HICO Data User's Proposal

Hyperspectral Remote Sensing of Coastal Water Quality for Istanbul Strait and Marmara Sea in Turkey

Principal Investigator

Arife Tuğsan İşiaçık Çolak, PhD Student

Istanbul Technical University, Satellite Communications and

Remote Sensing Application Programme, PhD Student

34649, Maslak, Istanbul, Turkey

Phone: 00 90 533 934 5299

Mail: isiacikt@gmail.com, isiacik@itu.edu.tr

Co - Investigator

Assoc. Dr. Elif Sertel,

Director of Center for Satellite Communications and Remote Sensing (ITU-CSCRS)

Istanbul Technical University, Maslak-Istanbul/TURKEY

Phone: +90-212-285 68 13 / 120

Mail: elif@cscrs.itu.edu.tr, sertele@itu.edu.tr

1. Abstract/ Project Summary

The aim of this project is to develop an advanced monitoring of water quality parameters (chlorophyll, suspended sediment, temperature) for Istanbul Strait and Marmara Sea coastal areas by using HICO and data from (Radarsat and Spot imagery) Center of Satellite Communications and Remote Sensing. Second step of this project is to combine the remote sensing data with in situ measurements (sea surface temperature, salinity…etc) data to estimate water quality modelling through the Marmara Sea and Istanbul Strait.

A regression analysis will be carried out to transform an image into water quality distribution maps based on the empirical and semi-empirical relationship between the parameters and image data (Dekker et al., 1996). The project is proposed to find the distribution of pollution and to generate advanced map of pollution sources for coasts of Marmara Sea and Istanbul Strait.

2. Statement of work/project description

According to the European Environment Agency (EEA), "the pollution can take many forms and have different effects. Examples of polluters are sewage, wastewater treatments, nutrients from farm fertilizers, pesticides, metals, household chemical products, hydrocarbons, sediment runoff, industrialization effect, cooling water system of factories, sea transportation and rapid and irregular urbanization.

Marmara Sea is a nearly closed sea. Istanbul Strait connects Marmara Sea to Black Sea and Canakkale Strait connects Mediterranean Sea to Marmara Sea. The most environmentally problematic areas in Marmara Sea are Gulf of Izmit and Istanbul Strait including the Northern approaches from Black Sea due to the domestic wastes, shipyards, port and shipping facilities, rapid urbanization, industrialization and dense shipping traffic. In order to study these areas and achieve this project, HICO images and set of standard level 2 data products to be requested.

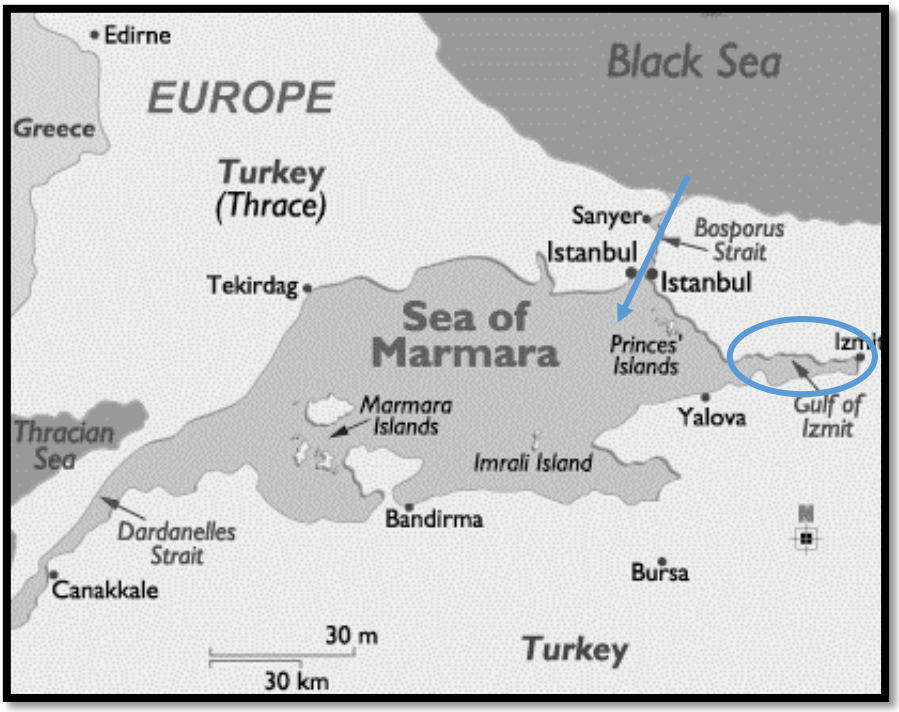

Fig 1: Turkish Strait Systems including Marmara Sea

Precisely and reliable data to estimate water quality will be obtained by providing joint data from HICO images, images provided from CSCRS and in situ measurements around Gulf of Izmit and İstanbul Strait. HICO images has many advantages for remote sensing of coastal waters. By having many spectral bands, HICO gives chance to obtain the most reliable water quality results.

3. Biographical Stretch

A. Tuğsan İşiaçık Çolak is PhD student and also captain at Istanbul Technical University Maritime Faculty Training Vessels. Being a captain will give her opportunity of taking samples of water quality for laboratory analysis by using training vessels of ITU Maritime Faculty. Her MSc thesis is about monitoring ship based oil pollution for Black Sea.

Elif Sertel Dr. is director of Center of Satellite Communication and Remote Sensing at Istanbul Technical University (ITU – CSCRS). She is Assoc. Professor at ITU Geomatics Engineering. A. Tugsan Isiacik Colak is supervised by Elif Sertel Dr. during her doctoral dissertation. Elif Sertel Dr., has been working for remote sensing of; land use/land cover changes, regional climate modelling, land surface-climate interactions, land cover change impact on climate, oil pollution and water quality analysis with remote sensing, geostatistic, natural disasters, geographic information systems (GIS), meteorological remote Sensing, environmental remote sensing. She has many papers regarding the above mentioned subjects.

ITU-CSCRS, Center of Satellite Communication and Remote Sensing has the capabilities of acquiring images from remote sensing satellites, processing data, sending the products via satellite links to resident and foreign users. ITU CSCRS is one of the institutions around the world with a highly capable ground receiving station unit. It is the first center established in Turkey to conduct application oriented projects in remote sensing and satellite communications technologies. The station can receive images of the Earth's surface within a radius of 3000 km., which covers from Sweden to Sudan, and England to Kazakhstan. In the center, the data acquired from Spot-2, Spot-4, Spot-6, Radarsat-1, Ers-2, Noaa-11, Noaa-14, Meteosat satellites is archived, formatted and processed with the state-of-the-art technology. Satellite image based Agricultural and Environmental researches and projects performed by ITU - CSCRS such as;

- Land Use/Land Cover Mapping and Updating,
- Base Map Production for City Master Plan,
- Urbanization, Classification and Change Detection,
- Identification of Urban Areas with VHR Images,
- Natural Resources Monitoring,
- Digital Elevation Model Production,
- Water Quality Assessment,
- Coast Line Change Detection,
- Water Resources Monitoring – Watershed Management,
- Forestry - Damage Estimation after Forest Fire,
- Vegetation Mapping, Biodiversity Analysis
- Flood Monitoring

P. Investigator's papers marine pollution studies:

- B., Ozsoy-Cicek, T., Isiacik Colak, About Oil Spill Detection from RADARSAT-1 Synthetic Aperture Radar imagery at Northern entry of Bosporus Strait, Turkey, Fresenius Environmental Bulletin, ISSN: 1018-4619
- A.T.İşiaçık Çolak, S.Can, "Ship Based Oil pollution for Black Sea", First International Symposium on Naval Architecture and Maritime INT-NAM 2011". Yıldız Teknik University, 2011
- Remote sensing techniques for monitoring oil pollution, T. Isiacik Colak, B.Ozsoy-Cicek, S. Can, E. Sertel, Global Conference on Global Warming 2012, Istanbul, Turkiye, 2012
- Determine Potential Sea Pollution Area in Turkish Straits Systems. T. Isiacik Colak, S. Can, B. Ozsoy Cicek, TumSat Marine Forum, 2012, Canakkale, Türkiye,
- Oil Spill Detection from Radarsat Sar Images by Remote Sensing. T. Isiacik Colak, B. Ozsoy-Cicek, S. Can, T. Satir, Fourth International CEMEPE and SECOTOX Conference, June, 2013 Mykonos / Greece
- Review of Oil Spill Remote Sensing for the Turkish Waters, T., Kececi, B., Ozsoy Cicek, S., Can, T., Isiacik Colak, T., Satir, 6th International Perspective on Water Resources & the Environment, Jan. 2013 İzmir /Türkiye

4. Outputs and Activities

a. A pollution map of Gulf of Izmit and Istanbul Strait will be produced.
b. International paper will be published.
c. Importance of water quality monitoring via satellite will be emphasized.
d. Integration of remote sensing data with water quality modelling will be outlined.

5. References

- Dekker, A.G., Zamurovic-Nenad, Z.,Hoogenboom, H.J. and Peters, S.W.M. 1996:Remote sensing, ecological water quality modelling and in situ measurements: a case study in shallow lakes. Journal des Sciences Hydrologiques 41, 531–47.
- Planning of Water Quality Monitoring Systems, Technical Report Series, No. 3, WMO-No. 1113, ISBN 978-92-63-11113-5World Meteorological Organization, 2013, Switzerland