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Multidisciplinary GIS for Geodynamic Research



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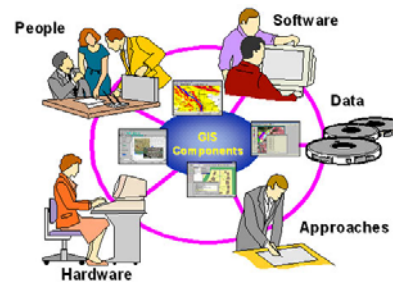
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- Geodatabase System and Applications
- Data Analyzing and GIS Applications
- Data Type and Acquisition in the Study Area
- Future works
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- Discussion

Introduction

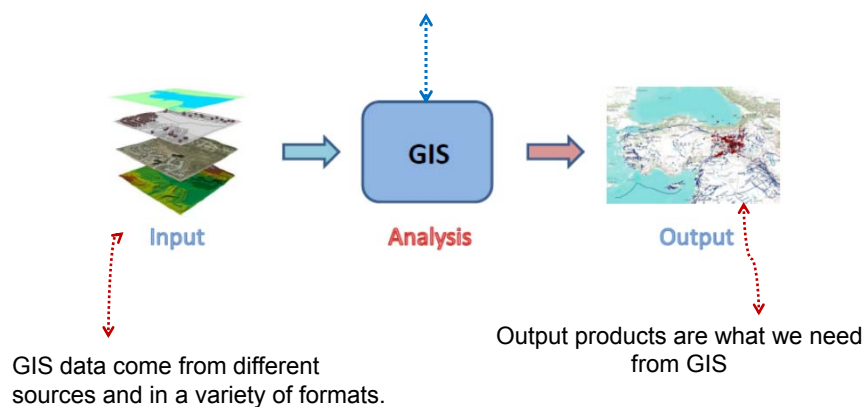
- Geographical Information Systems (GIS) are multifunctional systems where all type of geographical data are efficiently used, stored, updated, analyzed and the final products are presented as maps.
- GIS plays important role to develop data-driven solutions that help many organizations visualize, analyze, interpret and present data. The field of earth science is one of them. GIS is increasingly used to visualize elements associated with seismicity.

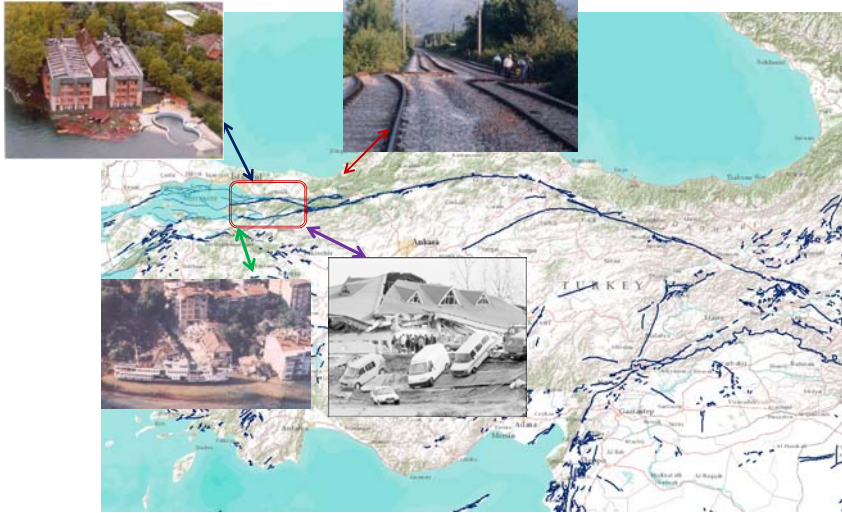


GIS and its components

Introduction

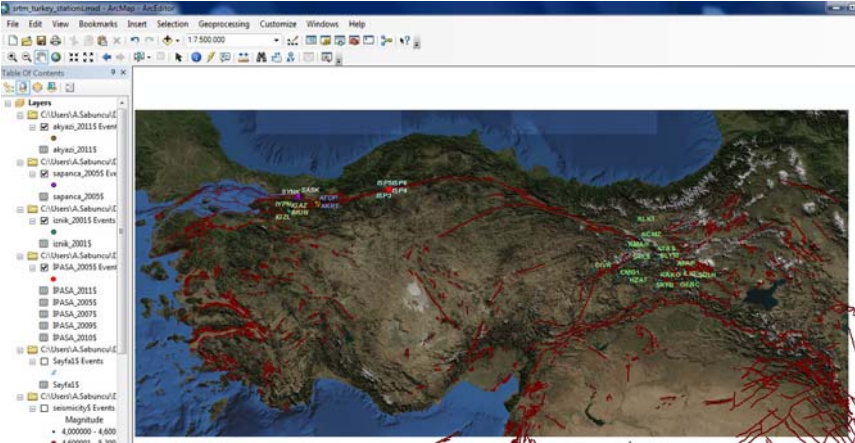
GIS is an ideal technology in order to use with multidisciplinary topics and issues





- 17 August 1999 and 12 November 1999 earthquakes in Marmara region, earthquake research and studies have been increased dramatically in our country.
- Both of them occurred on segments of the well-known North Anatolian Fault Zone (NAFZ).

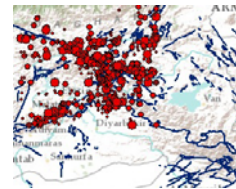
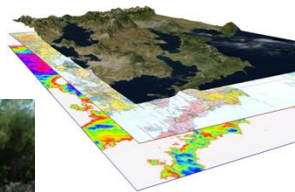
Study Area



- From the beginning of 90's, geodetic surveys with geodynamic purposes have been performed in regions of high seismicity of Turkey by Geodesy Department of Bogazici University, Kandilli Observatory and Earthquake Research Institute .

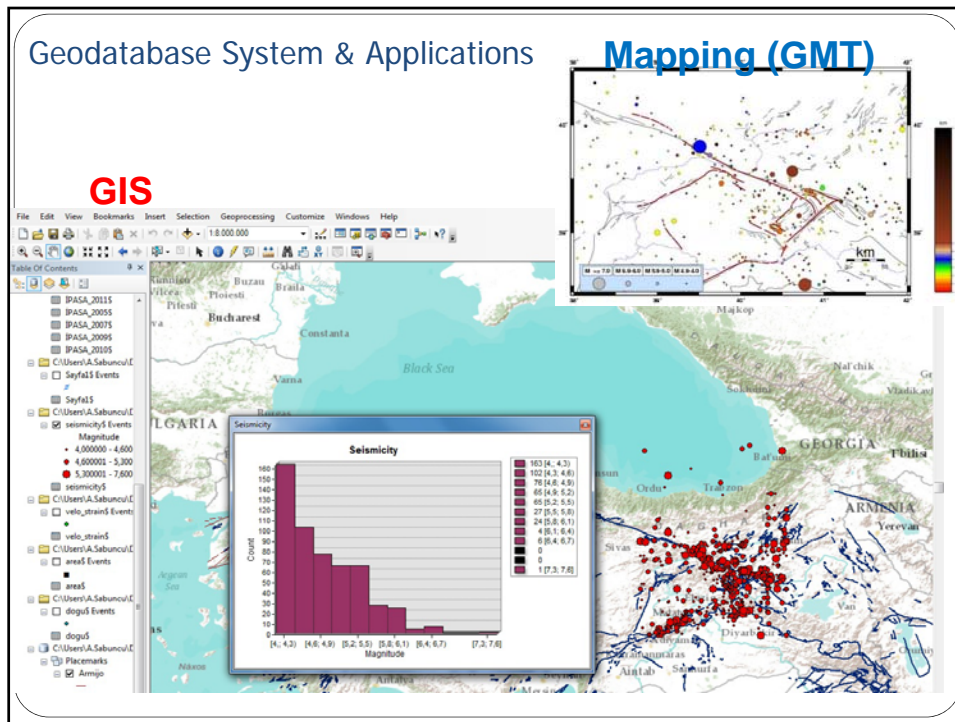
Geodatabase System & Applications

- The main objective of the geodatabase system in order to facilitate the management of a large amount of collected data.
- The database is essential for using modern GIS.
- Without geodatabase, mapping would be largely a drawing process, with little analysis.



Geodatabase System & Applications

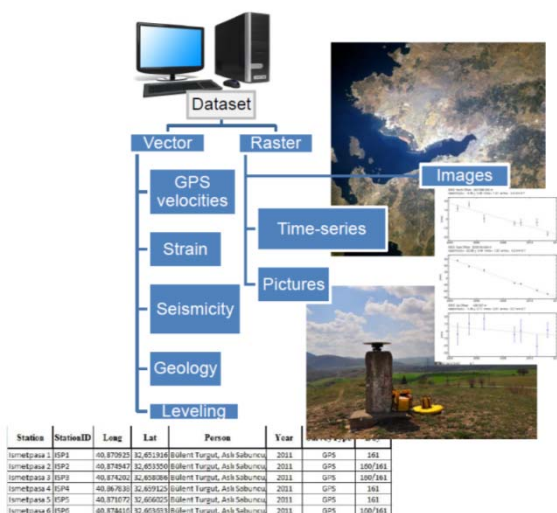
- There are numerous reasons in order to design and install the comprehensive geodatabase system for the Geodesy department studies.
- The expected benefits of this system are;
 - Designing sites locations and network geometry of geodynamic GPS networks for the field works,
 - Forming a base frame for future studies,
 - Integrating multidisciplinary data,
 - Temporal and spatial analysing with long term data. For instance, using NEMC earthquake data, querying different attribute data and making analysis of earthquakes in terms of time and location.



Data Analyzing and GIS Applications

- Geodatabase offer numerous benefits to projects and organizations. These benefits are;
 - **Flexibility** → GIS provides flexible opportunity to update or add data in different sources. Easily scale our storage solution.
 - **Decrease redundancy and error** → GIS contributes unnecessary duplication and provides supplies making errors. Store a rich collection of data types in a database.
 - **Standardization** → Compliance to the standards will facilitate data sharing, integration and compatibility within the GIS System.
 - **Update** → GIS has an important role in update section. Work within a multi-user access and editing environment.

Data Type and Acquisition in the Study Area



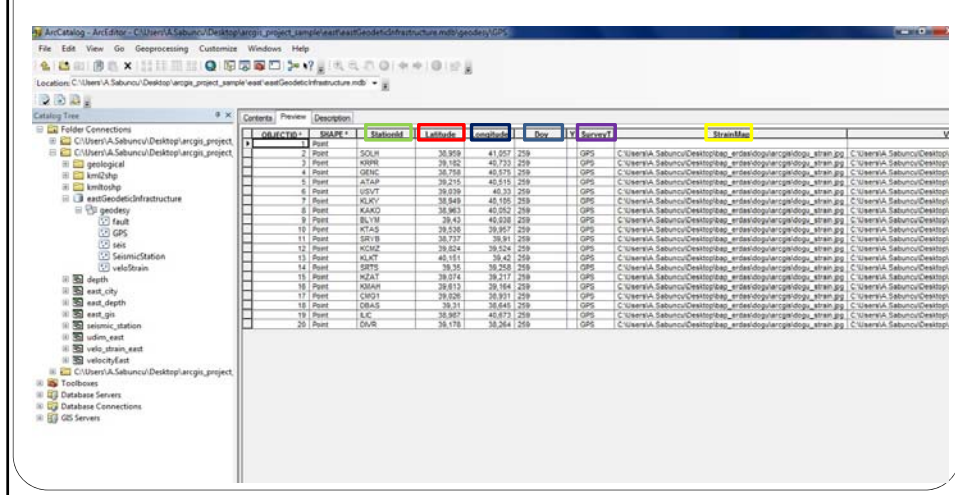
- Raster and vector geographic data types are used in this study.
- These data come from different sources and in a variety of formats.
- All data should be in the same formats and spatial reference system due to combine the multiple files.

Data Types and Datasets

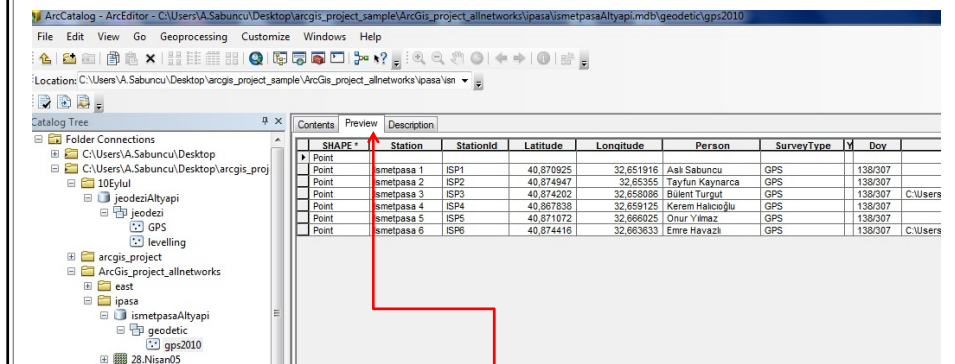
Data Set	Data Type	Data Source
Boundaries, rivers, lakes, roads	Vector	GTOPO30
Earthquakes (Historical & instrumental)	Vector	KOERI-NEMC
Fault Line	Vector	GDMRE (Saroglu et al 1992)
GPS & Levelling Stations	Vector	KOERI-Geodesy Department
Displacements by GPS	Vector	KOERI-Geodesy Department
Stations Photo	Raster	KOERI-Geodesy Department
DEM (SRTM 90 m resolution)	Raster	NASA JPL
Optical Satellite Image 60 cm res.	Raster	Worldview 2

Data Type and Acquisition in the Study Area

- For the GPS stations layer, further field attributes were added.
- These attributes are GPS station name, GPS Station ID, latitude, longitude, surveyors, survey type, year and day of year information

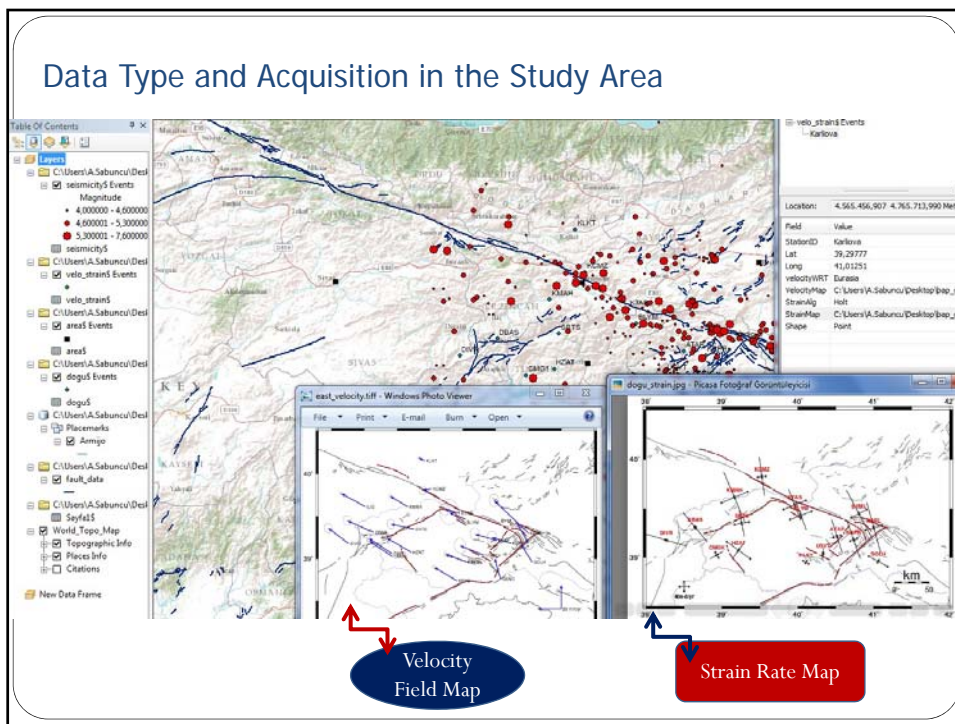


Data Type and Acquisition in the Study Area

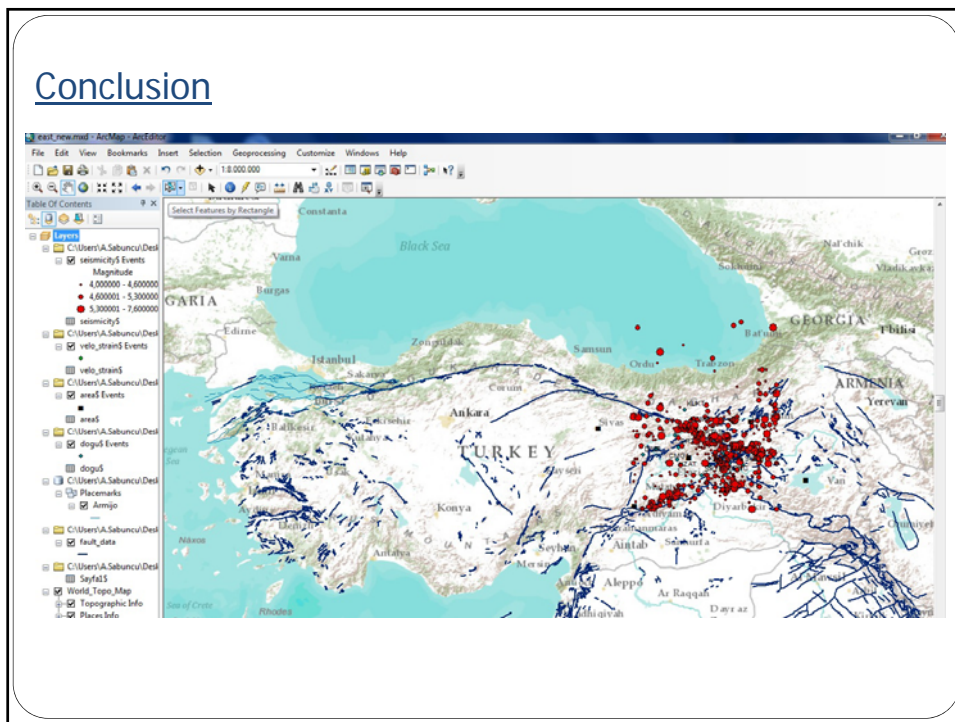


- Arc Catalog helps us manage and organize all the geographic information from simple tables to large datasets to complex maps.
- Arc Catalog provides numerous tools such as
 - viewing available GIS data sets in a catalog tree
 - looking what the data looks like (preview tab)
 - reading available documents which comes with the data.
 - viewing and updating metadata
 - managing databases of all kinds

Data Type and Acquisition in the Study Area



Conclusion



Conclusion

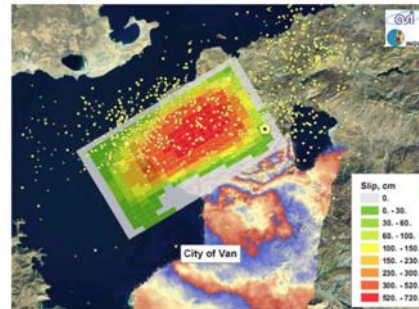
- GIS should be used to combine data different disciplines and multiple sources for a long time span.
- Data management in many fields of Earth sciences in Turkey is still in a period of transition.
- The most important issue is the harmonisation of data. So the harmonisation of data in GIS layers is one step on the road from "discovery to inter-operability".
- Scientists have to make harmonised and quality geographic information available for the purpose of formulation, implementation, monitoring and evaluation of community policy-making.

Conclusion & Discussion

- GIS studies can be examined in terms of earthquake studies in three categories.
 - Pre-seismic : GIS contributes data management , planning and analysis.
 - Co-seismic :Rapid Response
 - Post-seismic: Recovery
- GIS provides maximum functionality for geodynamic studies.
- Our department performs many field surveys in a year.
- As a result of these surveys, big amount of data are added into GIS.
- Better data management which GIS provides us means much more time to do science reducing duplications.

Van Earthquake

- A Mw: 7.2 earthquake struck northeast of the city of Van in eastern Turkey on Sunday, October 23, 2011, at 1:41 p.m. local time at the epicenter.
- The earthquake occurred at a depth of 16 km. and caused strong shaking throughout a broad area, causing significant damage to Van and neighboring towns.



Future works

- In this study, a GIS was designed and implemented to be used for the tectonic geodesy studies in our department.
- New data will be continued to add into the system.
- In addition to, a web application is going to be developed which provides to process GPS data and visualize them.

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**Thank you for attention and
interest**