



Earth Observation Activities in Turkey

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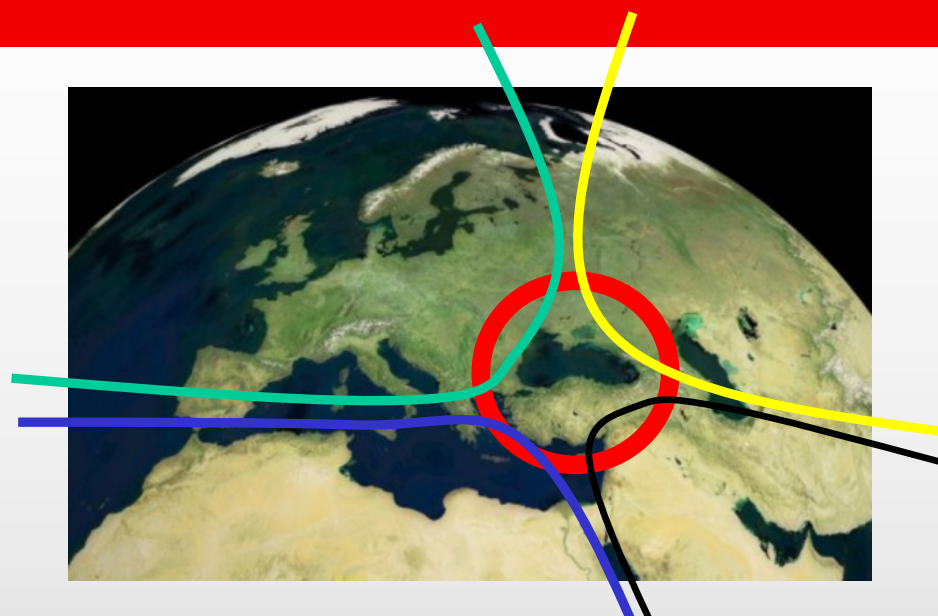
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Summary

Background



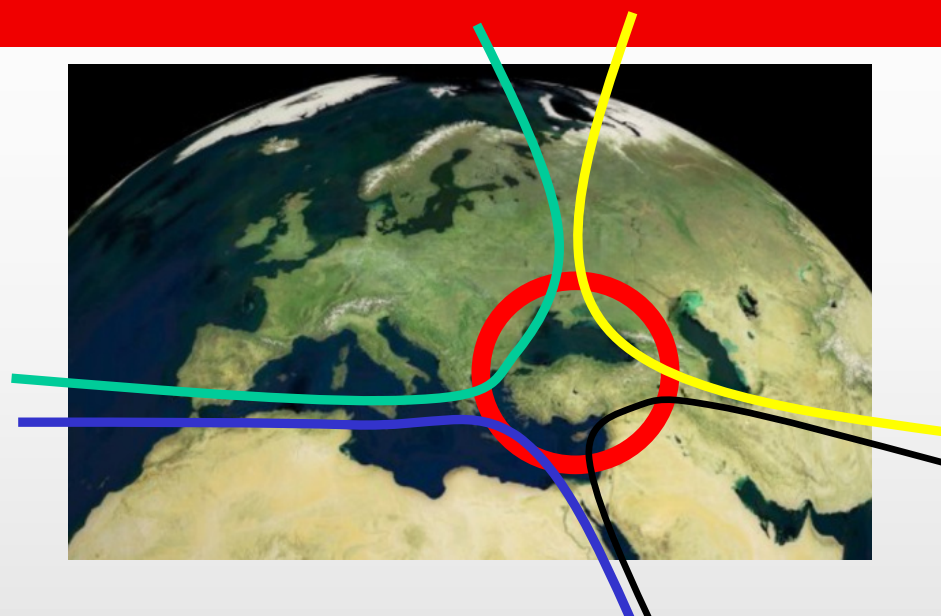
MEETING POINT

made up of micro-plates and has a unique **geostrategic location** in an area where Asia, Europe, Africa and Middle East meet

is surrounded by Balkan, **Black Sea**, Caucasian, Aegean Sea, **Mediterranean** and Middle Eastern Countries.

is a passageway (because of its position as energy and transport corridor linking East and West)

Background



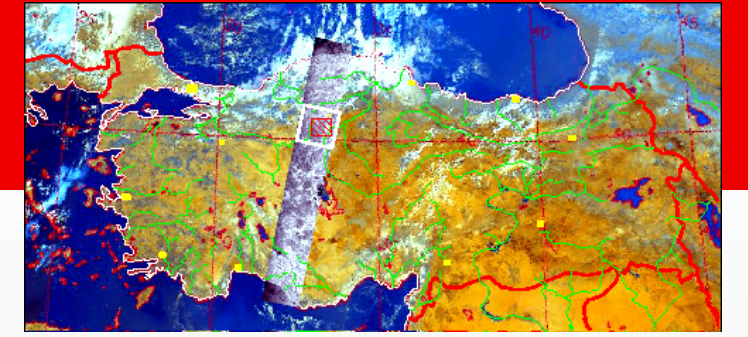
MEETING POINT

is a **window** of the west opening to the east and the north opening to the south.

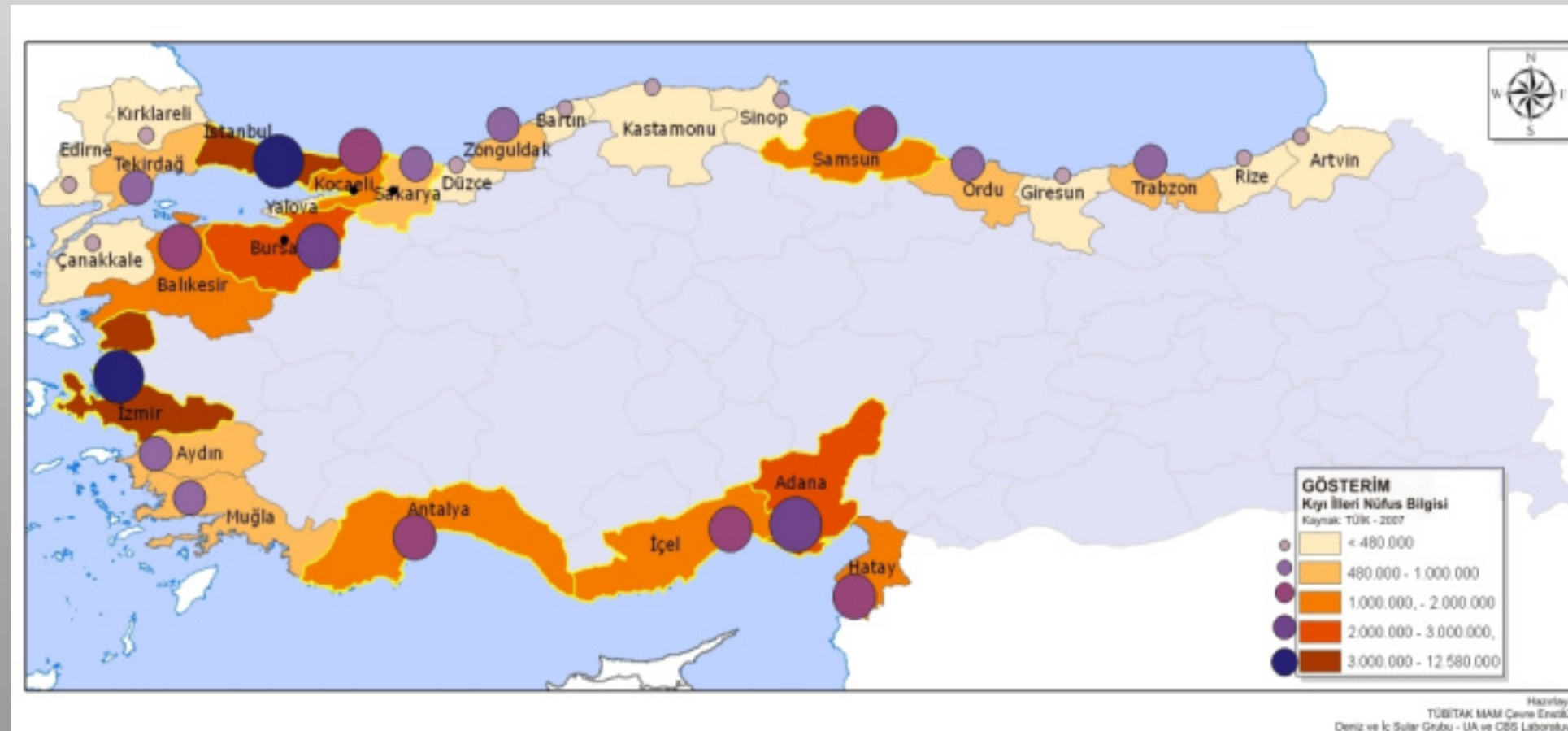
is playing a **pivotal role** in developing economic cooperation with countries that surround it.

Its size - with a **vibrant young population** - marks it as an emerging dynamic economy.

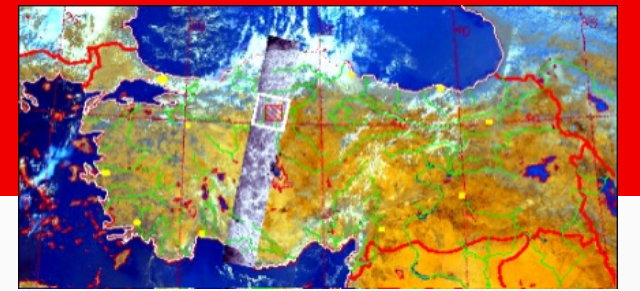
Background



80 million in population,
40 million lives in coastal zones and in urbanized areas,
mega cities (more developed areas),
Coastline is 8484 km in long



Turkey in General



Turkey is a country with a **rapid rate of change** in many aspects: its **urbanization process** is not sufficiently controlled, it has **large development projects** (highways, dams, irrigation, housing, infrastructure etc.), it undergoes changing **agricultural practices**, causing **environmental problems** with **soil erosion**, and **deforestations**.



Moreover, prone to **natural hazards** such as landslides, flooding, **earth quakes**, and **uncontrolled developments** cause higher risks and in the likely case of disaster event higher damages.

Turkey in General

Furthermore, in a **rapidly developing state**, these developments **have to be monitored** continuously, in order to support any necessary revisions in the spatial policies to streamline the developments.

Especially **Earth Observation Systems** can and must support the acquisition and handling of traditional information.

EO Experience



Most Turkish Institutions have **integrated EO facilities**.

In the Government agencies such as State Hydraulics and DG Meteorology have country wide **insitu observing networks**.

Monitoring systems and networks for **Natural disasters** in University, Research and Government Institutions

There are established research groups which are developing their abilities in the **use of various classes of EO data** for cartography, climate, marine, geology, agriculture, fisheries, meteorology, urbanization, hydrology, forestry, etc.

Some Turkish organizations like the Istanbul Technical University and TÜBİTAK UZAY have established facilities to acquire data from SPOT, LANDSAT, Meteosat, ERS, (ENVISAT) and RADARSAT remote sensing satellites.

EO Experience



In the case of TÜBİTAK Space Technologies Research Institute (UZAY), a project is being implemented to build a small research satellite for Earth observation data.

There is a noticeable activity in the private sector. A major component is made up of companies which are vendors of hardware, software and data.

In the **private sector**, projects are often funded by municipalities or government agencies and less frequently by major commercial entities such as oil or mineral extraction companies or water supply development projects.

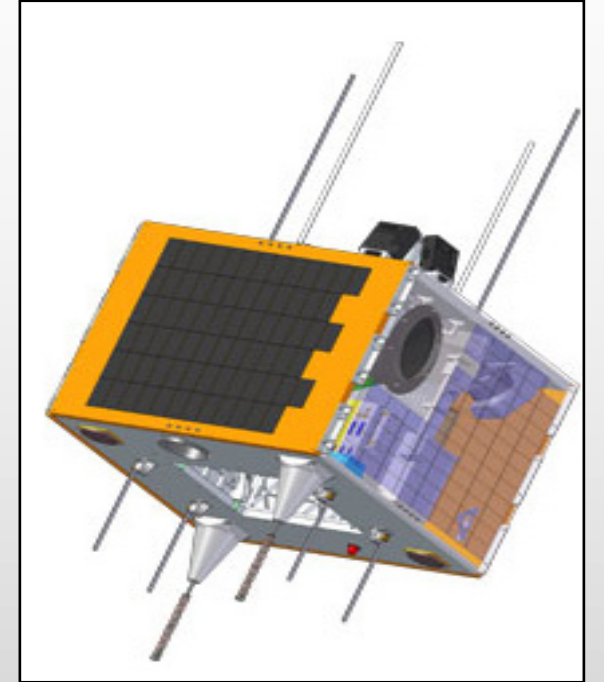
At present, the **manpower requirements** for the activities in public and private organizations cannot be met by existing Turkish institutions. Available training capacity in the universities must be expanded.

These are the **launching steps** for a Turkish EO sector.

Satellite Projects

RASAT SATELLITE

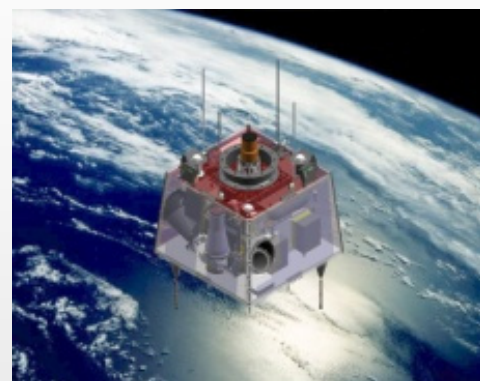
RASAT is the second remote-sensing satellite of TÜBİTAK Space Technologies Research Institute (UZAY). RASAT, having a high-resolution optical imaging system and new modules developed by Turkish engineers, is the first Earth-observation satellite designed and manufactured in Turkey.



GÖKTÜRK-2

Göktürk-2 project is the first step in the formation of facility, equipment and personnel infrastructure and in meeting the future satellite requirements locally. TÜBİTAK Space Tech. Research Ins. (UZAY) and Turkish Aerospace Industries (TAI) Consortium has all the system level responsibility. The 2.5 Meter Resolution Scientific Research and Technology Development Satellite (GÖKTÜRK 2) project is still on going.

Platforms and Measuring Categories



Satellite

*Meteorological
Optical
GPS, Insar*



Ground station



In situ,

*real-time observation
networks*

Marine/Ocean

color /biology
topography /currents
Surface temperature
wind, humidity, air temperature
and pressure

Atmosphere, Meteorological

Aerosols, humidity,
temperature, Cloud type,
amount and temperature
particle properties and profile
Liquid water and precipitation
rate, trace gases

Land

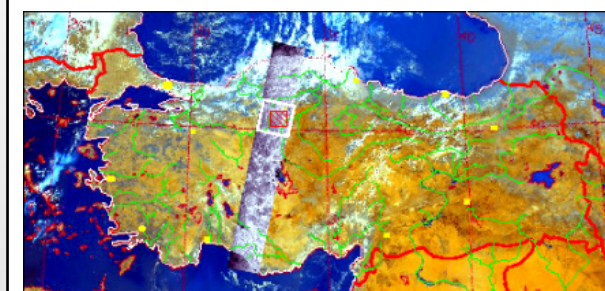
Landscape topography
Soil moisture
Vegetation
Reflectance

Solid Earth

Snow and Ice

Snow cover, edge and depth

Earth System Models



Disaster

Weather

Climate

Water

Ecosystem

Agriculture

Biodiversity

International Activities for EO

European Space Agency (ESA), Cooperation Agreement

**European Commission FP7, Env + Space
GEO (Group on Earth Observations)**

Asia Pacific Space Cooperation Organization (APSCO)

ROSCOSMOS, MoU

United Nations, Space Activities (OOSA)

CEOS, Committee on Earth Observation Satellites

EUMETSAT

ISPRS

Policy and Programme

TÜBİTAK currently has the task of providing the preparatory organization for Turkish space science and technology policies.

These policies are determined by the SCST, which reviews them annually at cabinet level.

Space research is of the priority area in Turkey's Science and Technology Policy, which is determined by the Supreme Council for Science and Technology (SCST) under the custody of Prime Ministry.

In 2004, the SCST, has approved the **National Science and Technology initiative**.

At the end of 2004 the SCST delegated TÜBİTAK to prepare a “**a national space research program** of Turkey”.

The first such program was launched in March 2005 for a 10-year period.

This programme would contribute the development of the **European Space Policy** and **European Space Programme**.

National Space Research Programme

Programme	
SCIENCE	Astrophysics
	Astronomy
	Near Space
	Earth Science and Observation
	Life Science, Microgravity
	Total
TECHNOLOGY	Space (System) Infrastructure (Satellite, Ground Control, Launching)
	Space Technology (Development)
	Space Transportation-Advanced Aeronautics
	Space Security
	Total
APPLICATION	Remote Sensing and Geographic Information Systems
	Navigation and Global Positioning System
	Meteorology
	Satellite Communication
	Total
HUMAN RESOURCES AND KNOWLEDGE	Future Generation
	Society and Culture
	Total
INTERNATIONAL COOPERATION	European Space Agency and European Union Relations
	International Cooperation (NASA, Russia, China, Ukraine, India, Japan, UN e.g.)
	Regional Cooperation (Southeast Europe, Balkans, Caucasus, Black Sea, Middle Asia, Mediterranean, Middle East)
	Total
MONITORING AND COORDINATION	Strengthening National Coordination and Cooperative work

Programme Areas for Earth Observation



Activity Areas

SCIENCE

Monitoring and investigating the Earth being a part of space

Earth searching the unknown about the factors effecting scientific or economically aimed activities done/will be done in or out of the atmopshere, investigating the problems that are faced, searching solutions to these problems, and doing exploration, investigation, monitoring, informative studies.

Earth (Science) Observation

Solid Earth

- Land Cover/Land Use
- Monitoring environment
- Soil and Soil Moisture
- Natural and Nonrenewable Energy Resources
- Measurement of Earth/Crust Movements
- Mitigation of Natural Hazards Risk Assessment and Management
- Early Warning Systems
- Agricultural Biomass Research
- Protecting the Forests and Increasing the Productivity
- Water resources, Hydrology
- Ecosystem, Biological Diversity

Atmosphere, Climate, Global Warming

Meteorology, Weather prediction, forecast models

Marine and Costal Zone Studies

*Producing sensors, Developing measurement tools,
Data analysis and improving the processing methods,*

Activity areas

TECHNOLOGY

Space technologies play a key role in accelerating the development processes of the countries, increasing the life quality standards of societies and security of the countries.

To increase welfare of the society, assessment of natural resources, protection of the environment

Space (System) Infrastructure

Satellite

Satellite Design and Development

*Disasters (Early Warning), Meteorological,
Navigation, Global positioning,
Communication*

Passive (Optic) ve Active (SAR, InSAR) Systems
High Resolution (1m-2.5m)

*Communication and Transmission
Earth Science*

(Land Cover, Natural– Energy Resources)

Modelling and Simulation,
Data Analysis
Data Assimilation,
Data Processing,

The main support of scientific researches is data. The necessary information for research is achieved from systematic and organized analysis of these data

APPLICATION

The space based application areas that takes place in decision support processes of the government institutions, and converted into a structure that can be reached by almost all sections of the society. These applications take an important place in strategic and economic areas of the countries.

1. Remote Sensing and Geographic Information Systems
 2. Navigation and Global Positioning System
 3. Meteorology
 4. Satellite Communication and Telecommunication
-

Developing application software, e-government applications, web services, data harmonization and standards, advanced satellite communication services, e-learning, e-health, generic use

Spatial Planning, Agricultural practices, Forest Fires, Land erosion, Pre and post earthquake applications, Water Resources, Coastal Zone Management, Environmental Pollution, Land Cover Change, Monitoring Bosphorus and Black Sea, Energy Resources, Improvement of e-learning and e-health tools, Regional and rural studies, Urbanization

Earth Observation Based Projects in progress and/or completed

National Space Research Programme	Projects (#)
<i>Science, Technology and Application</i>	
<i>Earth Science and Observation Systems, Remote Sensing, GIS, GPS, Meteorology</i>	~170

(2005-2008)

~10-15 MEuro in budget

GEO Societal Benefit Areas

Disasters

Health

Energy

Climate

Water

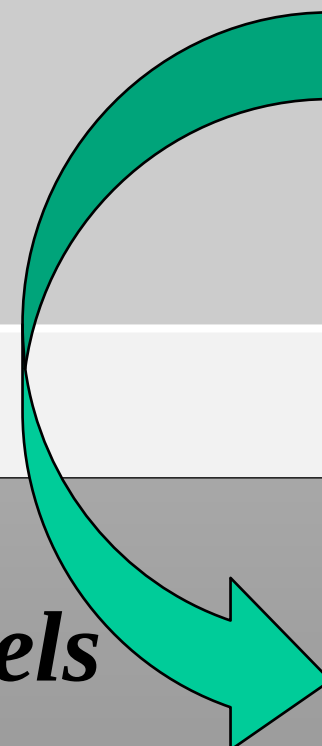
Weather

Ecosystems

Agriculture

Biodiversity

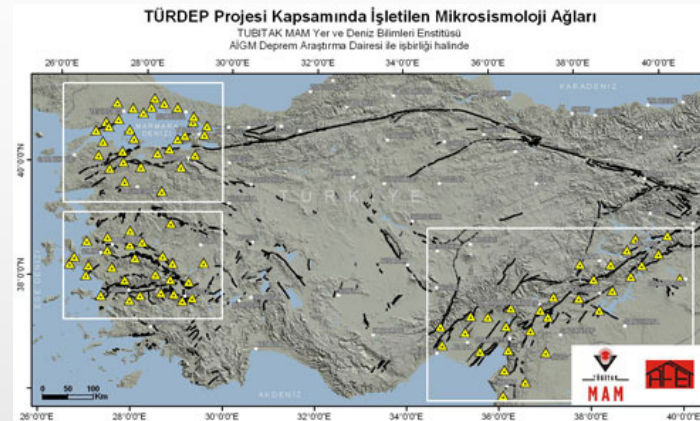
National, Regional, Local Levels



Examples



National Seismic Network
İstanbul Early Warning and
Rapid response system
Boğaziçi University



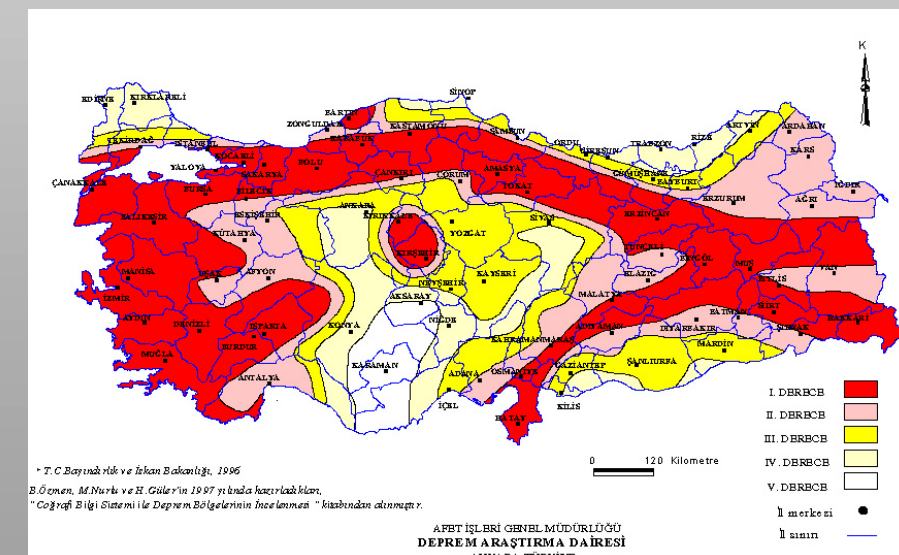
Urgent Monitoring
after Earthquake

Development and Operation of
Earthquake Monitoring Stations
Network of IMM



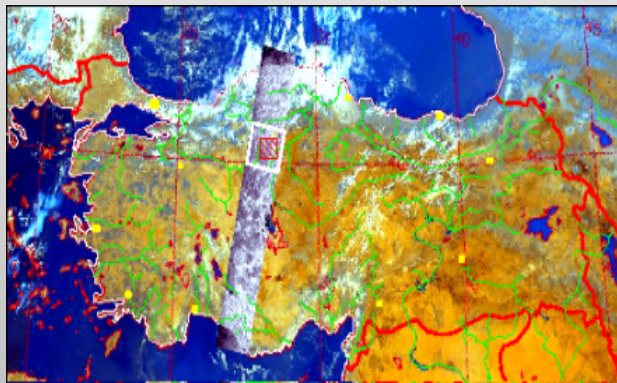
Upgrading Seismicity
Monitoring Infrastructure
Capacity in Marmara Sea

Multidisciplinary Earthquake
Research in high risk regions of
Turkey representing different
Tectonic regimes (TURDEB),
TUBİTAK MAM

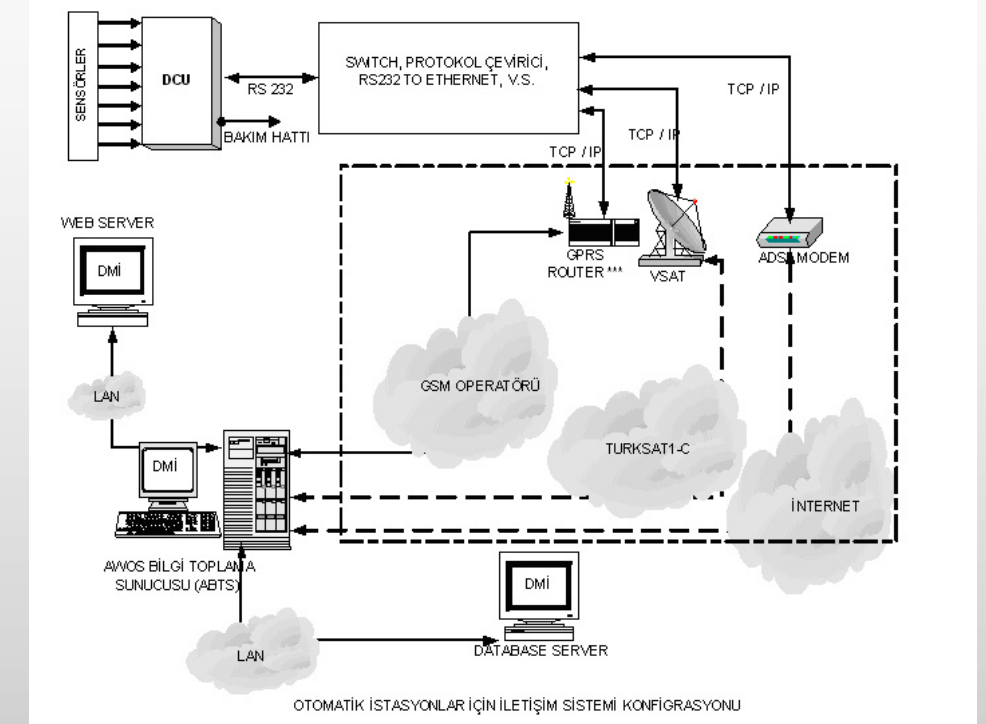


Micro seismology networks operated under
TURDEP project

INSTALLATION OF DISASTER MANAGEMENT AND METEOROLOGICAL EARLY WARNING SYSTEM IN RIZE PROVINCE(RABIS) ,ITU



*Natural Hazard
Information
Systems, **DG**
Disaster Affairs*



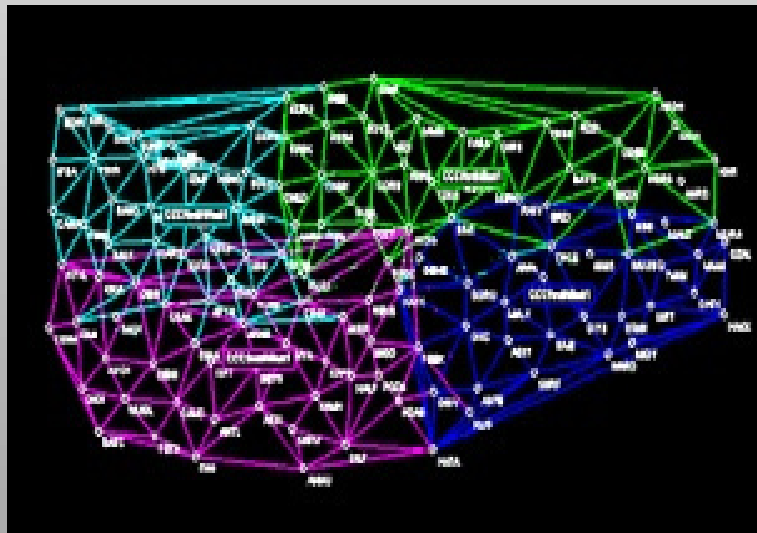
Meteorological
Observation System
and Early Warning
Systems (METSİS),
DG Meteorology

Examples

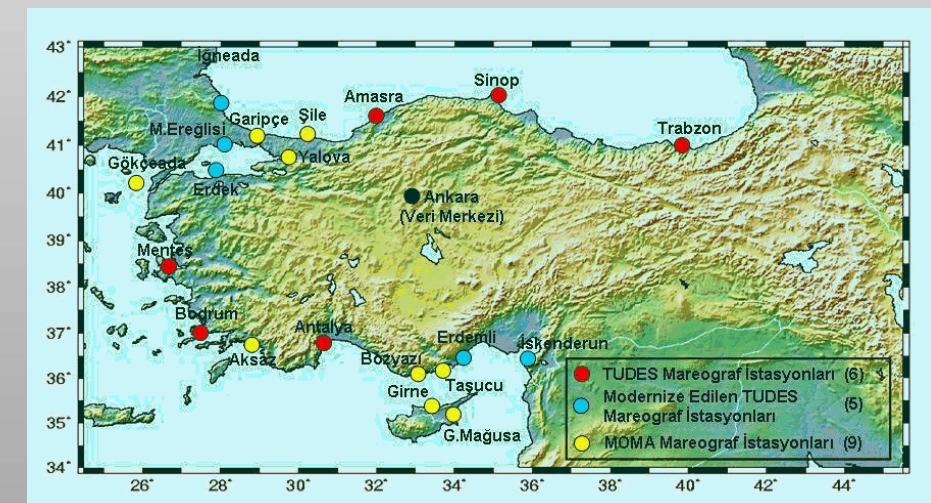


CORS-TR

Continuously Operating Reference Stations) the Establishment of Network based Stationary Real-Time Kinematic (RTK) GPS Terminals and Determination of Cellular Transformation Parameters CORS- TR, Istanbul Kultur University (IKU), General Command of Mapping (HGK) and the Directorate of Cadastre and Land Registry (TKGM)



MOMA, The Meteorology and Oceanography Network of Excellence
DG Meteorology,
Maritime DG, **METU**
IMS



Tr-GRID, TUBITAK ULAKBIM High Performance and Grid Computing Center is a national HPC center aiming to provide computing environment to the research groups from all over the country and also to coordinate National Grid Initiative (TR-Grid NGI) in Turkey.

Examples

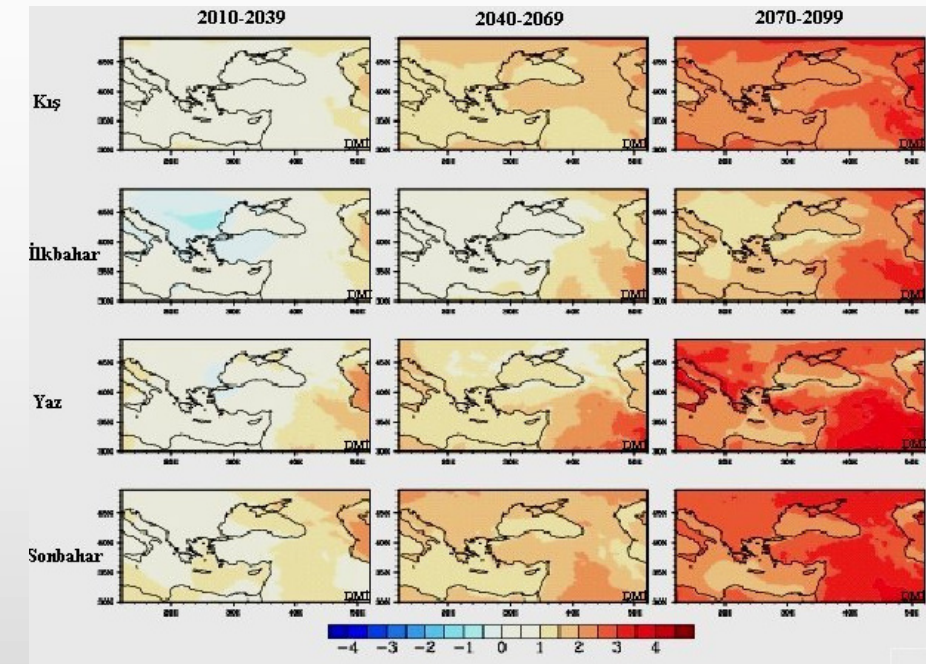


Climate Change Scenarios for Turkey, ITU

RIVER MONITORING AND **POLLUTION**
CONTROL SYSTEM, Ankara University,
Env and Forestry Ministry



Forest Fire Identification and Monitoring
Systems based on computer vision methods,
Bilkent University, DG Forestry



**Development of Land Evaluation Systems for Analyzing
Climatic Risk in Agriculture**
Ministry of Agriculture, TAGEM

Biodiversity Inventory of Turkey, Ministry of
Agriculture, TAGEM



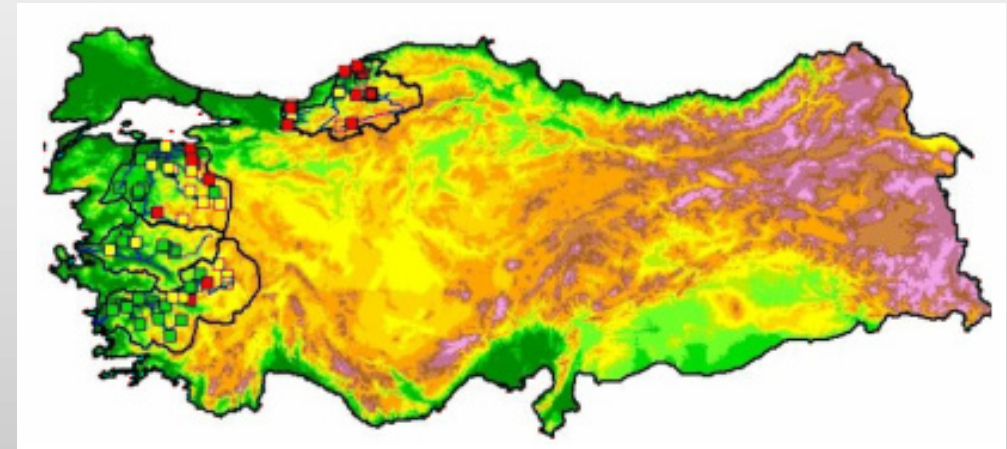
Examples



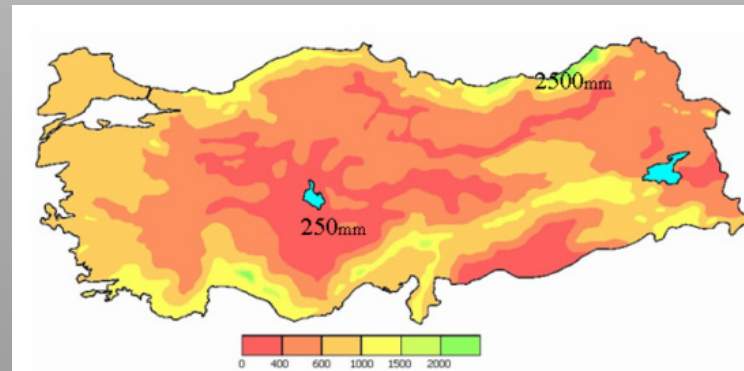
VSAT (satellite communication)

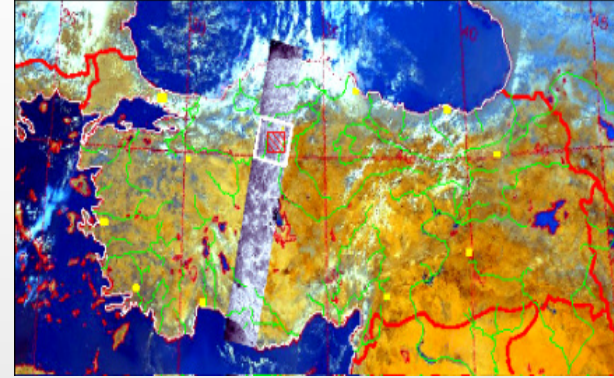
Emergency Flood and Earthquake Recovery Project

Flood Forecasting System in Turkey TEFER component takes real time monitoring data of the catchment and produces forecasts of the flood state of the catchment.

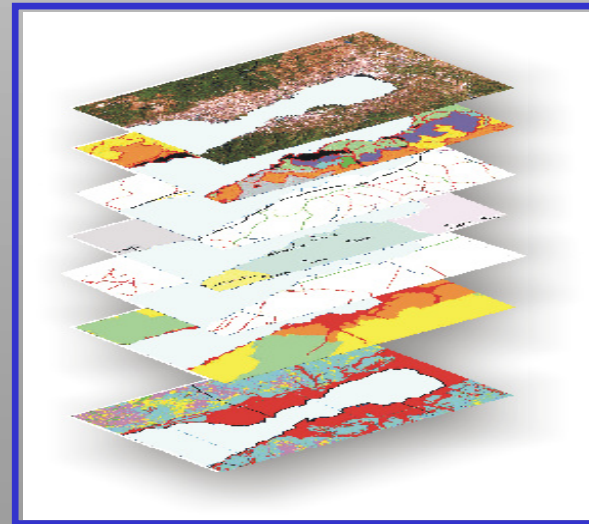


Annual Rainfall Distribution of Turkey





**National Spatial Data Infrastructure,
National GIS, Min. of Public Works and
Settlement the Directorate of Cadastre and
Land Registry**



Turkey's EO activities can be summarized under the following areas;

Space Systems

TÜBİTAK- UZAY (Space Research Technology Institute)

BİLSAT (2003)

RASAT (2008)

NEXT GENERATION EO SATELLITES (2011)

TAI (Turkish AeroSpace Industry)

Ground Segments

TÜBİTAK- UZAY

DG Meteorology

İTÜ-CSCRS

Private Companies such as INTA Space Systems

TÜRKSAT Globe

Services

Private companies

Insitu Systems

Universities: İTÜ, ODTÜ, İstanbul, Dokuz Eylül, Karadeniz

Government Agencies: DG State Hydraulics, DG

Meteorology and Ministries, Some private companies

SUMMARY

Data Integration, Management, Standards

Ministry of Defence(GC of Mapping)

State Planning Organization

TÜBİTAK Institutions

Ministry of Public Works and Settlement

Universities, İTÜ, ODTÜ, Karadeniz Teknik etc.

Associations, Chambers

International Cooperation

European Space Agency, ROSCOSMOS, APSCO

EUMETSAT

EC FP7

GEO, CEOS

Bilateral relations(Especialy with European Countries)

Promoting and Funding Mechanisms

Projects Support and Infrastructure

TÜBİTAK R &TD

State Planning Organizations

Others (Universities)

Policy and Strategy

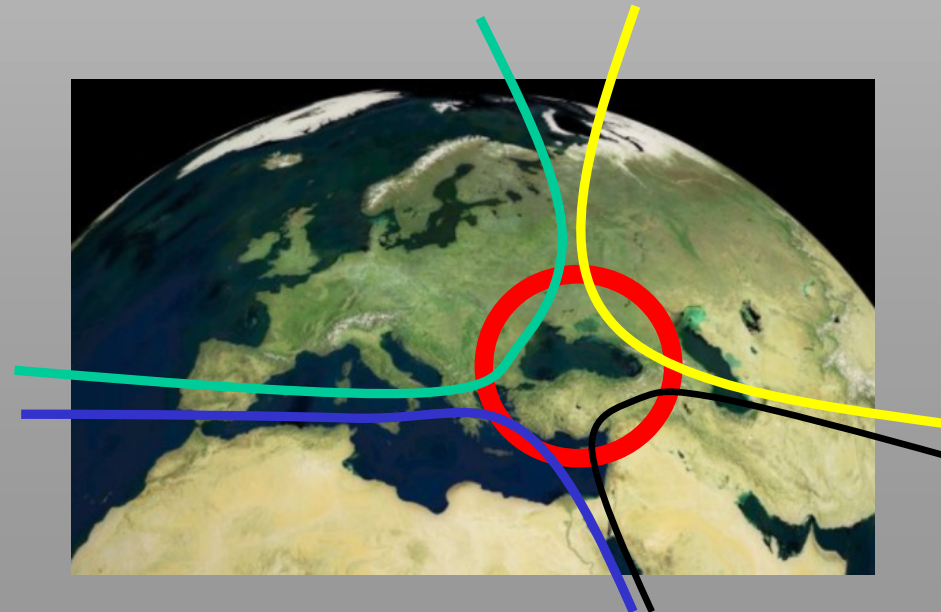
SCST,TUBITAK,SPO

GEO VIII Plenary Meeting



GEO VIII. Plenary Meeting will be held in Turkey, hosted by The Scientific and Technological Research Council of Turkey (TÜBİTAK) in 15-17 November 2011, İstanbul.

(The Group on Earth Observations - GEO is coordinating efforts to build a Global Earth Observation System of Systems, or GEOSS.)



MEETING POINT



TÜBİTAK

**EU Framework Programmes
National Coordination Office
Ankara-Turkey**

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