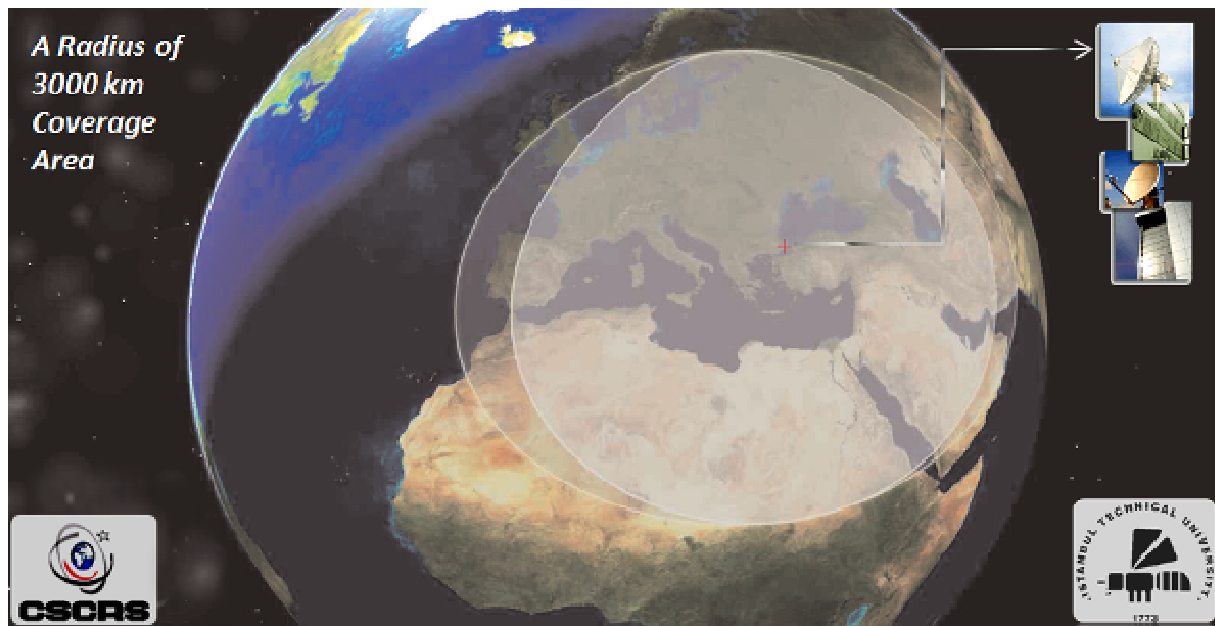




## Istanbul Technical University-Center for Satellite Communications and Remote Sensing (ITU-CSCRS)

Istanbul Technical University, Center for Satellite Communications and Remote Sensing (ITU-CSCRS) was originally established with the funding provided by the Turkish State Planning Agency (DPT) in 1996. Installation of the facility was completed by the end of 2000 and after conducted acceptance tests; the center became operational in 2002. The Center has five antenna systems with different capabilities and all the hardware and software needed for a complete ground receiving station for remote sensing. The mission of ITU-CSCRS is to develop an advanced capability in remote sensing and satellite communications to meet the scientific needs and operational requirements of Turkey. The Center occupies an important strategic location extending from Sweden in the North to Sudan in the South and from Ireland in the West to Kazakhstan in the East covering the Earth's surface within a radius of 3000 km (Figure 1). With its infrastructure and experienced staff, ITU-CSCRS has the capabilities of acquiring images from remote sensing satellites, processing remotely sensed data, sending these images via satellite links to resident and foreign users and using these data to develop operational project for environmental monitoring, agricultural applications and disaster management. Figures 2, 3 and 4 illustrate the current infrastructure in the Center.



**Figure 1:** Coverage of the main antenna



**Figure 2:** Building of ITU-CSCRS and Satellite System, Terminal Room for Data Acquisition System



**Figure 3:** Antenna System Establishment Area



**Figure 4:** Motion of the 13 m diameter antenna

Since 2003, ITU-CSCRS has been part of the worldwide certified network stations of international satellite providers. Technical, administrative and research staff (Table 1) at the Centre have gained considerable experience in ground station operation and critical remote sensing applications such as disaster monitoring, ship detection for monitoring illegal fishing

activities, ice monitoring for oil platform navigation, water quality monitoring, agricultural monitoring, climate change and deformation analysis by interferometric techniques in collaboration with international partner institutions. The Caspian Sea Project (2003-2006; with AgipKCO (Agip Kazakhstan North Caspian Operating Company) and Danish Meteorological Institute (DMI)), IMPAST (Improving fisheries monitoring through integrating Passive and Active satellite-based Technologies) Project (2004; with EC-JRC, Italy), and InSAR Project (2004-2007; with Euroimage SpA, Italy), and Giant Field Project (2006; EU Donation Project) are typical examples of participation in international environmental and wildlife protection programs. Aside from a variety of on-going research projects, the center has a capacity for GIS applications and solutions with well equipped laboratory and highly educated staff. Potentially, the Centre is a major asset for Turkey and the region.

**Table 1:** Staff of ITU-CSCRS

<b>Title</b>	<b>Name</b>
Prof. Dr. Cankut Ormeci	Director, Geomatics Engineer
Prof. Dr. Sedef Kent	Vice Director, Telecommunication Engineer
Assist. Prof. Dr. Elif Sertel	Vice Director, Geomatics Engineer
Prof. Dr. Tahsin Yomralioglu	Geomatics Engineer
Prof. Dr. Esref Adali	Computer Engineer
Assist. Prof. Dr. Berk Ustundag	Computer Engineer
Assist. Prof. Dr. Mesut Kartal	Telecommunication Engineer
Damla Uca Avci, MSc	Space Engineer
Muhittin Karaman, MSc	Geology Engineer
Emre Ozelkan, MSc	Meteorology Engineer
Orkan Ozcan, MSc	Hydrogeology Engineer
Ugur Alganci, MSc	Geomatics Engineer
Alper Akoguz, MSc	Telecommunication Engineer
Ibrahim Papila, MSc	Telecommunication Engineer
İsmail Yilmaz	Technician

The projects that are listed below are the titles of some projects conducted by ITU-CSCRS staff:

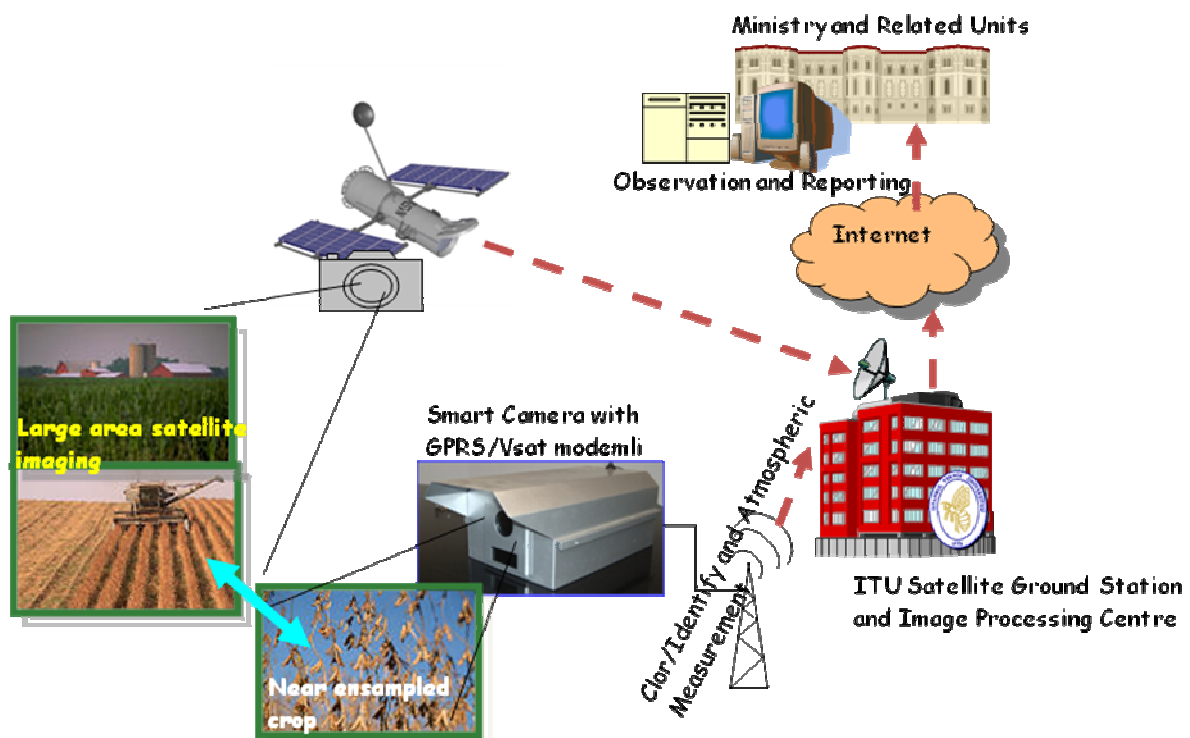
- Italy INSAR project,
- Oil Spill Detection project,
- Agricultural Monitoring & Yield Estimation System,
- Water Quality Monitoring in Salt Lake, Turkey using multi-temporal SPOT Imagery and ground surveys,
- Analysis of the Salt Lake and its basin area in Turkey using multi-temporal ASTER data,
- Investigation of general characteristics of Filyos River Basin using remotely sensed data and digital elevation model,
- Determination of earthquake-induced heavy damages in urban areas by means of remotely sensed data,
- Monitoring the state owned lands of Istanbul using satellite sensor images and GIS,
- Rectification accuracy analysis of multisensor remote sensing data,
- Investigation of the geometric accuracy and engineering applications of Orbview-3 satellite images,
- Rize Disaster Information System and Meteorological early warning System

Being a fully operational 7/24 and with its large coverage area (about 3000 km radius), ITU-CSCRS is extremely suitable for supporting applications related to surveillance, environmental monitoring, agriculture and disasters. ITU- CSCRS has one 13 m full motion antenna and two VSAT antennas of 2.4m and 4.6m diameters for satellite communications. The antenna frequency range of operation is extensive and covers the Remote Sensing X-Band, Meteorological L-Band, Telemetry S-Band and Ku Band. CSCRS antenna and control systems can be scheduled for automatic acquisition of supported satellites operating in the L, S, X and Ku bands.

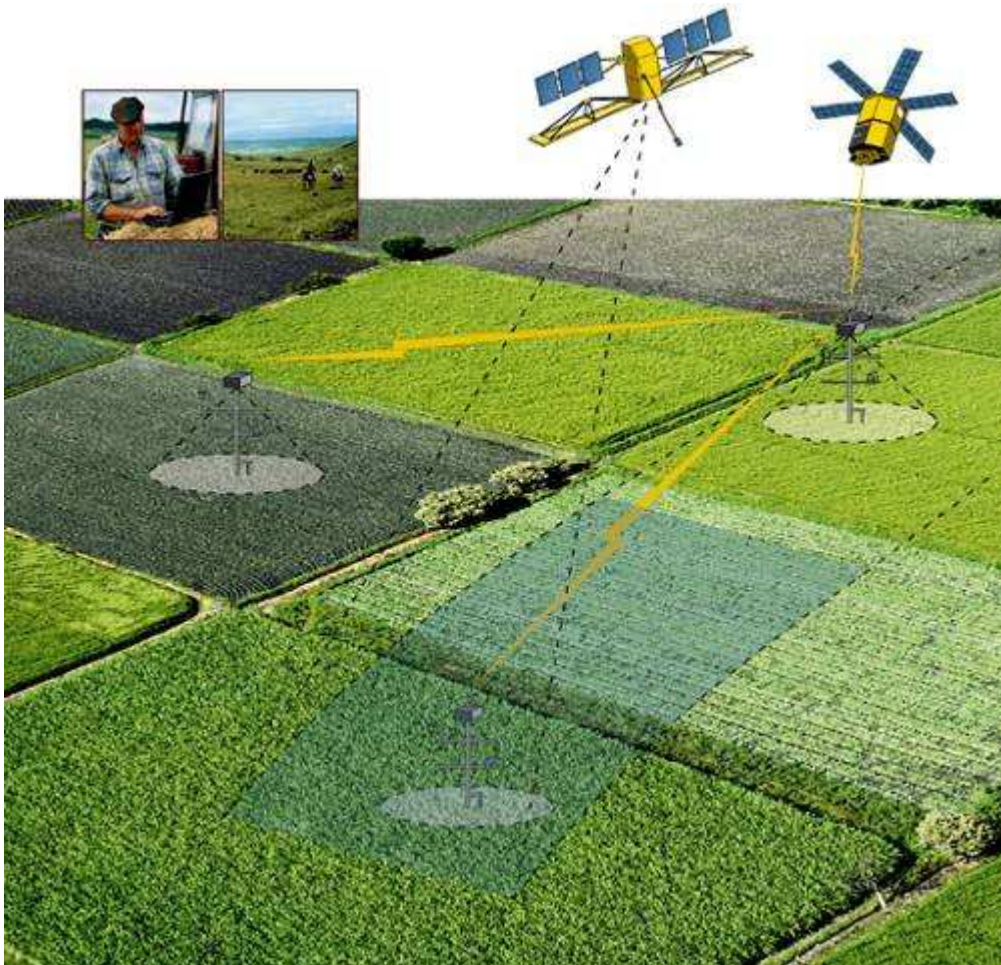
In the center, data downlinked from SPOT-2, SPOT-4, SPOT-5, RADARSAT-1, METEOSAT, NOAA satellites have been archived, formatted and processed with the state-of-the-art technology. We will start to downlink MODIS TERRA and AQUA in near future.

The biggest ongoing project is National Agricultural Crop Yield and Monitoring System project financed by Turkish Government (Budget: 6 Million Euros). The main aim of this project is monitoring of agricultural areas and developing a GIS based system using SPOT-5 data, statistical data and in-situ data for the crop yield estimation (Figure 5). Some outcomes of this project are;

- Prediction of the crop yield for different crop types,
- Live and continuously reporting system for different crops,
- Damage and crop loss reporting after any event,
- The early warning against climate effects and agricultural diseases,
- Report based decision support system for agricultural management.



**Figure 5:** Process flow chart of National Agricultural Crop Yield and Monitoring System



**Figure 6:** En example to SPOT 5 satellite earth surface swapping such as monitoring agricultural area that is used for National Agricultural Crop Yield and Monitoring System Project

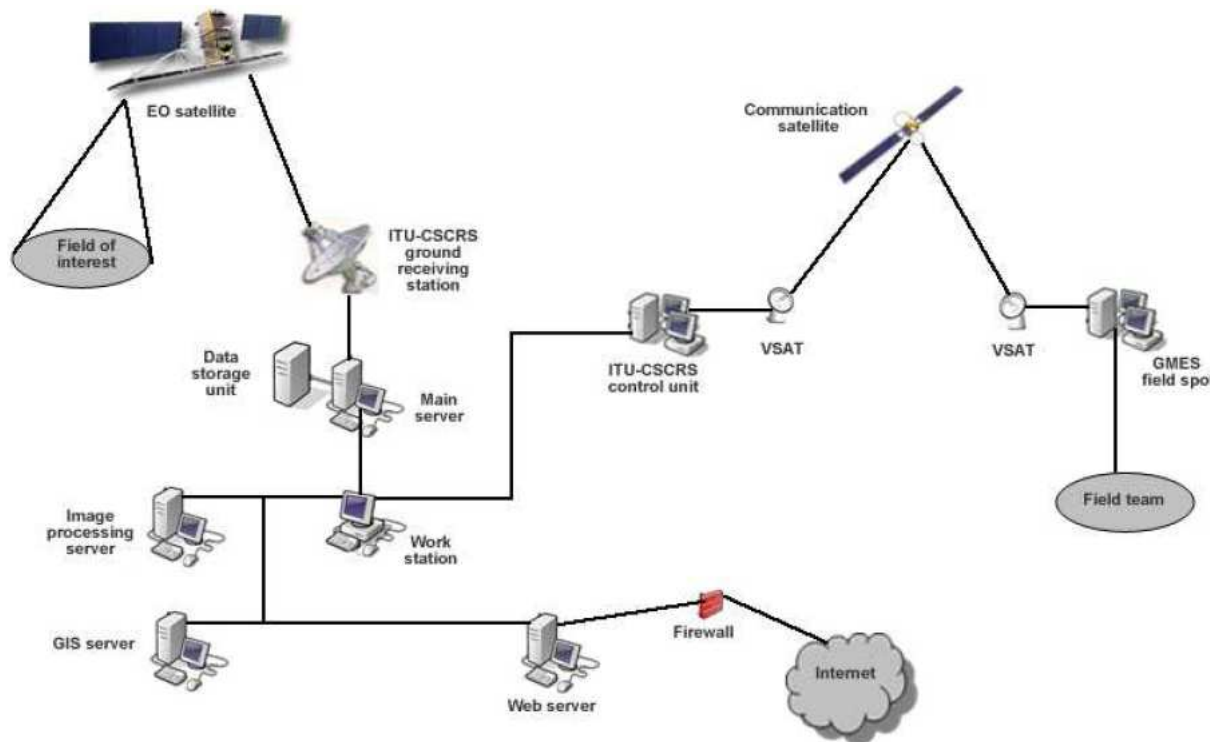
### **How to contribute to European Union Projects?**

Owning ground segments for both Earth Observation (EO) and Satellite Communications (SatCom) within its infrastructure (Figure 2,3 and 4), ITU-CSCRS provides a suitable facility in global data distribution network for GMES services:

#### **1. Earth Observation**

Integration of ITU-CSCRS to the global data distribution network, with its wide coverage will enlarge the GMES operational area. The area from Sweden in the North to Sudan in the South and from Ireland in the West to Kazakhstan in the East will be covered both with a Synthetic Aperture Radar (SAR) and optical remote sensing data with downlink

rate of 400 Mbps. Online recording capacity of the system is a 600 Mbps reliable dual-capture recording system.



**Figure .** Integration of SatCom with GMES via ITU-CSCRS infrastructure.

Automatic data aging capabilities, transparent file system access, data snapshotting and mirroring and volume management flexibility are among other positive features. For archiving telemetry data, LTO3 generation-3 tape archiving system will be used instead of DLT tapes, which have been utilized up to now.

Besides the ITU-CSCRS's current infrastructure, high performance data processing cluster and automatized data processing system has been operational since the end of 2008. Considered together with its communication facilities, ITU-CSCRS will be able to synthesize, synchronize, and classify satellite based observations. Hence, this will help to produce validated, accurate and more user-friendly information for emergency actions in the region.

## 2. VSAT Satellite Communication

Since VSAT is a safe SatCom technique, it can be utilized to spread information to civil security and emergency coordination and management services in case of disasters like

floods, forest fires, volcanoes, earthquakes, and other emergency calls. Point to multi-point safe telephone, high speed broadband internet and video communication can be available through VSAT. Rapid network deployment is another advantage of this system for emergency system test and development purposes. With its VSAT SatCom facilities, ITU-CSCRS can be a hub or part of a mesh of a VSAT communication network consisting of in situ measurement systems for real emergency situations as well as disaster coordination and management centers. Hence, the acquired satellite data could be distributed rapidly and safely from the Center to other GMES network.

### **3. Web Based Services**

Robust, extensible and reliable web, ftp, database, storage and archiving systems of ITU-CSCRS will be suitable for an integrated internet based communication system which will meet the GMES user needs effectively. These EO, SatCom and Web facilities will also enable ITU-CSCRS to serve as a test-bed for the research and development phases of the proposed project. As a conclusion, with synergetic use of its space based capacities, ITU-CSCRS is willing and able to cooperate in integration of SatCom with GMES and distribution of satellite based EO data to the end-users via VSAT satellite communications or web based services in emergencies.

#### **Contact Person**

Assist. Prof. Dr. Elif SERTELE

Vice-Director

Istanbul Technical University

Center for Satellite Communications and Remote Sensing

Tel: +90-212-285-6813 Ext. 122

Fax: +90-212-285-7167

e-mail: [elif@cscrs.itu.edu.tr](mailto:elif@cscrs.itu.edu.tr), [sertele@itu.edu.tr](mailto:sertele@itu.edu.tr)

web: <http://www.cscrs.itu.edu.tr/index.en.php>