

# Continuous Operating GNSS Network (COGNET)

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# COGNET

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- Introduction
- Objectives
- Why COGNET is necessary?
- Detail
- Conclusion



## Introduction

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(GNSS) covers all current and future global radio-navigation systems.

- GPS is currently the only fully operational GNSS.
- GLONASS should be fully operational in 2011.
- GALILEO will be deployed and operational by 2013.
- COMPASS is likely operational mid of the next decade.



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we can define three continuously operating GNSS networks on the basis of their size and aims as follows:

- Global IGS network.
- Regional GNSS networks.
- Local GNSS networks.



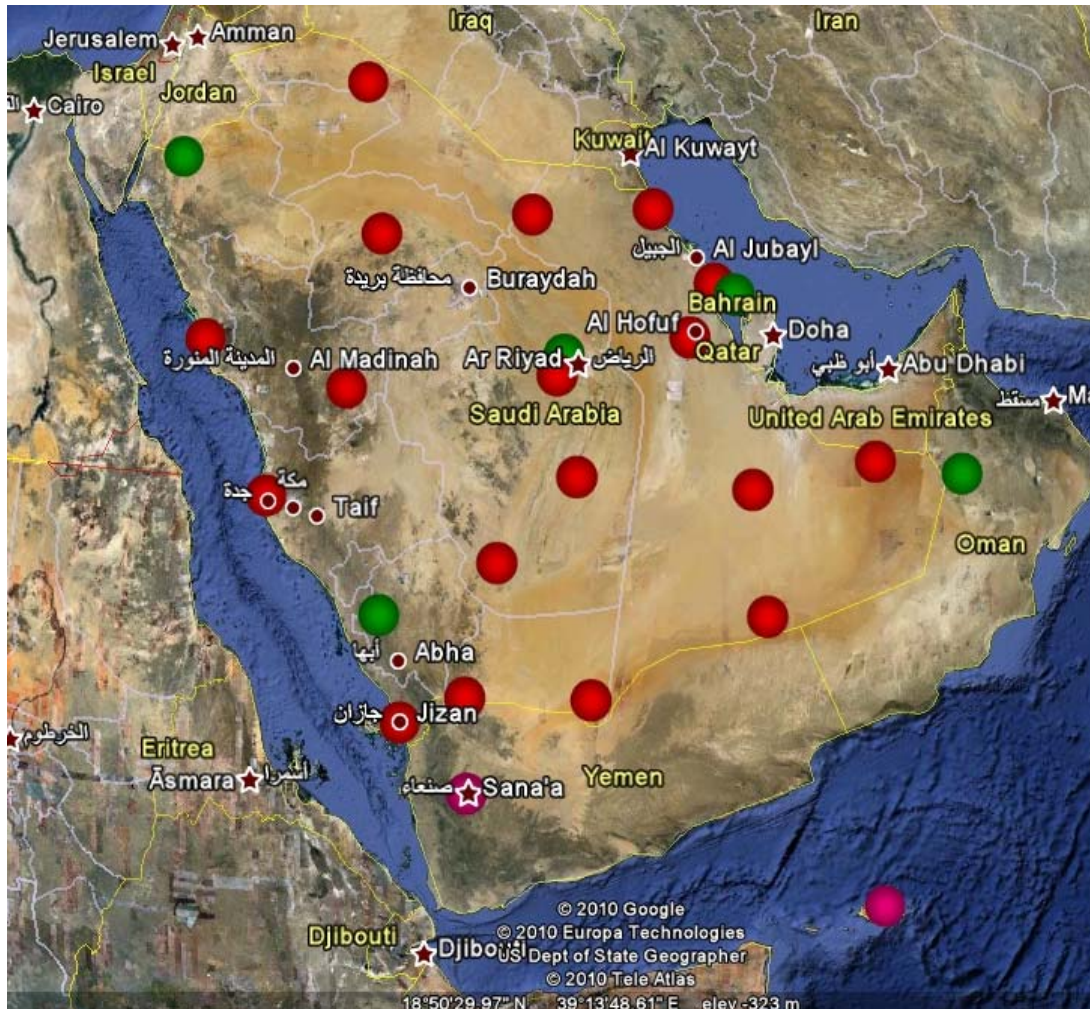
## Objectives

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- Establish 16 CORS (GNSS) network.
- Observation of almost 2 years , 24 hours, 7 days a week.
- Creation of permanent center of computation and analysis CCA.
- Define and implement a new geodetic network for Saudi Arabia based on space geodetic systems.
- One of the goals of COGNET project is to facilitate cooperation with local, regional and global agencies.
- Define a common Arabian Reference Frame (datum) ArabREF.



# COGNET Network



- Red – proposed sites for new stations.
- Green – existing IGS stations.

## Why COGNET is necessary?

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- defining a common reference in the kingdom is essential.
- Institutions in the kingdom work independently and produce their own geodetic reference frame (datum); GDMS, MOMRA, KACST, and ARAMCO.
- GNSS technology provides the precise orbit of GPS and GLONASS satellites and accurate coordinates of globally distributed points which can be used for the reference frame definition.



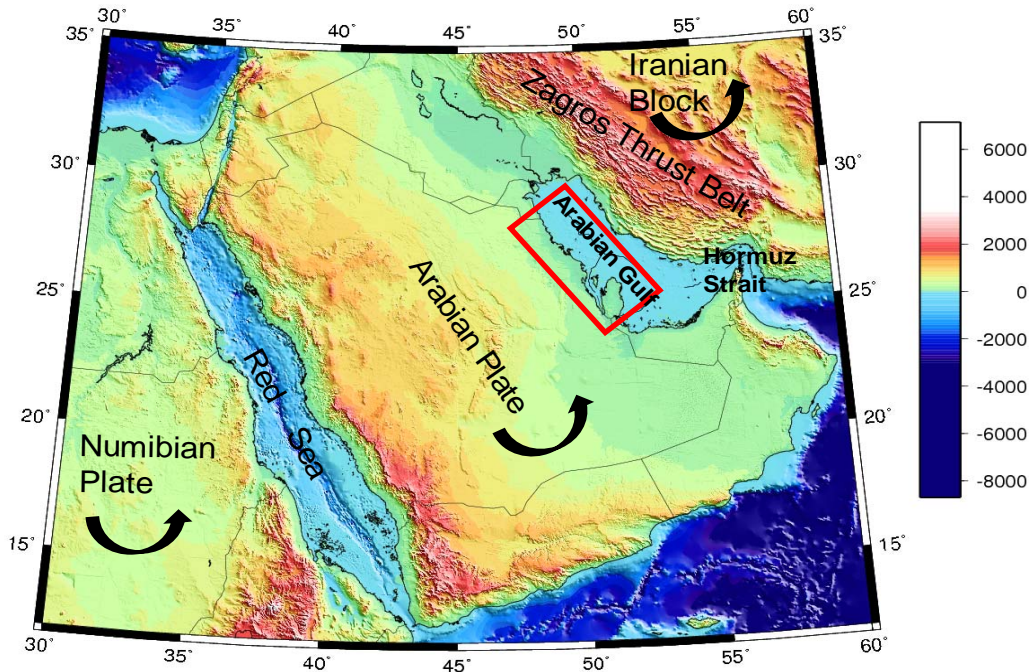
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- The existing IGS sites in the area can be exploited to define COGNET.
  - Allow interpretation of geophysical and geodynamic phenomena, 3D geo-referencing activities in national and regional scales.
  - COGNET project like any other regional reference frame, will contribute to the global geodetic infrastructure.





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- There is a need to observe and accurately model the motion of the Arabian plate.
  - There exists a fault within the Red Sea, where earthquakes and volcano activities occur.
  - These activities are of small magnitude and happen continuously during the last thousands years.
  - these activities need to be properly observed and modeled.

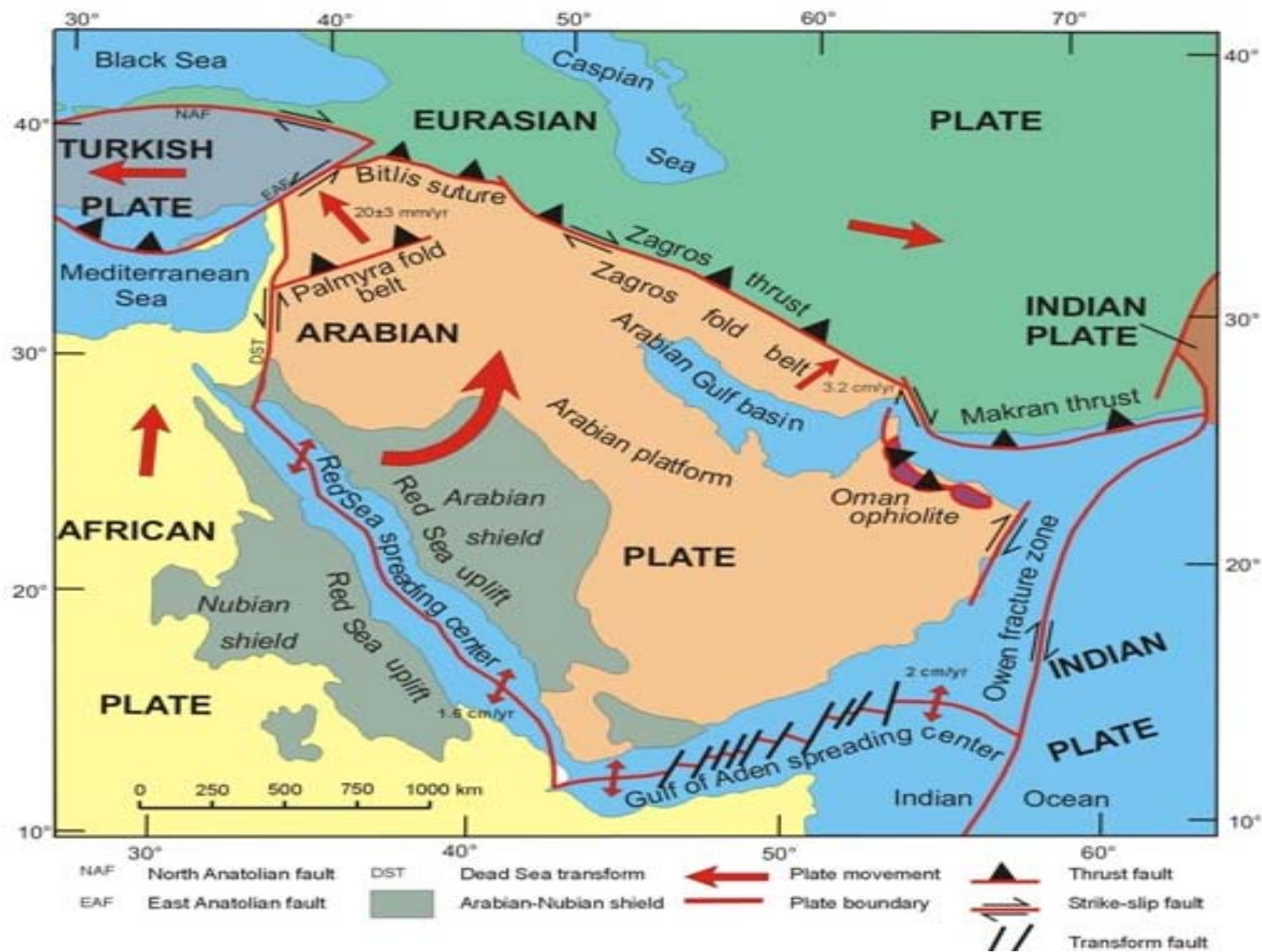
# Motion of the Arabian Plate



Reillinger et al (2006)

- Some researches indicate that rotation rate of the Arabian plate relative to adjacent plates (Eurasia and Africa) could reach the range of 20-30 mm/yr counterclockwise.

Motion of the Arabian plate with respect to adjacent plates



<http://www.sgs.org.sa/Arabic/Earthquakes/AboutEarthQuakes/Pages/ArabianPlate.aspx>

## Detail

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- Scope of work
- Center for Computation & Analysis (CCA)
- National Applications
- COGNET Implementation



## Scope of work

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- COGNET will therefore be part of the global geodetic infrastructure that includes other regional frames like :
  - North American Datum NADREF
  - The European EUREF
  - African AFREF
  - The South American SIRGAS
- prerequisite for many multi-disciplinary applications.



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- In order to establish the link with the global reference frame (International Terrestrial Reference Frame – ITRF2008), the existing IGS (International GNSS Service) stations in the region will also be incorporated in the network.
  - When completed, it is envisaged that users will not be more than 500 Km from one such point any place in Arabia, and eventually increased in order to reduce the distance to 300Km or less.



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- with the implementation of COGNET, there will also be an urgent need to determine the transformation parameters between the current existing traditional national reference frame, and its associated legacy geospatial data in order that information based on traditional reference frames will not be lost or discarded.
  - COGNET will be headquartered at the Saudi Space Geodesy Center (SSGC).



## Center for Computation and Analysis (CCA)

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- The CCA will be located at SSGC.
- Data from all CORS stations will be collected and continuously monitored at this center.
- Products shall be available for scientific and technical applications.





## National Applications

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- Mapping production at various scales.
- Civil aviation and Navigation.
- Military applications.
- Geographic Information Systems.
- GIS Cadastral survey and land registration.
- Earth sciences.
- Border demarcation projects.
- Transportation; roads and railways.
- Electricity and Power transmission lines.



## COGNET Implementation

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- A permanent GNSS station network is a three-step process:
  - 1- Data acquisition.
  - 2- Data upload to CCA.
  - 3- Data distribution to end users.
- Proposed equipment include *Leica* GR10 receivers and AR25 antennas. These receivers are able to receive GPS (L1, L2 and L5), GLONASS (L1, L2) and GALILEO (L1, E5a, E5b and E5a+b) signals.



## Data acquisition

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COGNET will have the ability to acquire GNSS observations for scientific applications, namely, for reference frame and geodynamic studies, which have the highest requirements in terms of GNSS data quality.



## Conclusion

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- COGNET project will be implemented in three phases, resulting in more than 60 CORS, and RTK for main metropolitan areas of the Kingdom of Saudi Arabia.
- Once these phases are completed, it is envisaged that this will pave the way for the establishment of the first true geodetic Arabian Reference Frame for the region at large.



# Thank you

