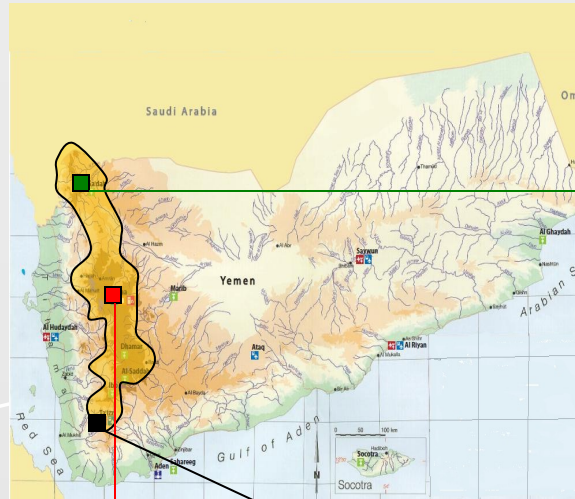


Case for Large Scale Dust Storm, effecting Yemen, (17-22) Jun, 2011

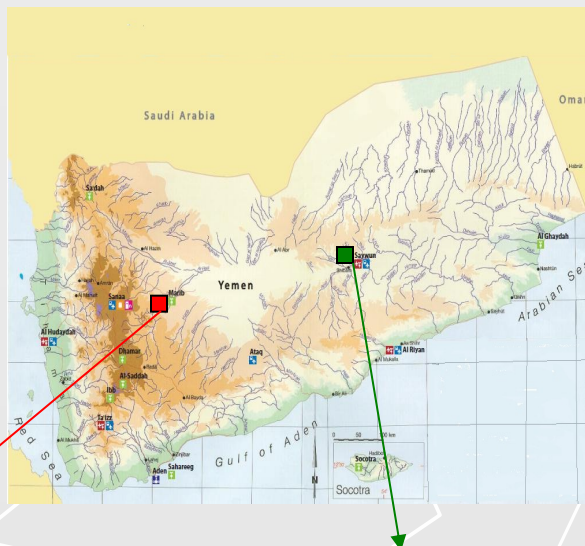


Dust Storm, effecting Sana'a, (17-22) Jun, 2011, Visibility < 200 m

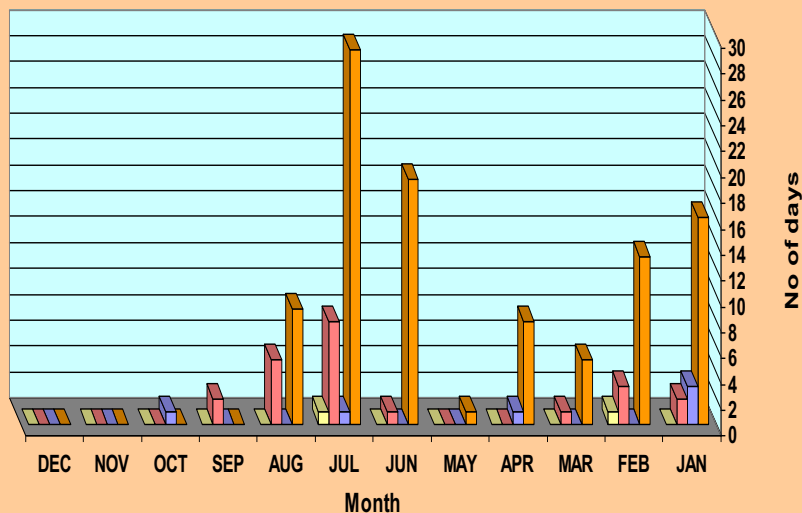
Monthly Dust, Haze, Rising Sand and Sand / Dust Storm Over Mountain Areas (Saddah, Sana'a, Taiz)



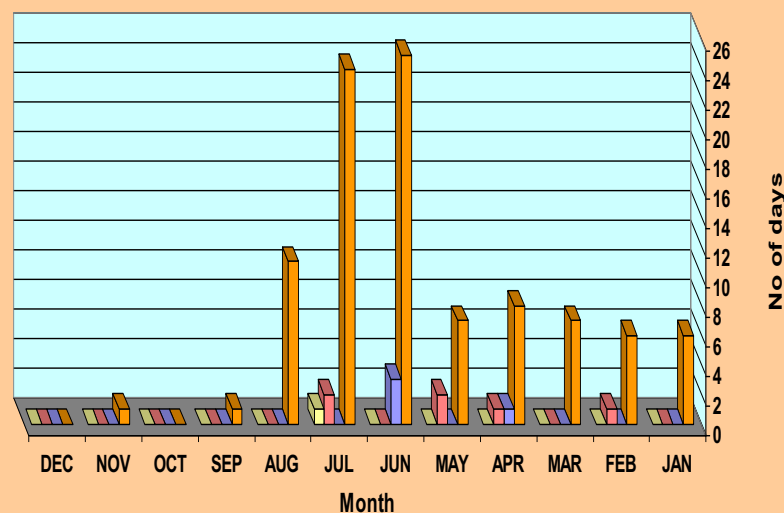
Monthly Dust, Haze, Rising Sand and Sand / Dust Storm Over Deserts Areas (Marib, Seiyun)



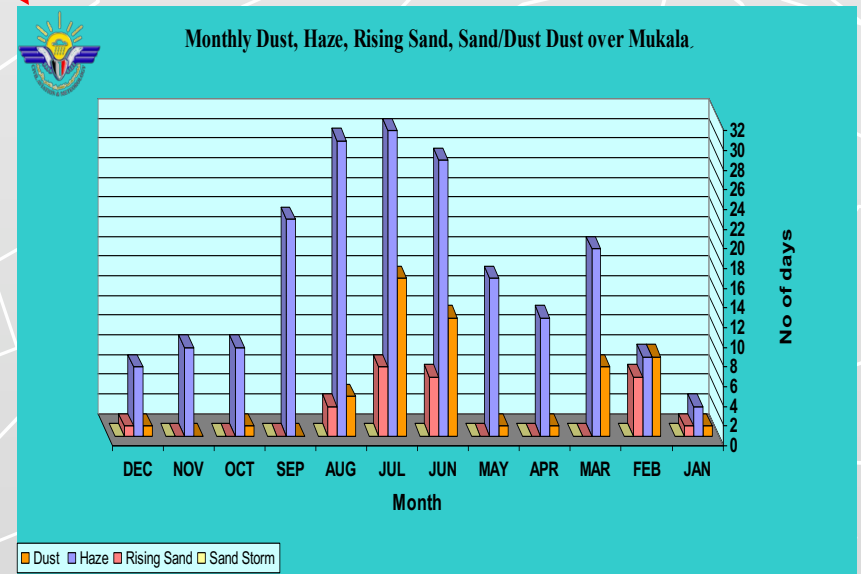
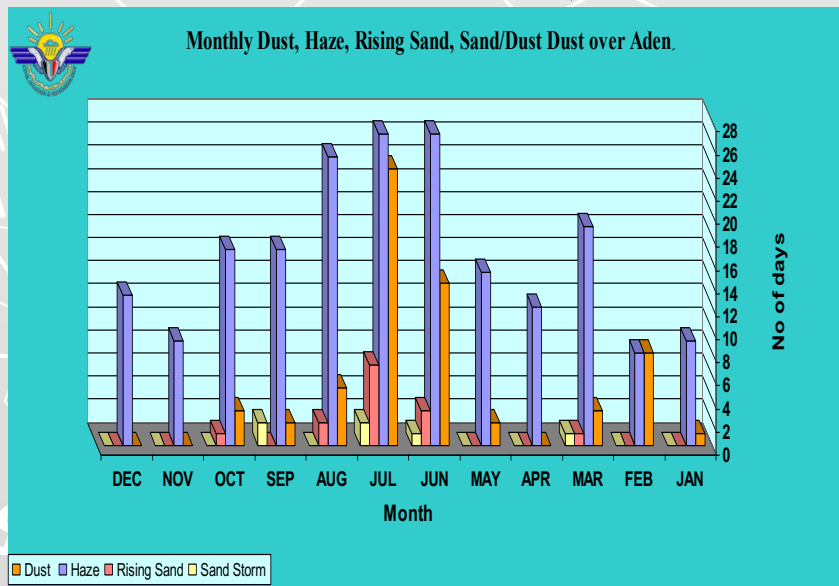
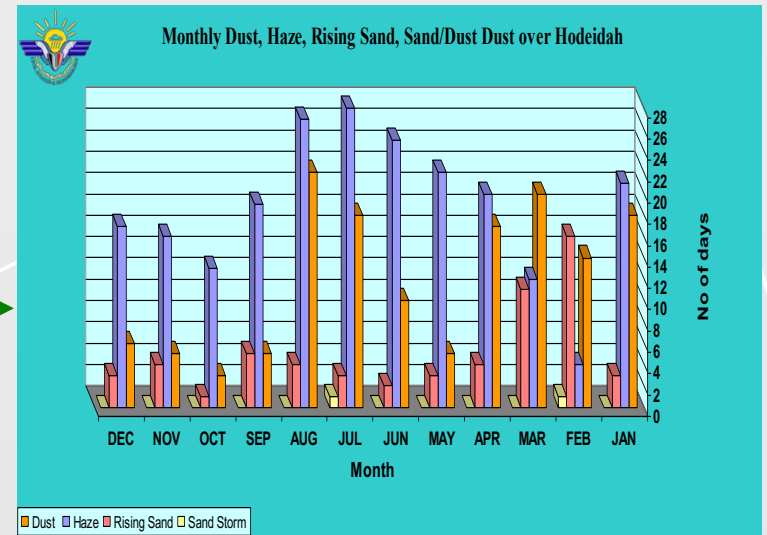
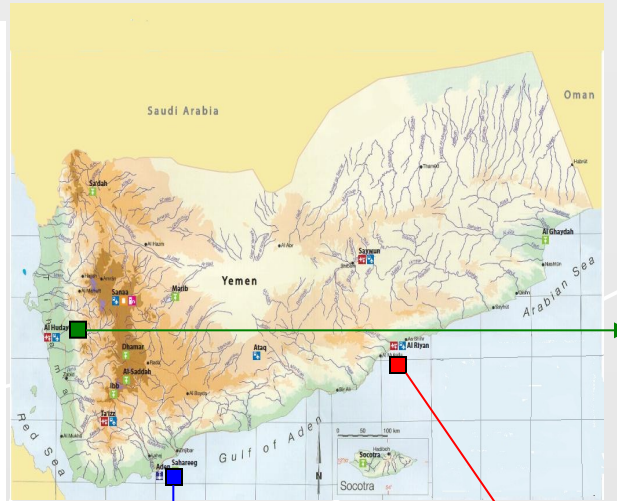
Monthly Dust, Haze, Rising Sand, Sand/Dust Dust over Marib



Monthly Dust, Haze, Rising Sand, Sand/Dust Dust over Seiyun

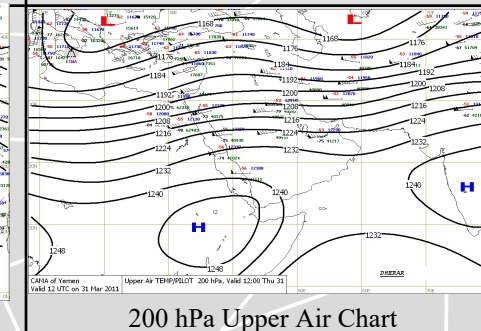
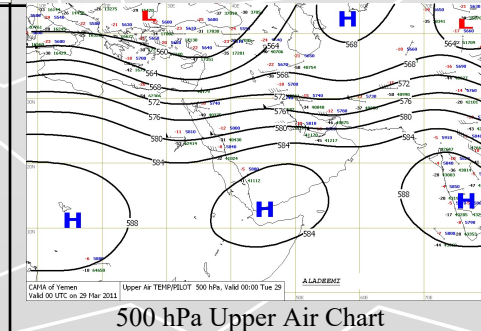
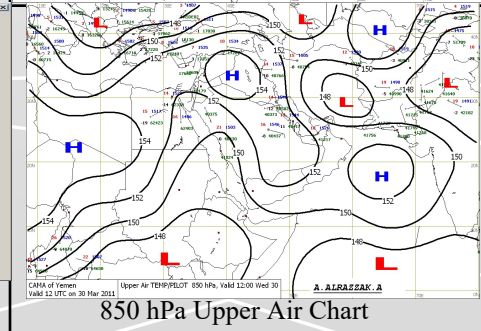
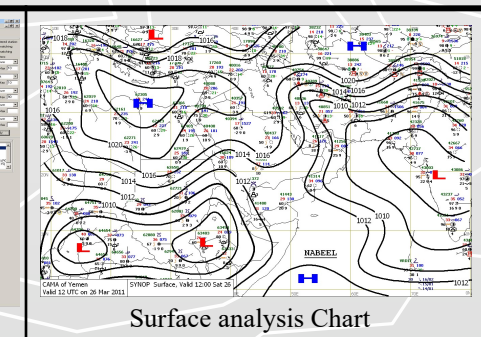
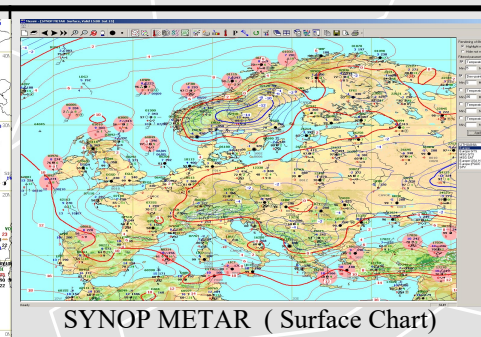
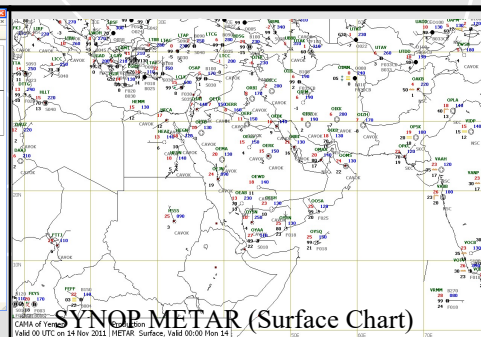
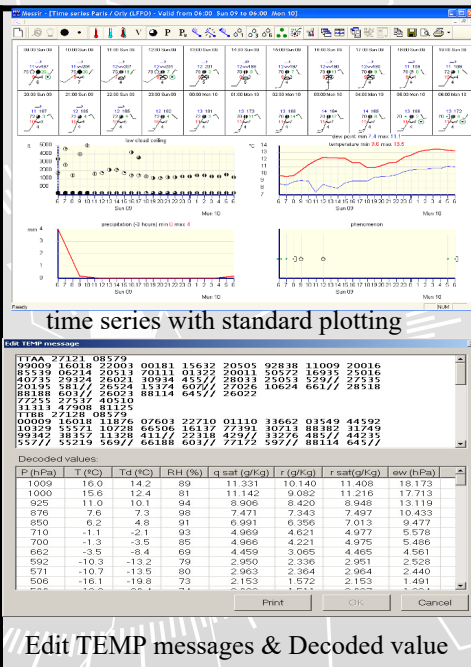


Monthly Dust, Haze, Rising Sand and Sand / Dust Storm Over Coastal Areas (Hodeidah, Aden, Mukala)



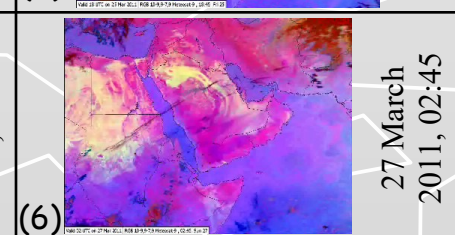
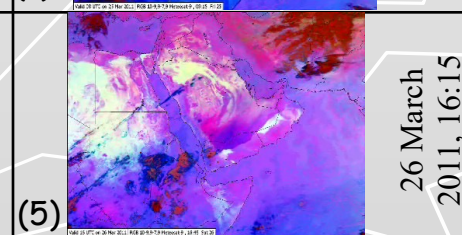
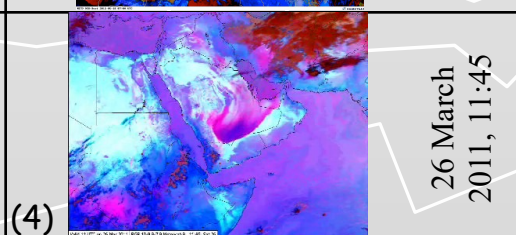
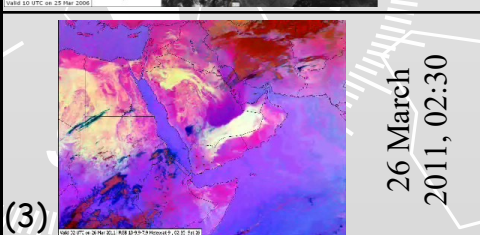
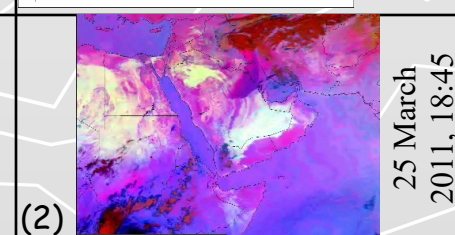
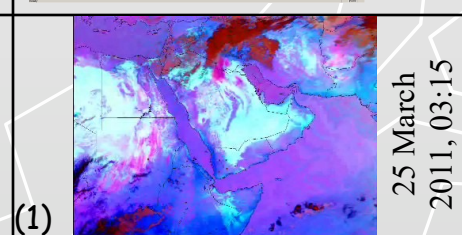
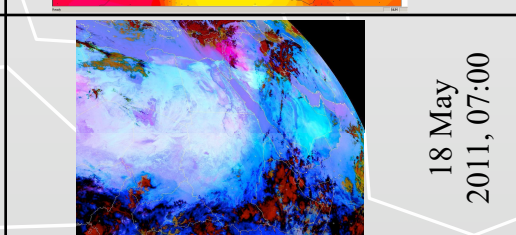
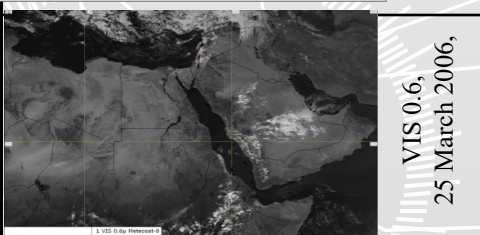
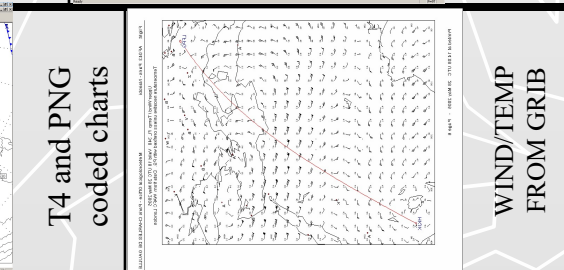
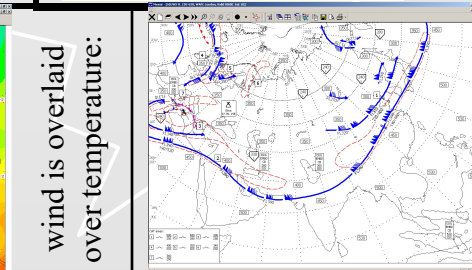
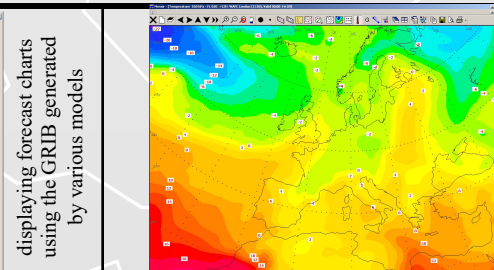
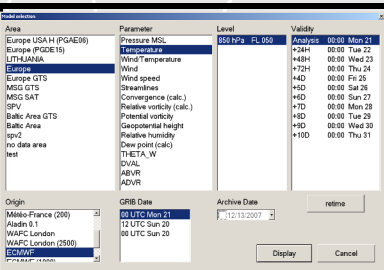
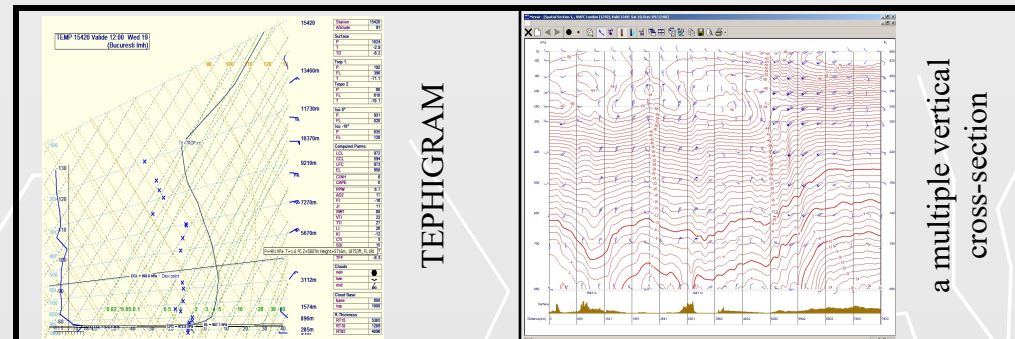
Detection and Monitoring of Dust / Sand Storms used by NMC/YMS

- Diagnostic and analysis of ;
 - Surface meteorological stations network reports.
 - Upper meteorological stations network reports.



Detection and Monitoring of Dust / Sand Storms used by NMC/YMS

- Cross section analysis.
- Products of NWP models.
- MSG 2G product images.



Warning and Forecasting products by NMC/YMS

Dust/Sand Storms are common hazards phenomenon effecting Yemen, particularly to the environment, human health, transportations especially long distance travel due to severe reductions in visibility.

National Meteorological Center, Yemen Meteorological Services (NMC/YMS) issuing and disseminate warning and forecasting for public and relevant communities for dust/sand storms. These warnings are as follows;

- Issuing AIRMET for aviation purposes for Yemen FIR.
- Issuing warning advisories for Public including ;
 - 1.Sources of the dust/sand storm,
 - 2.The Areas effecting,
 - 3.The prediction for the next few hours.
- Issuing warnings to old people and Children, Illness peoples (whom are sensitive from theses storms) , Drivers , Farmers, Fishers.
- Disseminating warnings and forecasting products to users through, (T.V, News Paper, Radio and SMS.)
- Sending warning and forecasting products to list of relevant communities and institutions through facsimile.



THANK YOU

