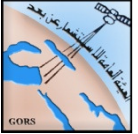


GPS enhancements in civilian RS/GIS projects in Syria

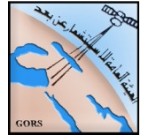
Eng.Alaa Aldin ZEIN

GORS , SYRIA



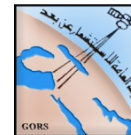
Agenda

- Syria – Basic Information
- GORS overview
- GPS errors overview
- GPS in GORS
- GPS enhancements in RS Projects
- Conclusion

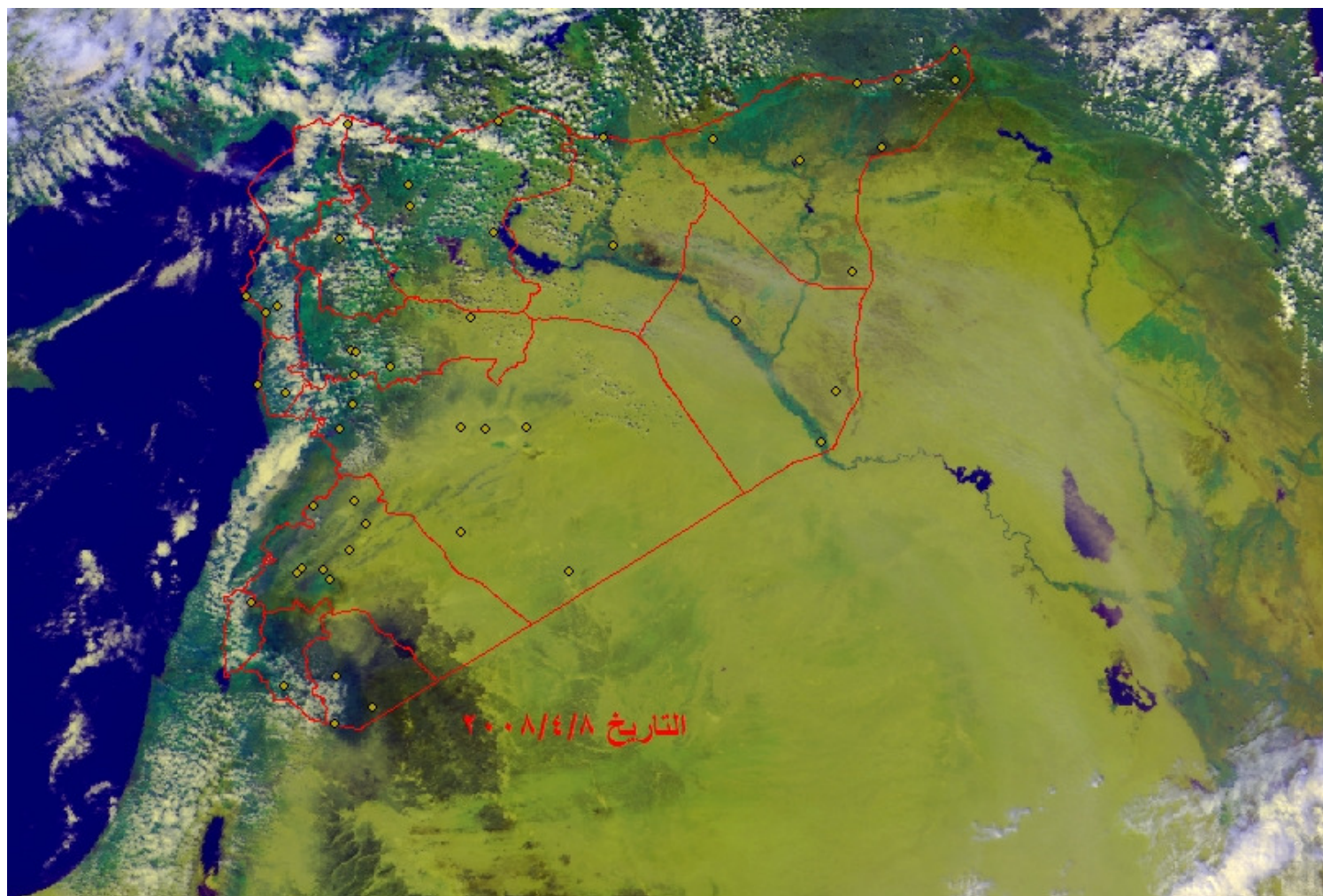


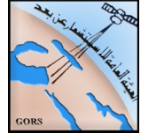
SYRIA – Basic information

- Location: 35 ° 0' 0" N, 38 ° 0' 0" E
- Area: 185,180 sq km
- Population: 20,178,485 inhabitants
- Climate: Moderate (Winter) , Warm (Summer)
- Water resources: Rivers , Springs
- Natural resources: Petroleum and natural gas, Phosphates
- Main crops: Cotton , Wheat , Olives
- Natural hazards: dust storms, sandstorms, Earthquakes
- Environment problems : deforestation, soil erosion, desertification, water pollution



SYRIA – The need for RS

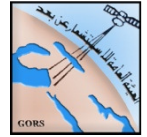




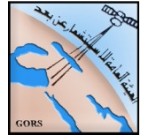
GORS

- General Organization of Remote Sensing
- Established in 1986
- Its mission: Collecting and analyzing remote sensing data , and using it in researches and projects that support economic, and social development , and improve efficiency of natural resources management

GORS

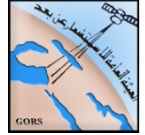


- Campus located near Damascus on 240000 m² area
- Remote sensing equipments: Satellite meteorological station, GPS survey stations , Resistivity meters , Chemical analysis lab, Photogrammetric lab, GIS lab , IP lab , aerial photography lab
- GIS/RS software (GIS ,Image processing)



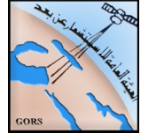
The need for GPS Enhancements

- Sources of GPS errors and biases
 - Satellite dependent
 - Orbit computation
 - Unpredictable orbital motion
 - Selective Availability
 - Satellite Clock error
 - Receiver dependent
 - Receiver Clock error
 - Signal propagation
 - Ionosphere dispersion
 - Troposphere refraction
 - The satellite to receiver distance
 - Multi Path effects
 - Satellite – Receiver geometry (DOP)



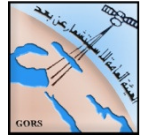
Relative positioning

- An effective method to get high accuracy positioning
- One receiver at a fixed known position (Base station)
- Another receiver at an unknown position (Rover station)
- Two methods (Real time , Post processing)
- Eliminates error common factors as long as the two receivers are within short distances



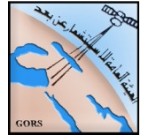
Advantages and Disadvantages of Post processing

- + No communication link required
- + QA can be applied
- + In some applications , no need for real time positions
- Instrument specific software
- Coordination of data capture needed
- No Real Time ,not suitable for ITS



GPS in RS projects - Syria

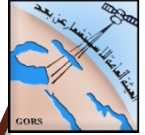
- GPS positioning is a main component of RS projects implemented by GORS
- Urban planning: The infrastructure of the Industrial city in Hessa
- Geologic studies: The Geodynamic study for Damascus and western parts of Syria
- Climatic studies: Sandstorms monitoring in Syria
- Image referencing: Geometric Correction of Satellite Imagery using GPS
- Precision Agriculture: Increasing the accuracy of Land cover and Land use maps



GPS in GORS

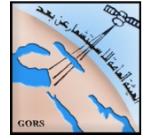
- Different GPS applications require different levels of GPS accuracy
- Differential positioning is the most effective available technique of accounting for many GPS biases
- No special satellite or ground based augmentation systems used
- No real time corrections
- Measurements during suitable physical conditions of Season , Time , Humidity , Solar activity

The infrastructure of Industrial city in Hessa

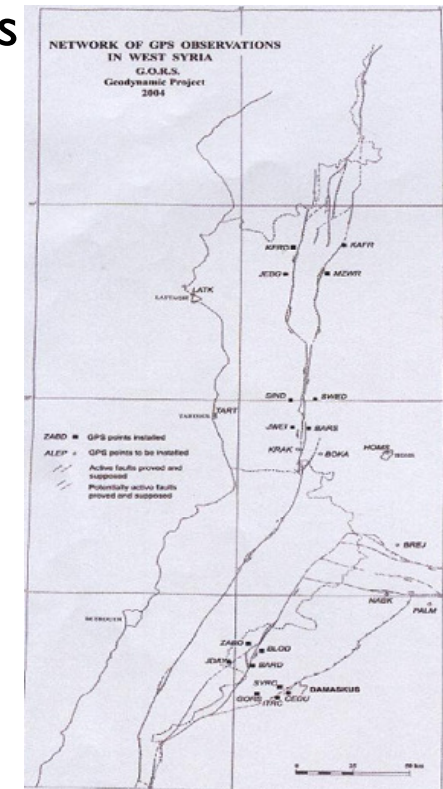


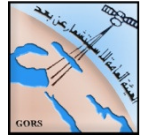
- Goal of project: Digitizing the infrastructure (Electricity, Telecommunication, Seaware) in the highest possible accuracy
- Using 3 reference points in local coordinate system to build a triangular network based on GPS measurements
- Produced the maps referenced to this network using GIS
- Sub meter Accuracy achieved through DGPS (Post processing method), Static positioning

Geodynamic study for Damascus and Western Syria



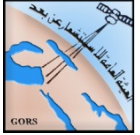
- GPS was used to study Tectonic movements of continental plates and crustal movements and active faults
- The goal: predict earthquakes
- 18 surveillance bases alongside the active faults Distance between points(3-28km)
- 16-24 hours survey for each point
- Redundant distance measurements (every 4 – 6 months)
- DGPS was used, high accuracy needed
- Static survey method
- post processing using SKIPRO software
- Seismotectonic and Geotectonic Maps produced using GIS software to asses geologic hazards





Conclusion

- GORS has an important role in economic and social development in Syria
- The use of GNSS is essential in most GORS projects
- Still GORS has no means of achieving high accuracy positioning without using static , post processed DGPS
- International cooperation is needed to develop the use of GNSS in Syria



Thank You