SPACE TECHNOLOGY APPLICATIONS FOR DROUGHT, FLOOD, WATER RESOURCES MANAGEMENT AND EARLY WARNING SYSTEMS IN SYRIA

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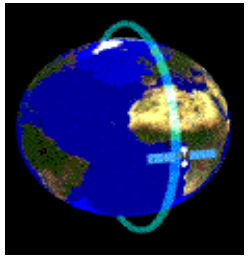
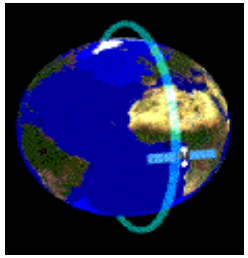
Koudmani.m53@gmail.com

Damascus, SYRIA

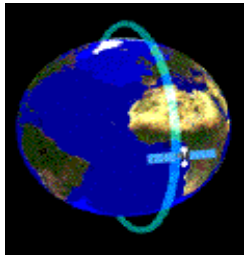


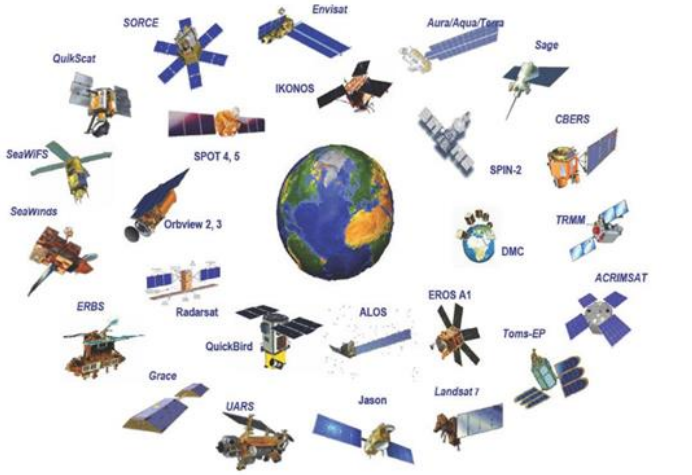
Contents:

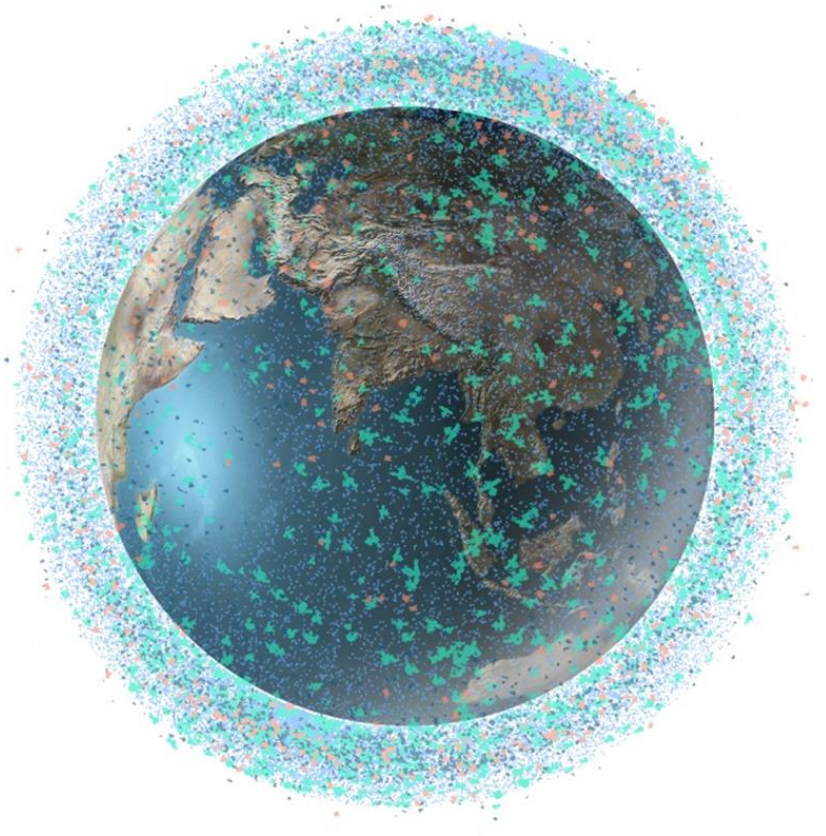


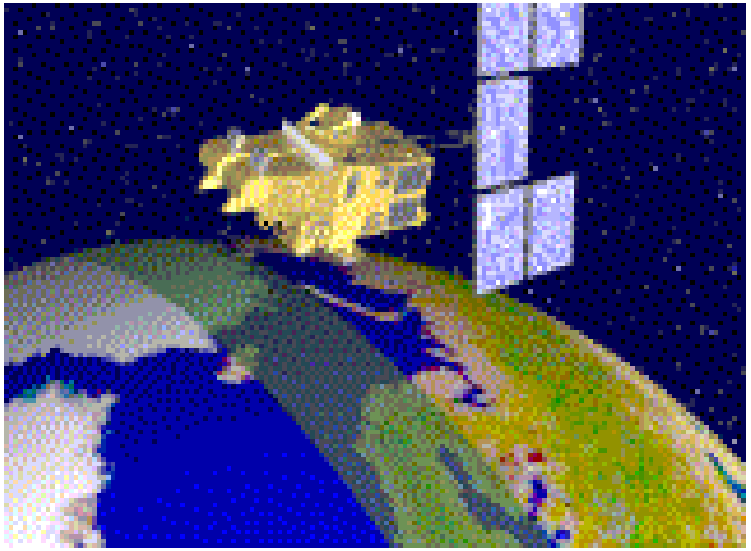
1- Introduction:

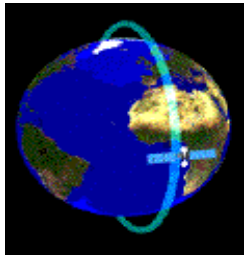
Space technologies can play important roles in the reduction of disasters. The use of such technologies can be particularly useful in the risk assessment, mitigation and preparedness phases of disaster management. Space technologies are also vital to the early warning and management of the effects of the disaster. In order for the developing countries to be able to incorporate the routine use of space technology-based solutions there is a needs to increase awareness, build national capacity and also develop solutions that are customized and appropriate to the needs of the developing world.



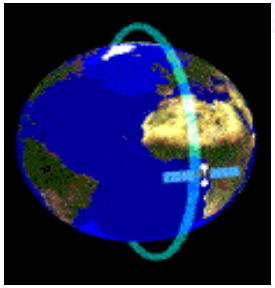

SORCE
Envisat
Aura/Aqua/Terra
QuikScat
Sage
IKONOS
CBERS
SeaWiFS
SPOT 4, 5
SPIN-2
SeaWinds
Orbview 2, 3
TRMM
DMC
ACRIMSAT
ERBS
Radarsat
EROS A1
ALOS
QuickBird
Toms-EP
Grace
Landsat 7
UARS
Jason



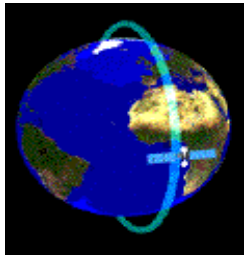




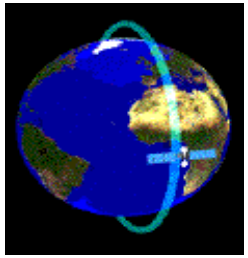

Integrated Information Web For Disaster Management Support
Background photo: © Claudia Henriette Schmidt



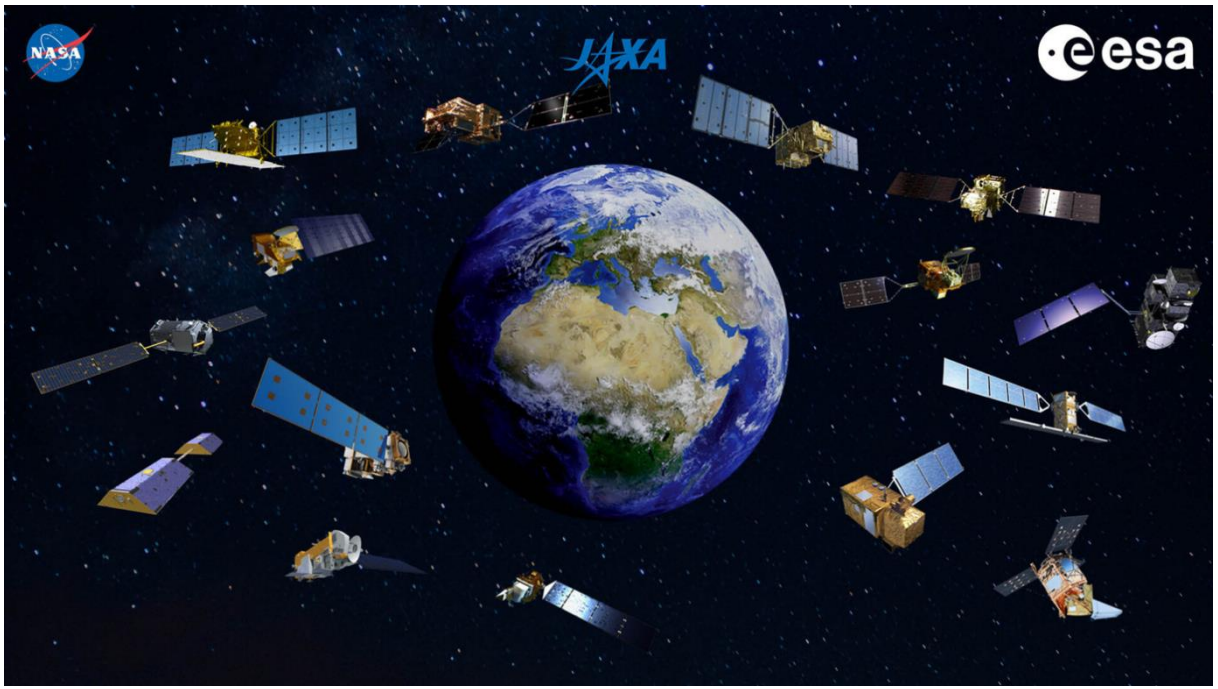
During the past four decades, natural hazards such as dust storms, severe storms and tropical cyclones, droughts, floods, forest fires, oil spills have caused major loss of human lives and livelihoods, the destruction of economic and social infrastructure, as well as environmental damages. Economic losses have increased almost ten times.

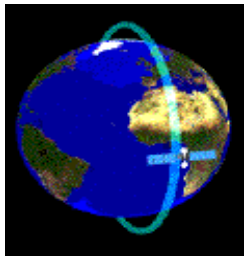


In 2020, 389 disasters were recorded, resulting in 15,080 deaths, affecting 98.4 million people, and economic losses estimated at $171.3 billion worldwide.



This paper shows examples of drought, flood, water resources management and early warning systems taken by different satellites in Syria.

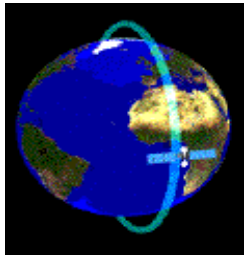


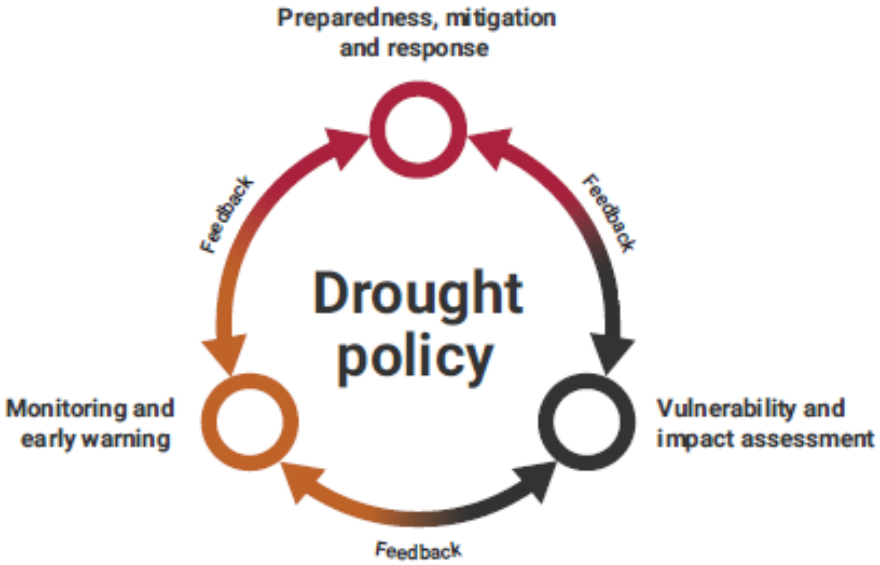


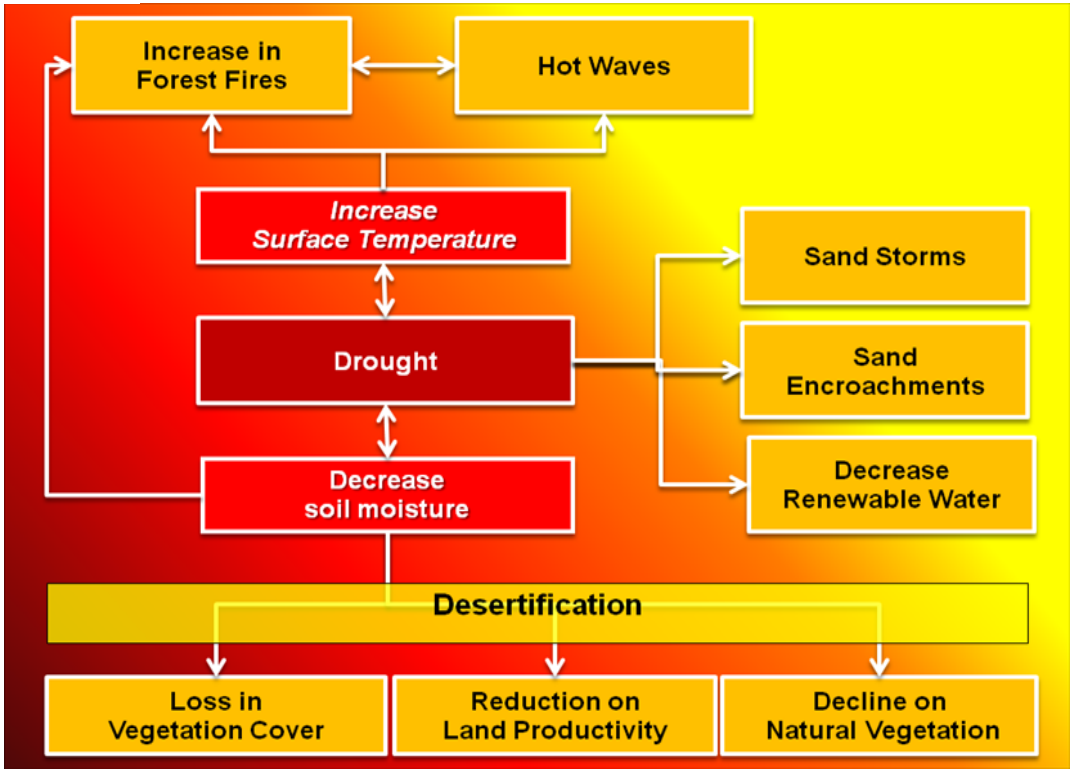
2- Examples of Drought in Syria:

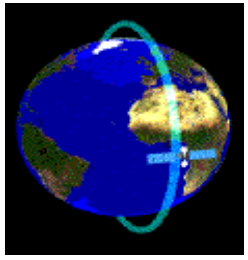
Drought is by far the most damaging of all natural disasters. Worldwide, since 1967, drought is responsible for millions of deaths and has cost hundreds of billions of dollars in damage. According to UNCCD (International Convention to Compact Desertification), desertification is land degradation in arid, semi arid and dry sub humid areas resulting from various factors including climatic variations and human activities. Desertification monitoring includes activities which are part of the integrated development of the degraded land which are aimed at:

* Assessment of current states of desertification.
* Analyses of land degradation process.
* Selection of basic indications of desertification.
* Mapping of degraded land and other related natural resources.
* Evaluating the impact of land use change and implemented rehabilitation measures.

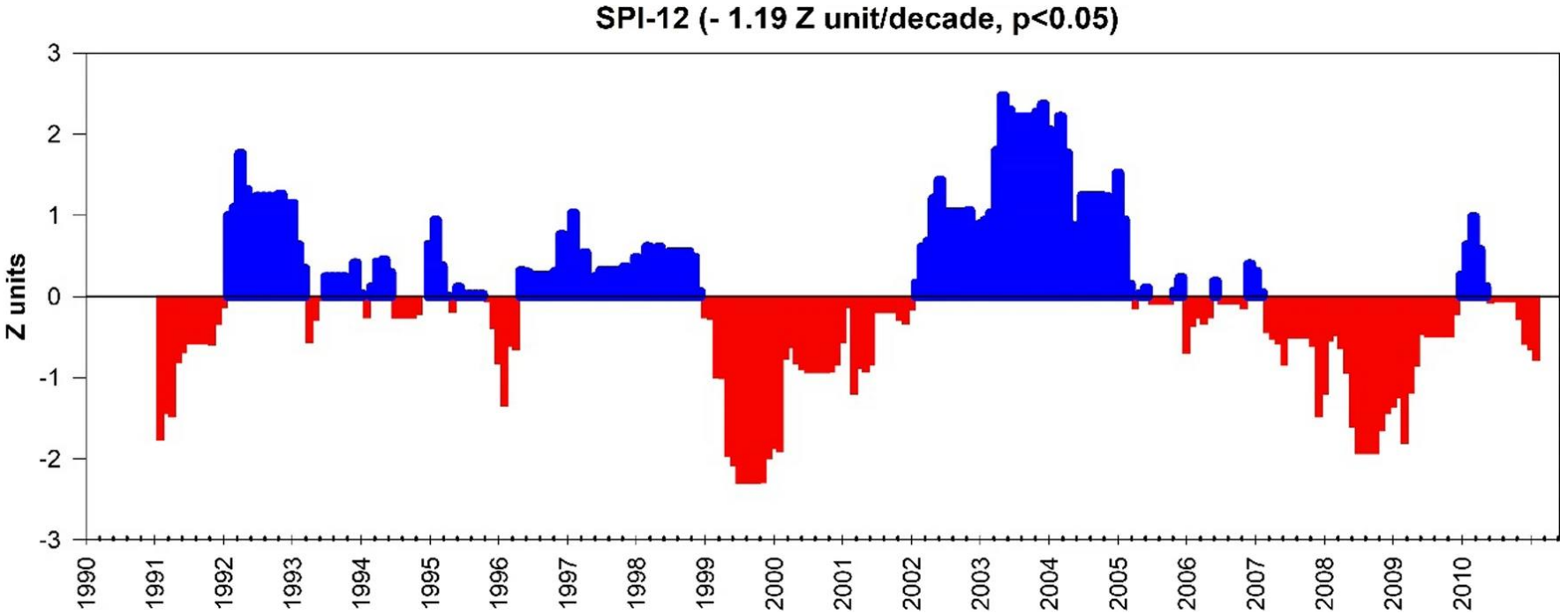


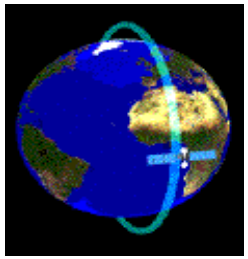

Preparedness, mitigation and response
Feedback
Feedback
Drought policy
Monitoring and early warning
Vulnerability and impact assessment
Feedback


Increase in Forest Fires
Hot Waves
Increase Surface Temperature
Sand Storms
Drought
Sand Encroachments
Decrease soil moisture
Decrease Renewable Water
Desertification
Loss in Vegetation Cover
Reduction on Land Productivity
Decline on Natural Vegetation

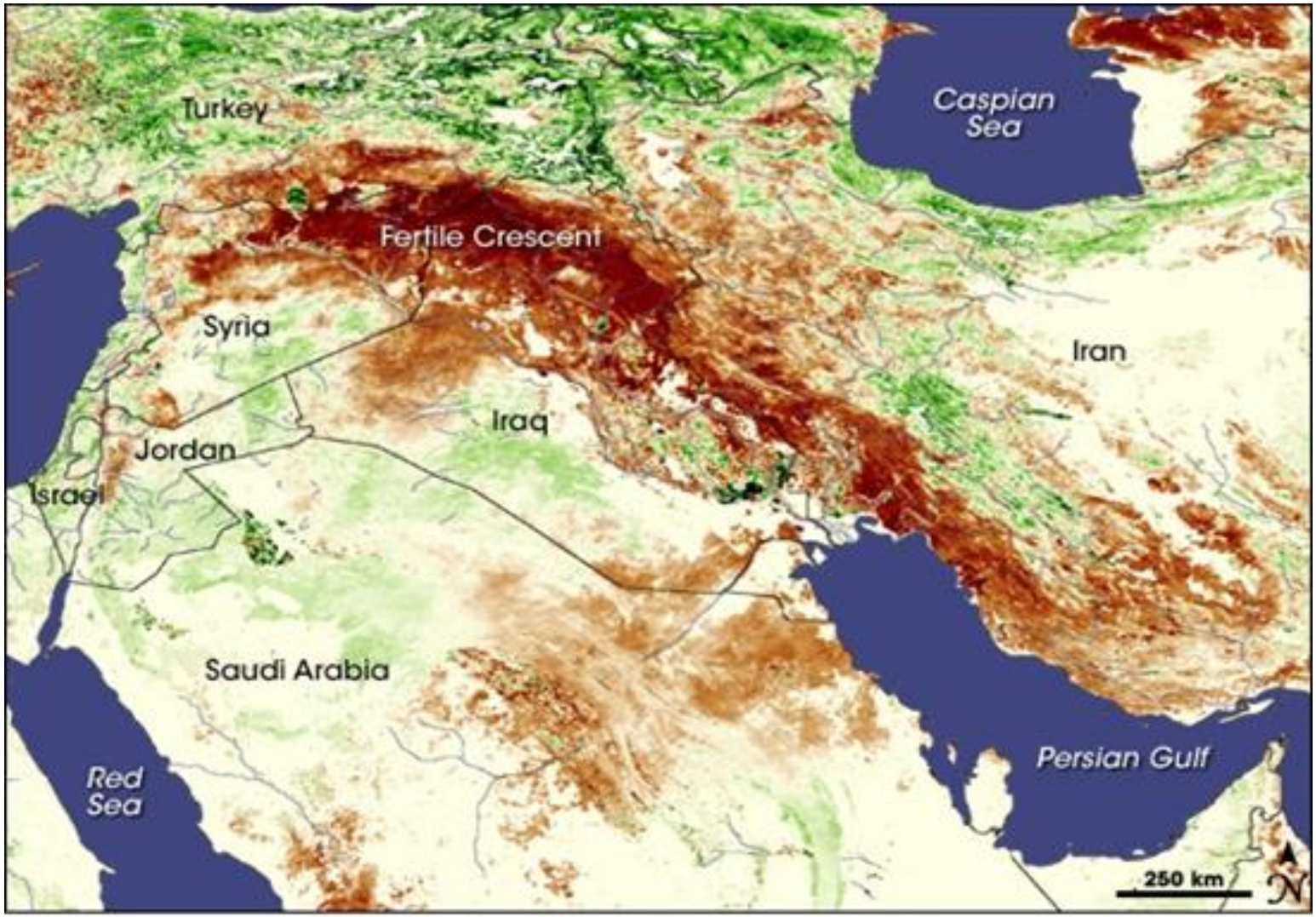


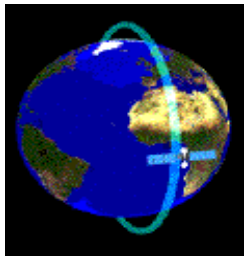
Syria has exposed to many droughts and floods in the last century caused major loss of human lives and food production.





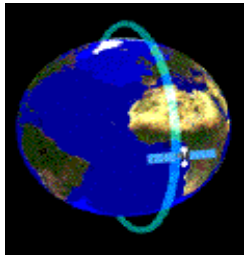
Drought in Syria and Iraq in 2008

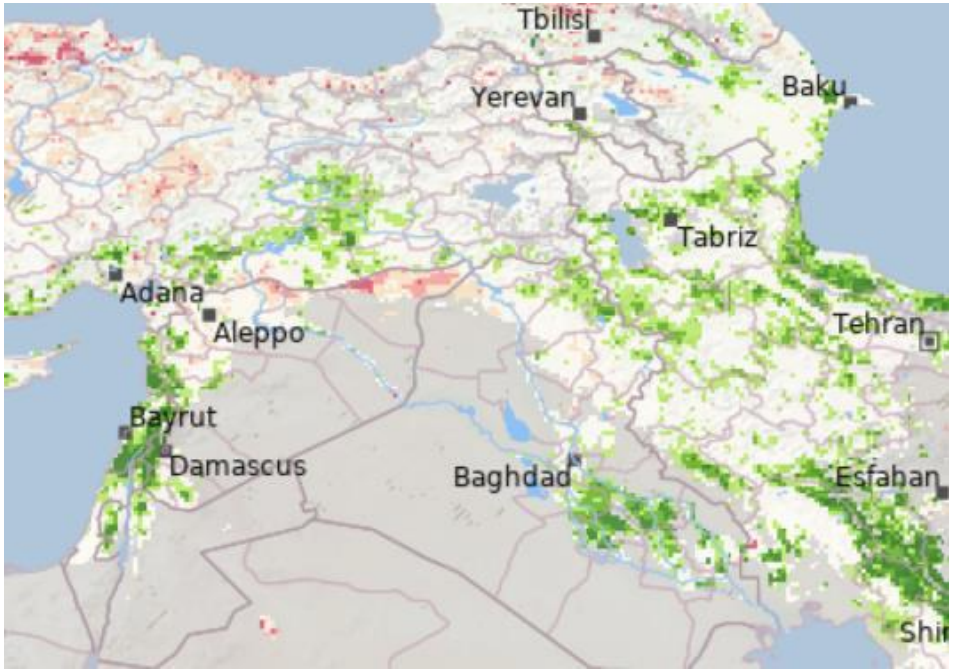


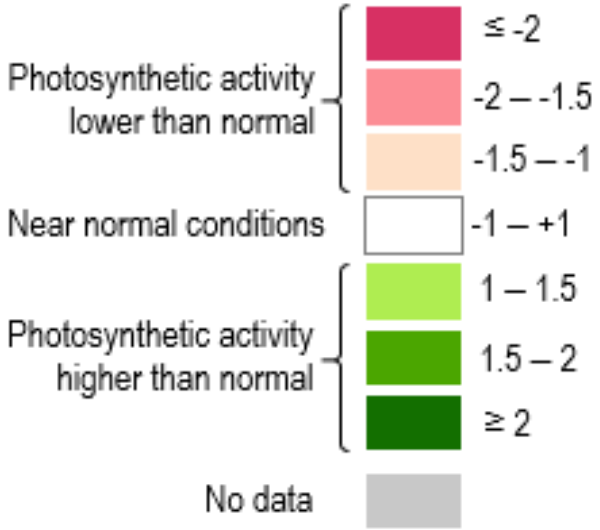


Drought in Syria and Iraq in 2021

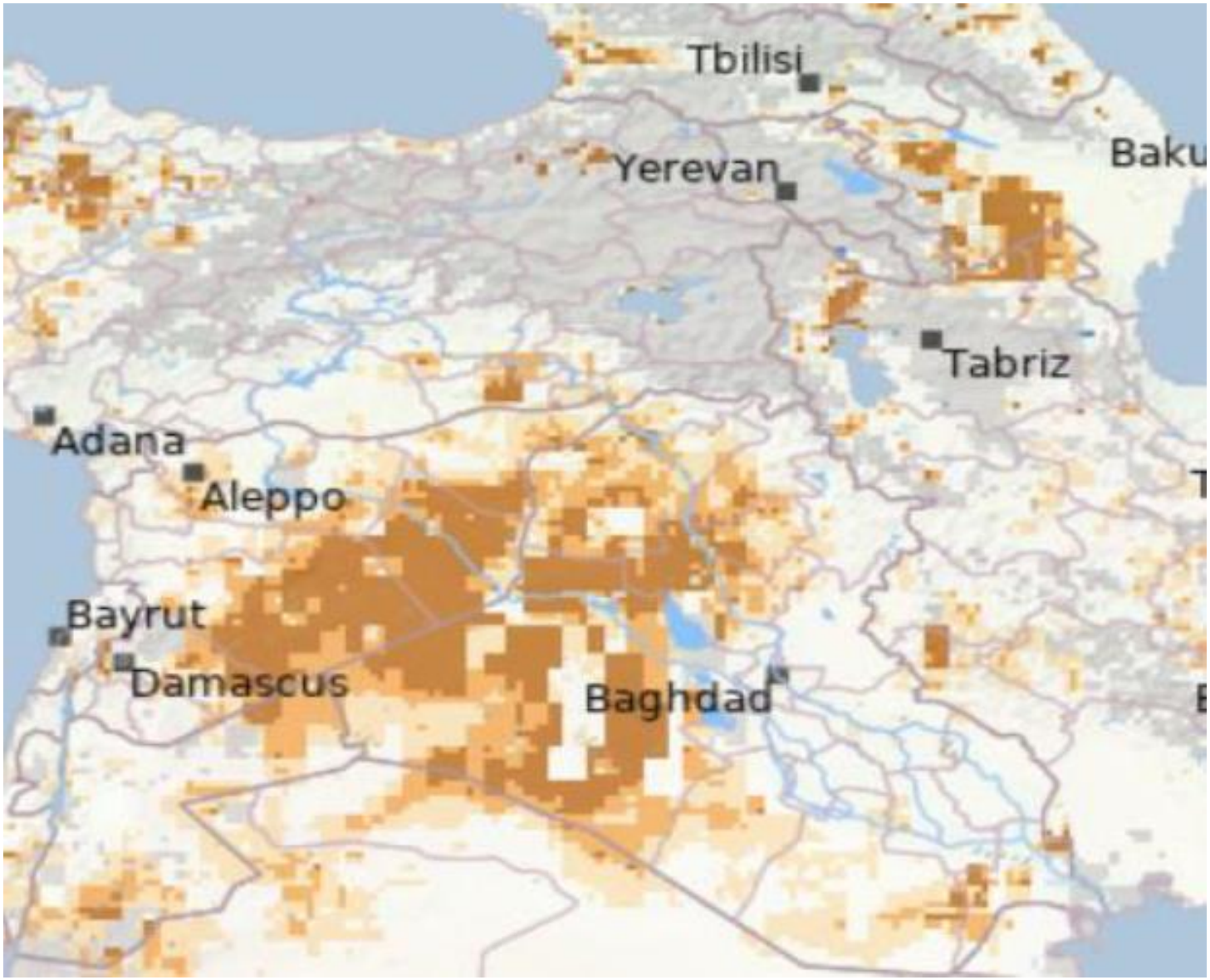
Drought conditions are affecting eastern Syria and northern Iraq since early 2021 , especially in the governorates of Al-Hasakah (Syria) and Ninewa (Iraq), after poor winter precipitation.

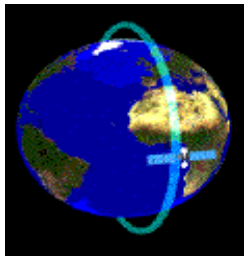






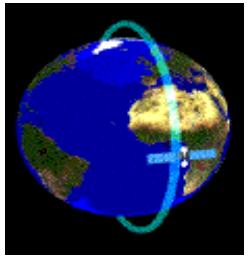
Global Drought Observation by Copernicus in 2021





3- Examples Floods in Syria:

A flood is an overflow of water that submerges land which is usually dry. It may occur due to an accumulation of rainwater on saturated ground in an areal flood. While the size of a lake or other body of water will vary with seasonal changes in precipitation and snow melt, these changes in size are unlikely to be considered significant unless they flood property or drown domestic animals



Flood in Barada River in Damascus in 1930

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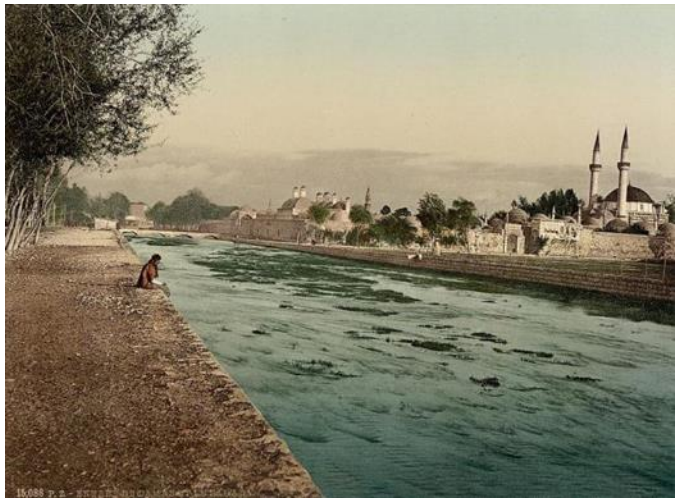
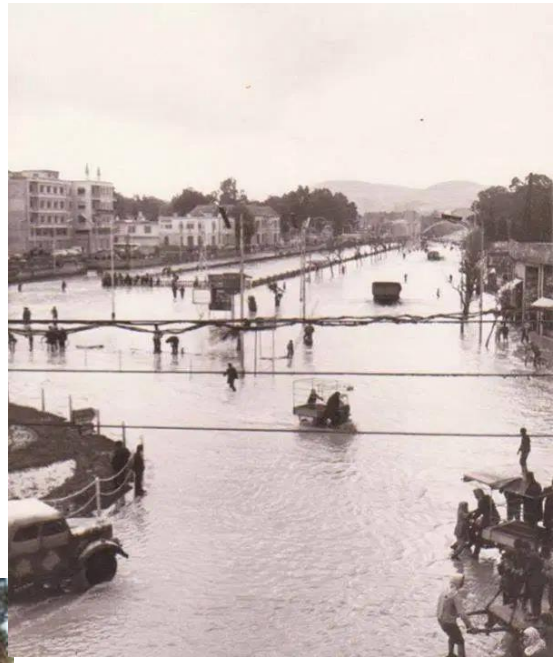
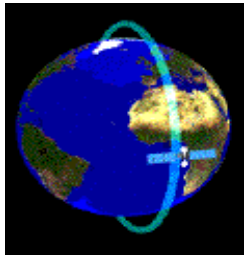
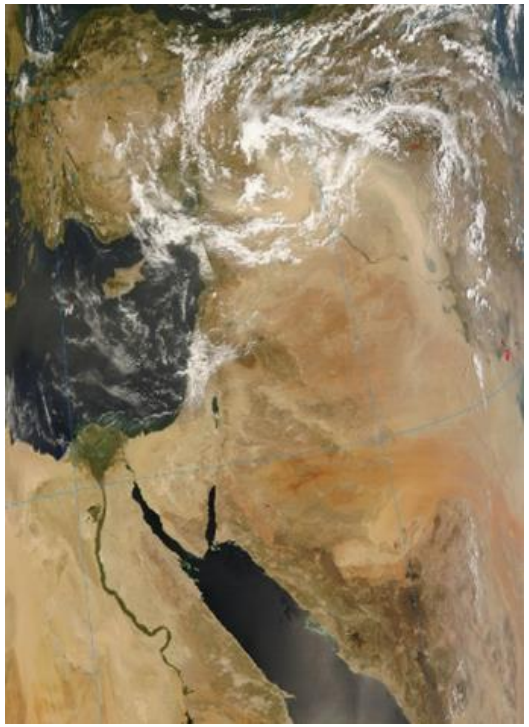
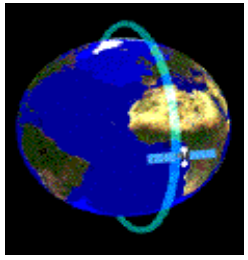




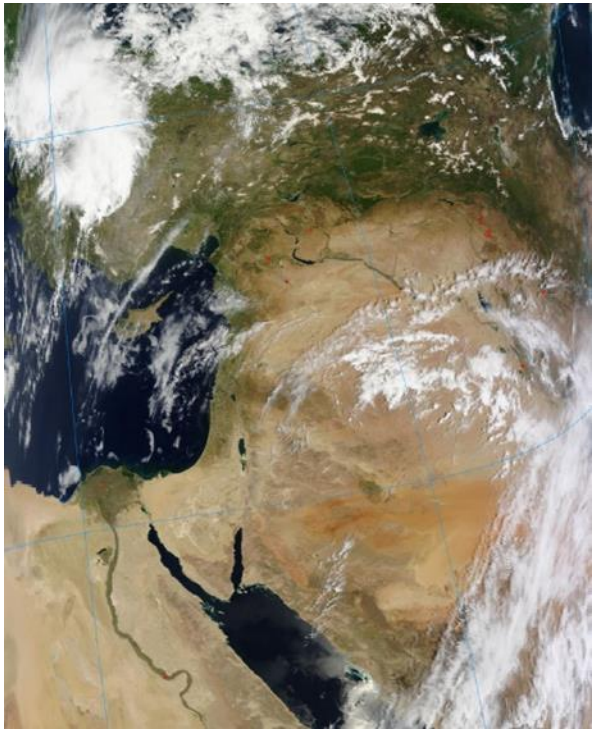


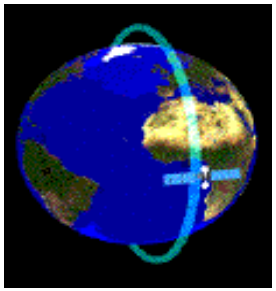
Flood in Damascus in 2008



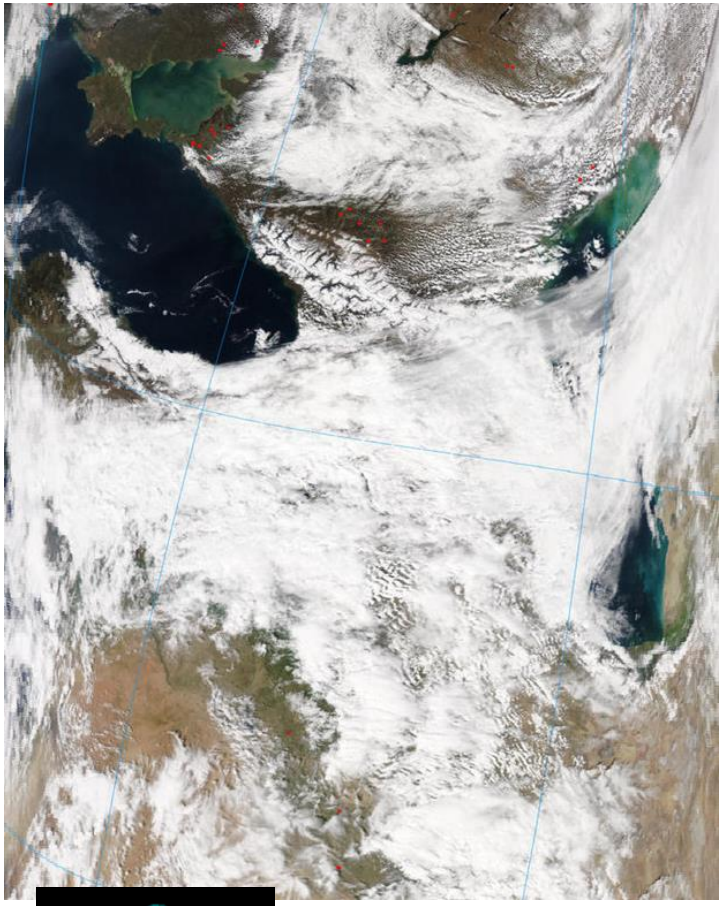


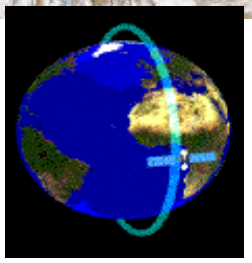
Flood by intensive rainfall in Damascus on May 8, 2015



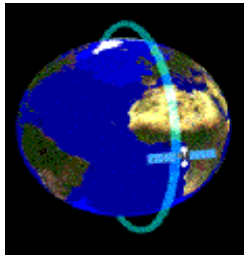


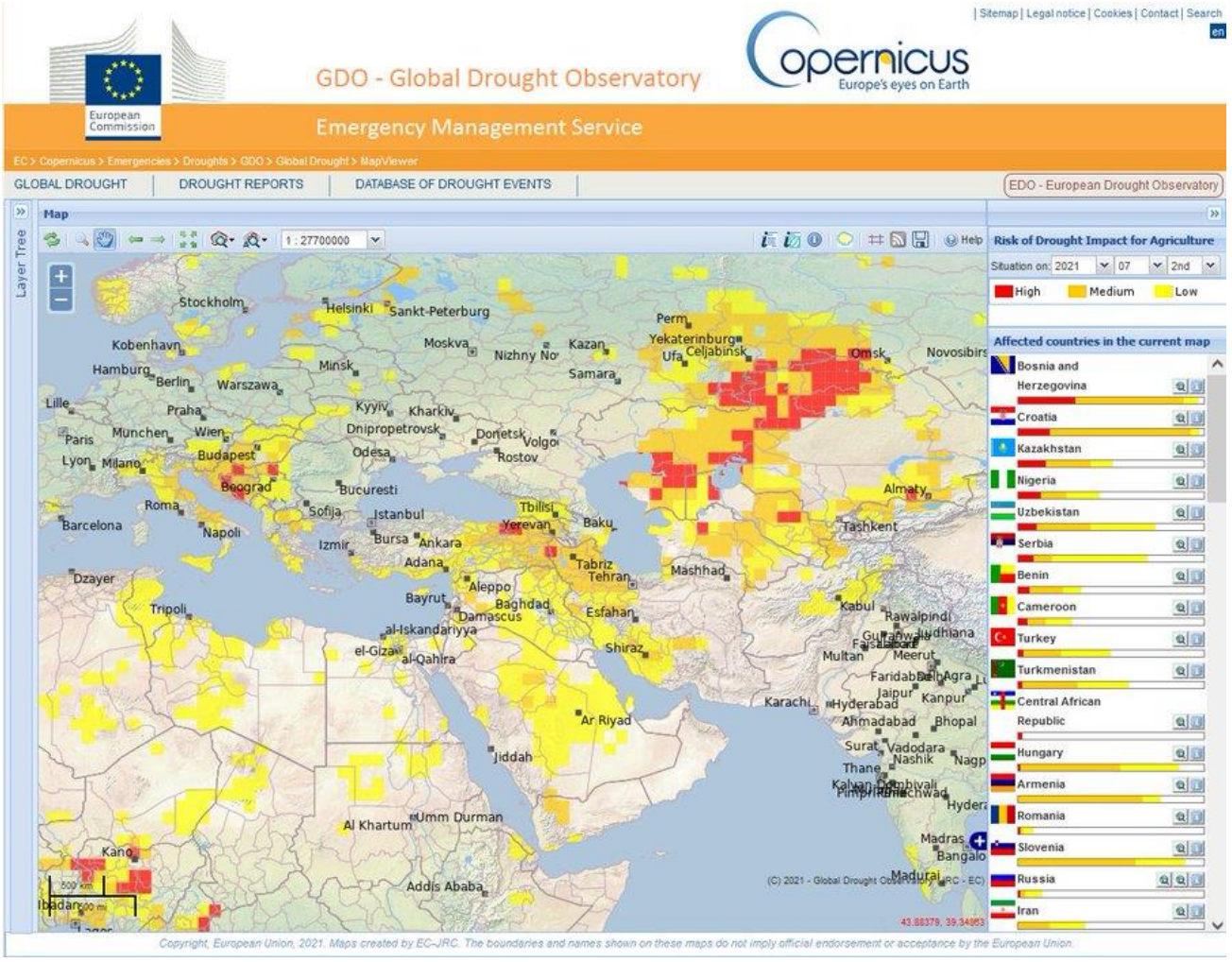
Intensive rainfall in Hasaka and Kamishly on March 30 and April 2, 2019





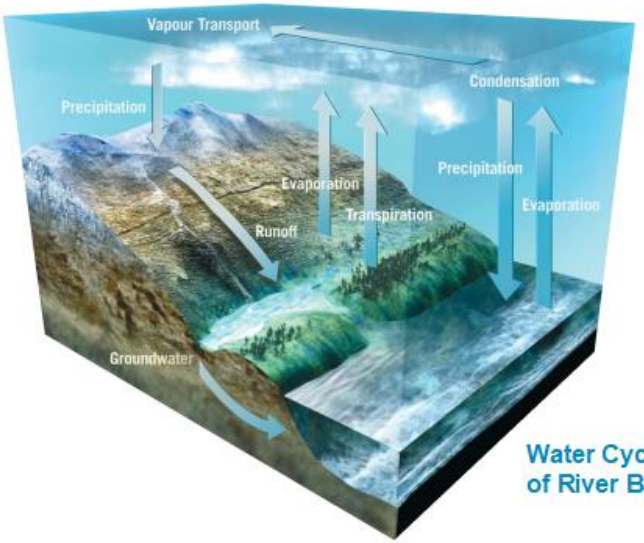
the Global Flood Awareness System (GloFAS) of the Copernicus Emergency Management Service (CEMS)



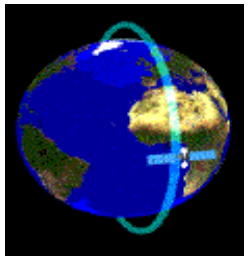


4- Water Resources Management in Syria

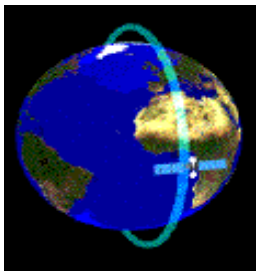
The concept of integrated water resources management (IWRM) has been around for some 60 years. It was rediscovered by some in the 1990s from the rainfall to surface water to ground water to water use to the treatment of sewage.



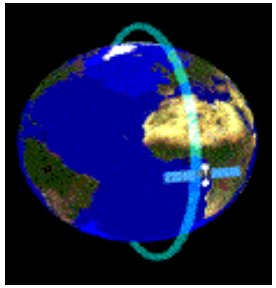
Water Cycle Modeling
of River Basins



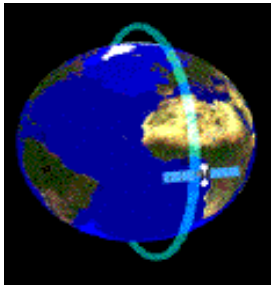
Many countries in the world complain of water problems especially our region complains of great water shortage. This problem increases greatly in result of great increasing of the population, agricultural projects and investments. That will make additional pressure on water resources. Also, the water storage had begun complaining of pollution problems



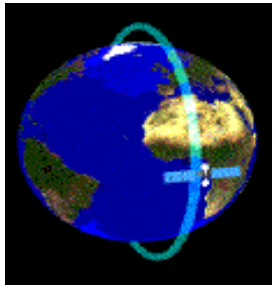
The new technologies of remote sensing, geographic information system and global positioning system had a great importance in groundwater exploration. Whereas the space images taken by Landsat TM, radar images by European Remote Sensing satellite ERS, using geographic information system GIS, global positioning system GPS and previous geological, tectonic, hydrological and hydrogeological studies of study regions contributed as ideal method in exploration of groundwater in those regions.



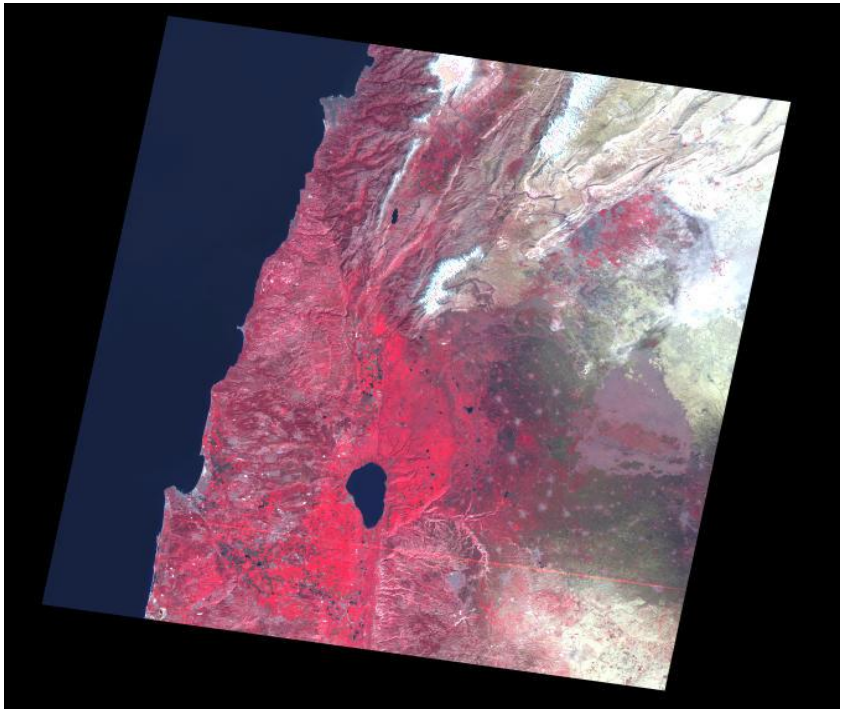
By processing , analyzing of space images, compiling thematic maps of drainage, lineaments and main faults with their intensity and crossing in addition to maps of all drilled wells with their discharge and existing springs in the study of each area, study of wet faults at the end of summer through thermal band in Landsat images, subsurface faults through radar images, cross of separated faults with their accurate coordinates by using GPS and carrying out geo-electrical sounding for perspective locations and analyzing the resulted curves and assurance of existing groundwater with their water table.

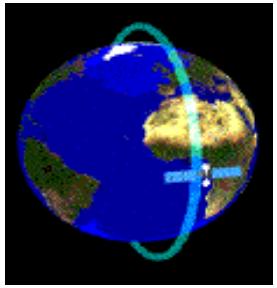


We had identified many locations in Salamyeh, Sweida, Dara,a, Lattakia, Tartous and Damascus cities by using this methodology. We had drilled many of wells in the studied perspective locations, and we had good results.

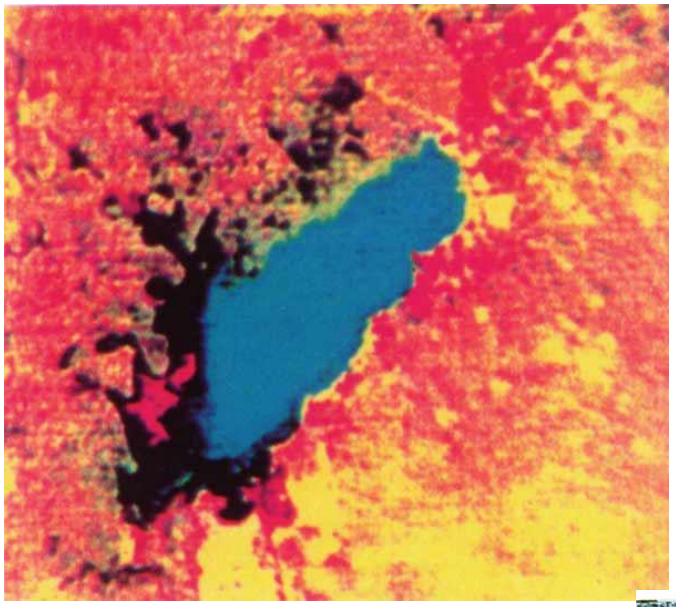


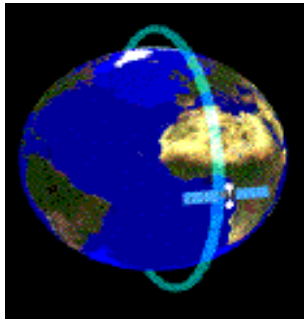
Studying the snow cover with snow pack in Syria





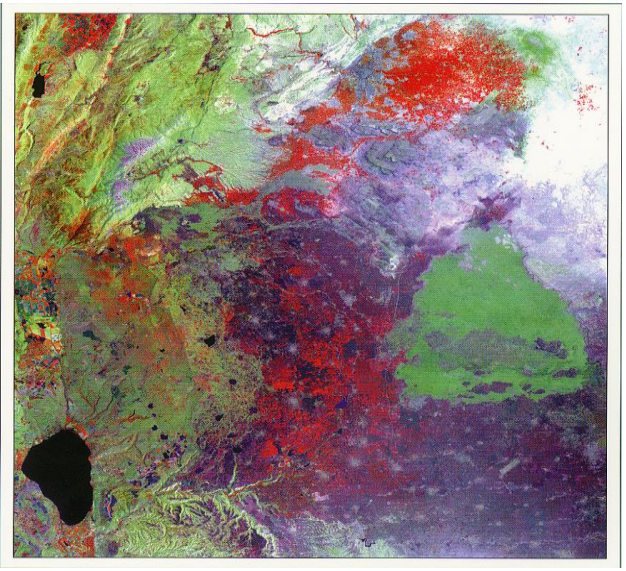
Monitoring the Syrian Lakes
1- Qateina Lake – 2- Assad Lake

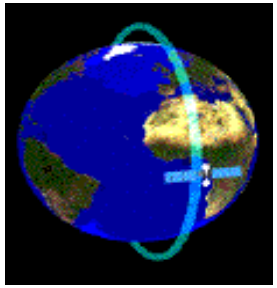


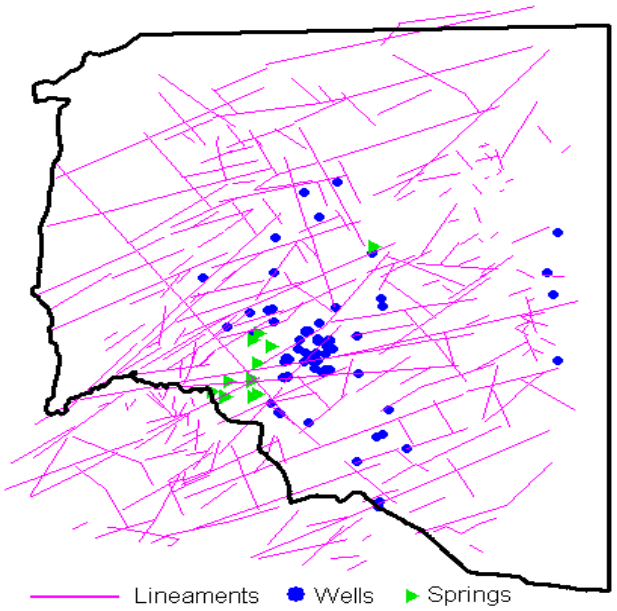


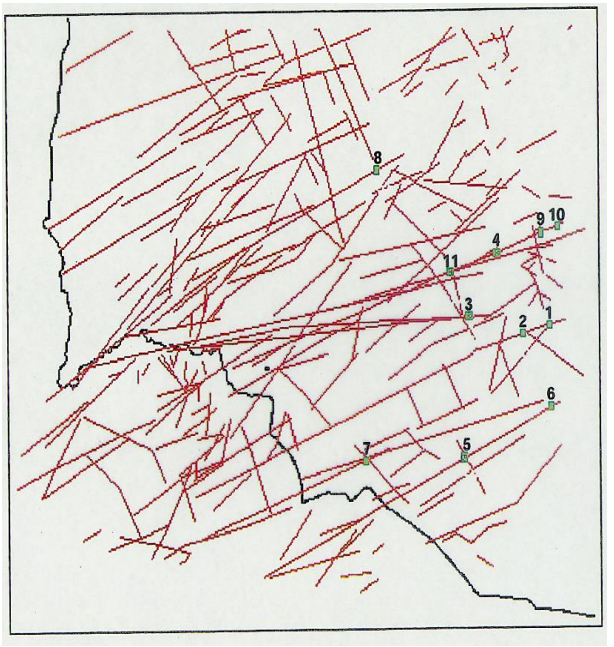
Exploration of ground water in southern part of Syria:

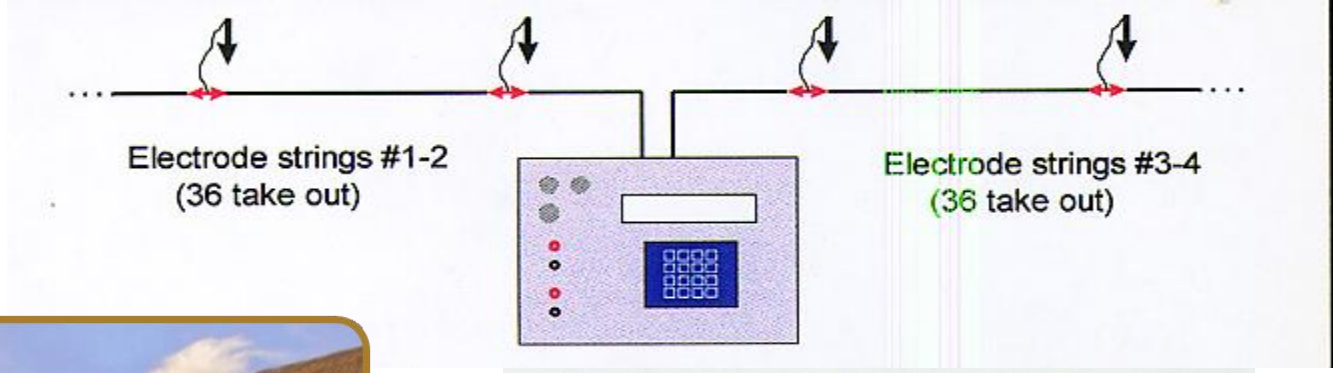
This study has been carried out in south – west part of Syria by using remote sensing techniques (Landsat and SPOT images). In Basalt Area.



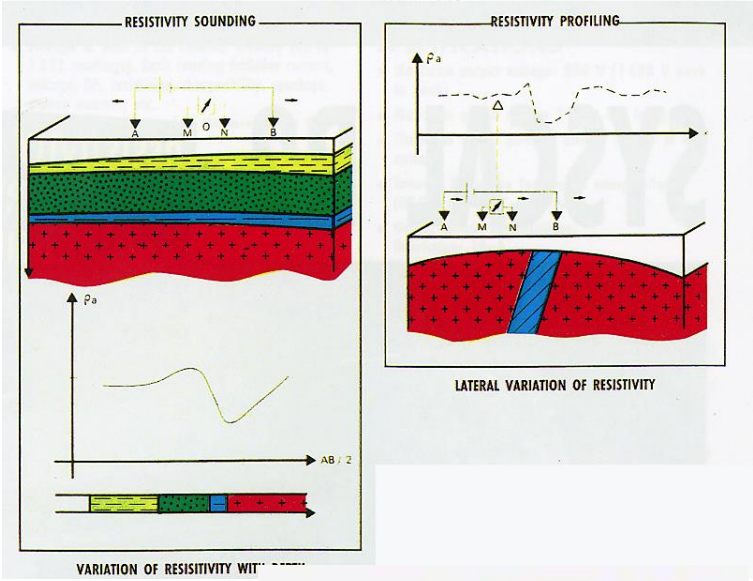


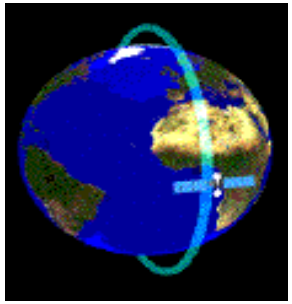





Electrode strings #1-2
(36 take out)
Electrode strings #3-4
(36 take out)

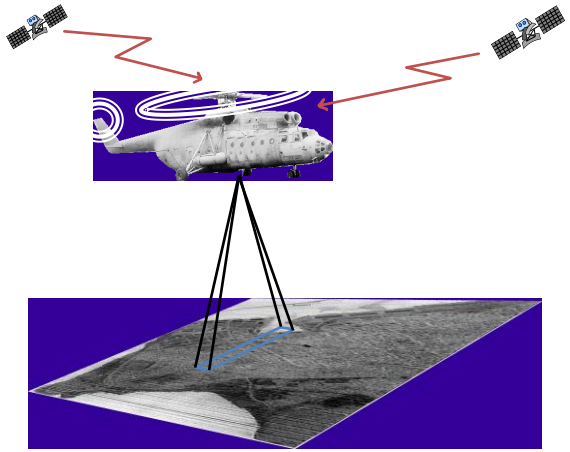

BR 500 W
BR-500W

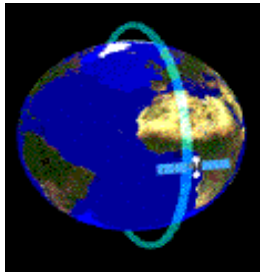

RESISTIVITY SOUNDING
A
M
O
N
B
Pa
AB / 2
RESISTIVITY PROFILING
Pa
A
M
N
B
LATERAL VARIATION OF RESISTIVITY

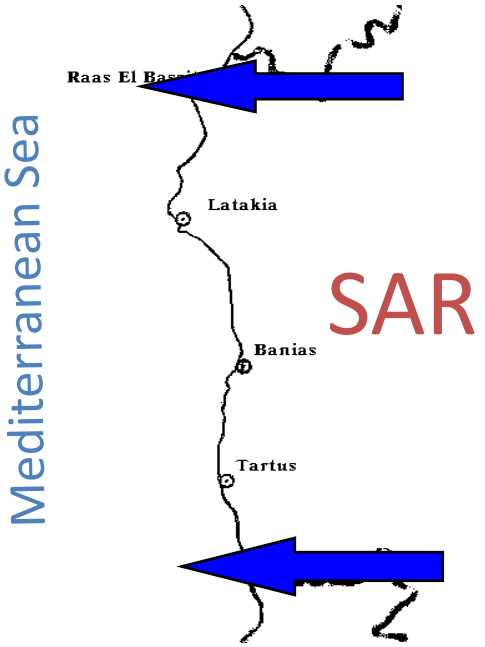


THERMAL SURVEY OF THE MEDITERRANEAN COAST OF SYRIA

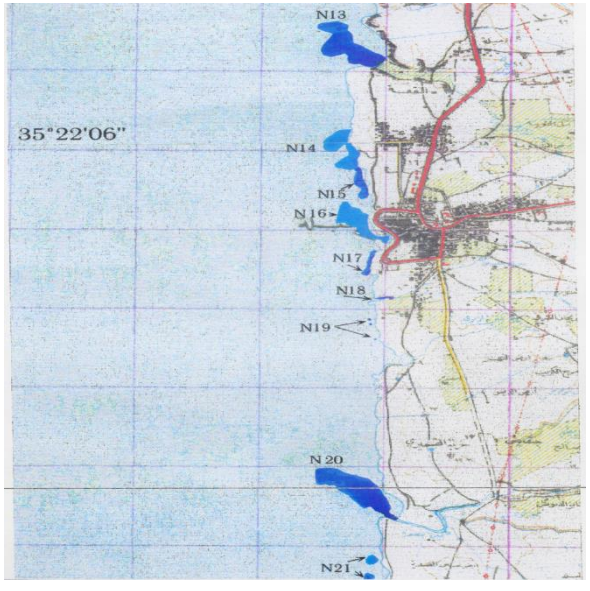
The survey was aimed to find places of the unloading of fresh water springs under sea water according to supposed temperature anomalies at the sea surface.

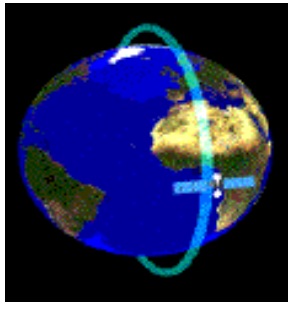




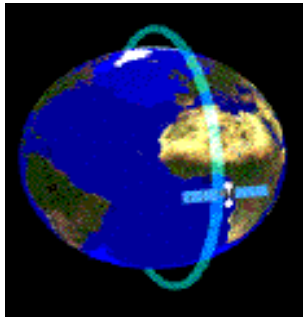


SUB-WATER SPRINGS -PART OF THE COAST MAP WITH ANOMALIES

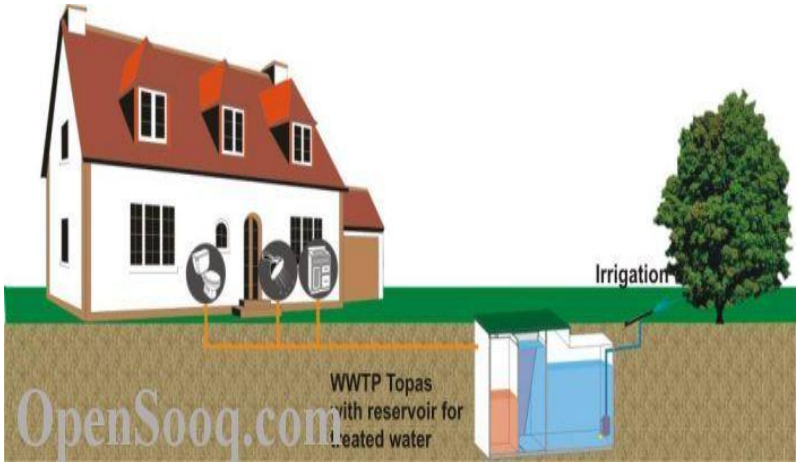


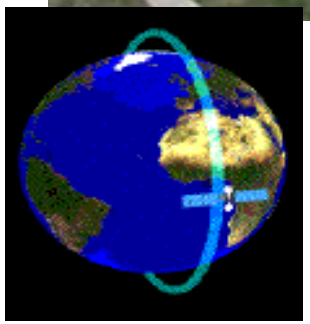


Water Harvesting in Syria



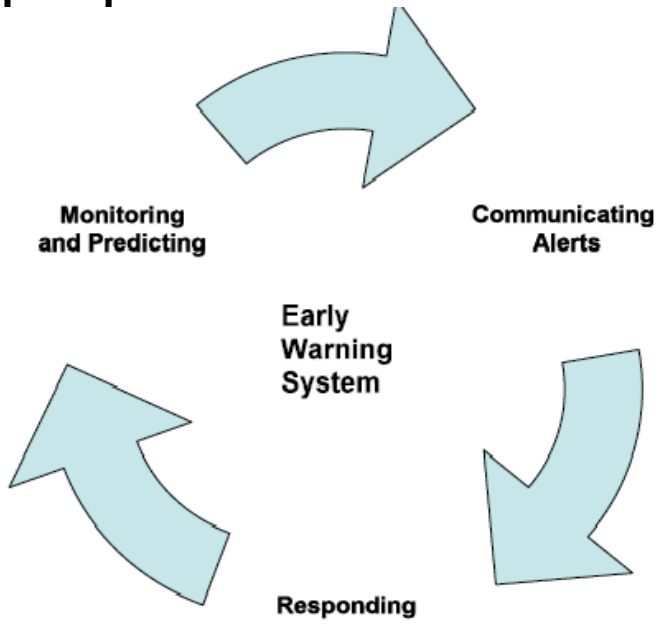
Treatment of Sewage



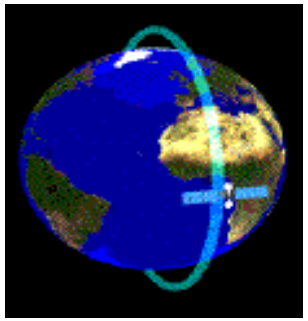


5- Early Warning Systems in Syria:

Early warning (EW) is “the provision of timely and effective information, through identified institutions, that allows individuals exposed to hazard to take action to avoid or reduce their risk and prepare for effective response.

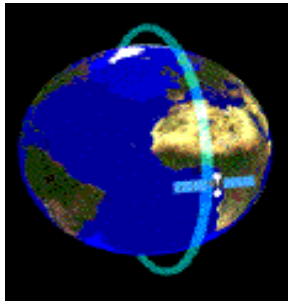


Early Warning System operational aspects.



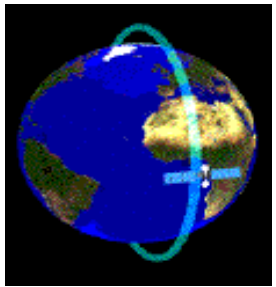
Key components of an Early Warning System

1- Earth Data Observations
2- Data and Information Collection
3- Hazard Event Detection
4- Hazard Warning System Decision Support
5- Warning and Other Products
6- Dissemination and Notification
7- Anticipated Response to the warning and potential disaster



Objectives of Early Warning

To be better prepared to face challenges of the risk of long term or sudden disasters by:
1- Avoiding and reducing damages and loss
2- Saving human lives, health , economic development and cultural heritage
3- Upgrading quality of life



National Aeronautics and Space Administration

Earth Science Data Operations

Mission Operations

Science Operations

Data Acquisition

Flight Operations, Data Capture, Initial Processing, Backup Archive

Data Transport to Data Centers/ SIPSs

Science Data Processing, Data Management, Interoperable Data Archive, and Distribution

Distribution and Data Access

EOSSpacecraft

Tracking and Data Relay Satellite (TDRS)

White Sands Complex (WSC)

EOS Data Operations System (EDOS) Data Processing

Direct Broadcast (DB)

EOS Polar Ground Stations

EOS Operations Center (EOC) Mission Control

Direct Broadcast/ Direct Readout Stations

NASA Integrated Services Network (NISN) Mission Services

EOSDIS Data Centers

Instrument Teams and Science Investigator-led Processing Systems (SIPSs)

Internet (Search, Order, Distribution)

Research

Education

Value-Added Providers

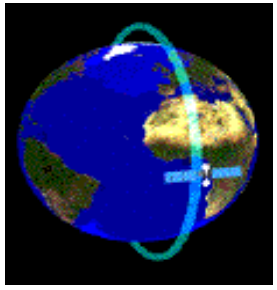
Interagency Data Centers

Earth System Models

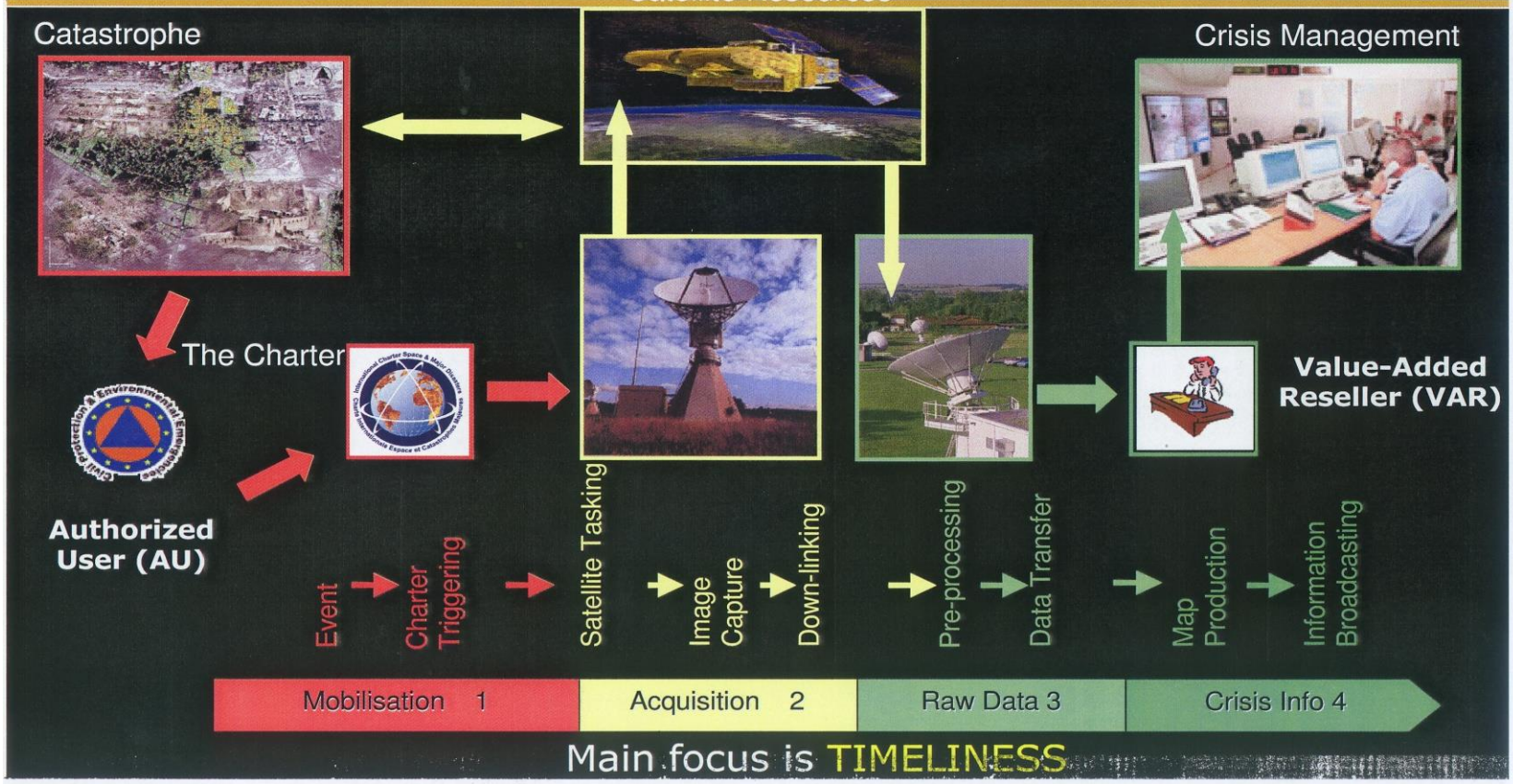
International Partners

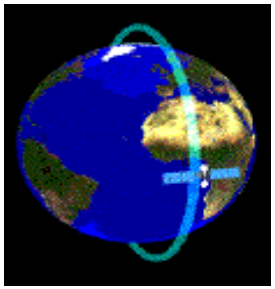
Decision Support Systems

www.nasa.gov

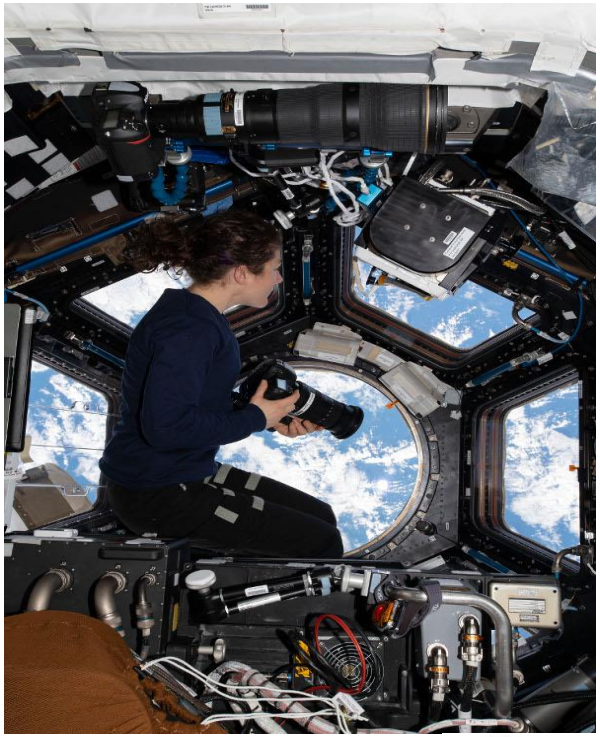


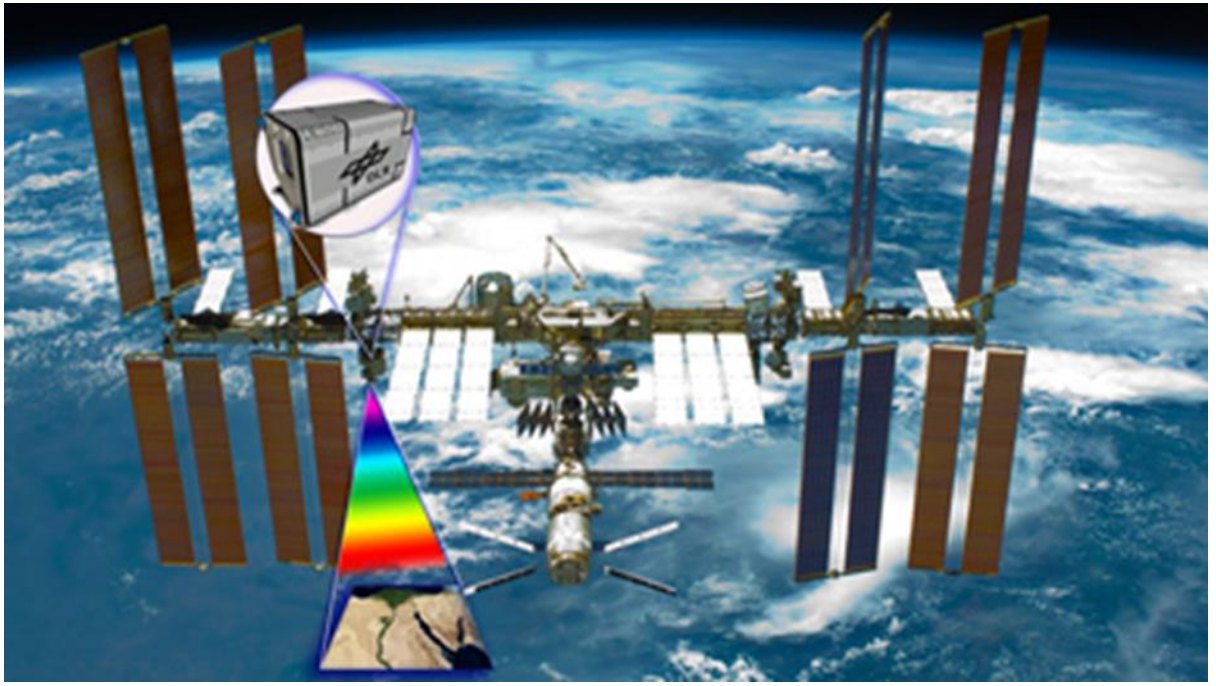
Flow-chart of a crisis mapping action

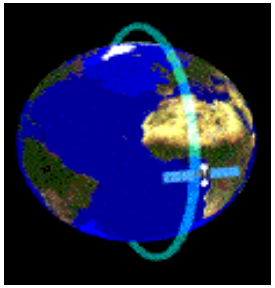




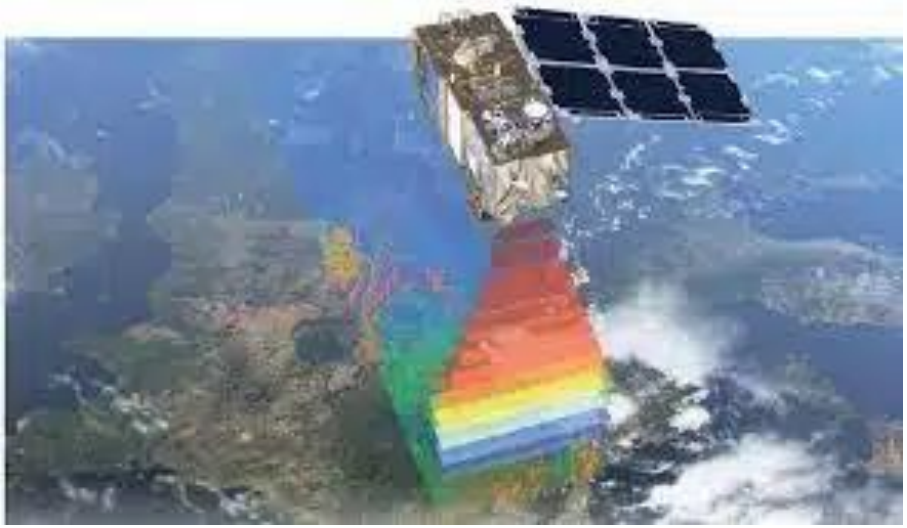
Using Remote Sensing Instruments Onboard of International Space Station (ISS) MUSES and DESIS for Early Warning Systems (SERVIR) program

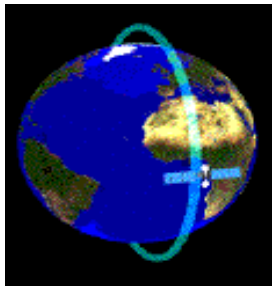




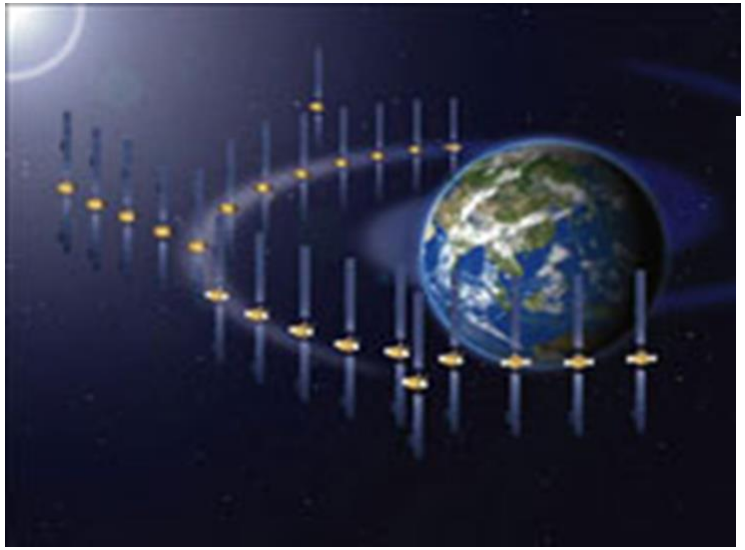


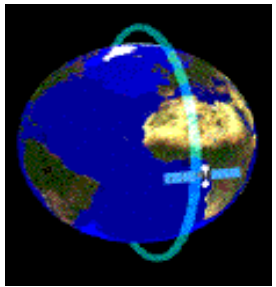
Using small satellites for Early Warning Systems





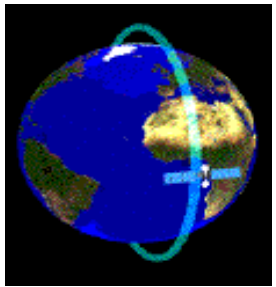
Using Communications Satellites and Global Positioning Systems (GPS) and Global Navigation Satellite Systems (GNSS) for Early Warning Systems.



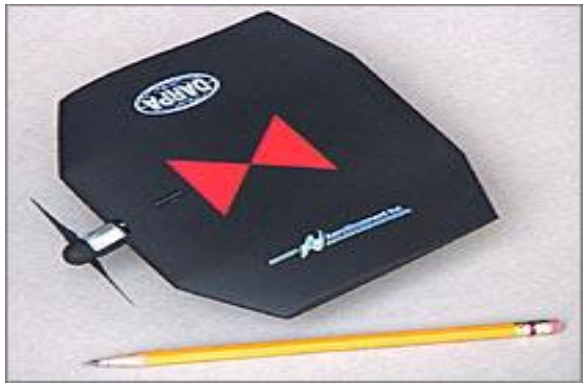


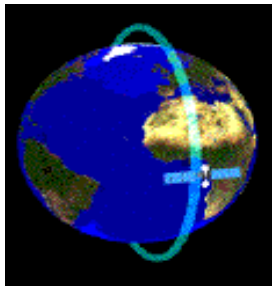

Compass
Galileo
GLONASS
GPS
Multi-GNSS Receiver


Sector 53

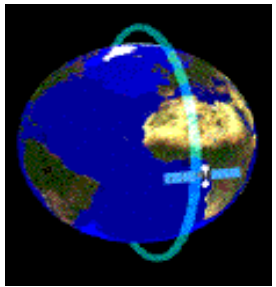


Using Unmanned Aviation Vehicles for Early Warning Systems

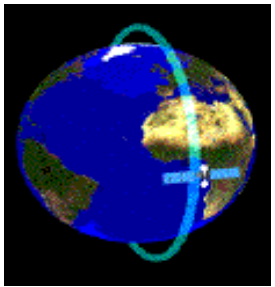




Using Balloons for Early Warning Systems



Using Robots for Prediction and Saving Lives

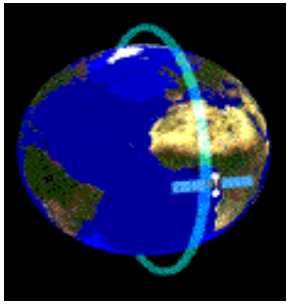


6- Recommendations:

1- Water crisis will continue to be of central concern in the region, therefore more efforts are needed to reach best possible solutions utilizing available management techniques and devising policy options to ensure water resources sustainability and responsiveness to basic human needs.

2- Establishing national center for disaster management and early warning systems.

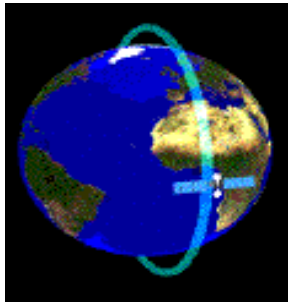
3- Integrated Water Resources Management (IWRM) should be further promoted in the region.

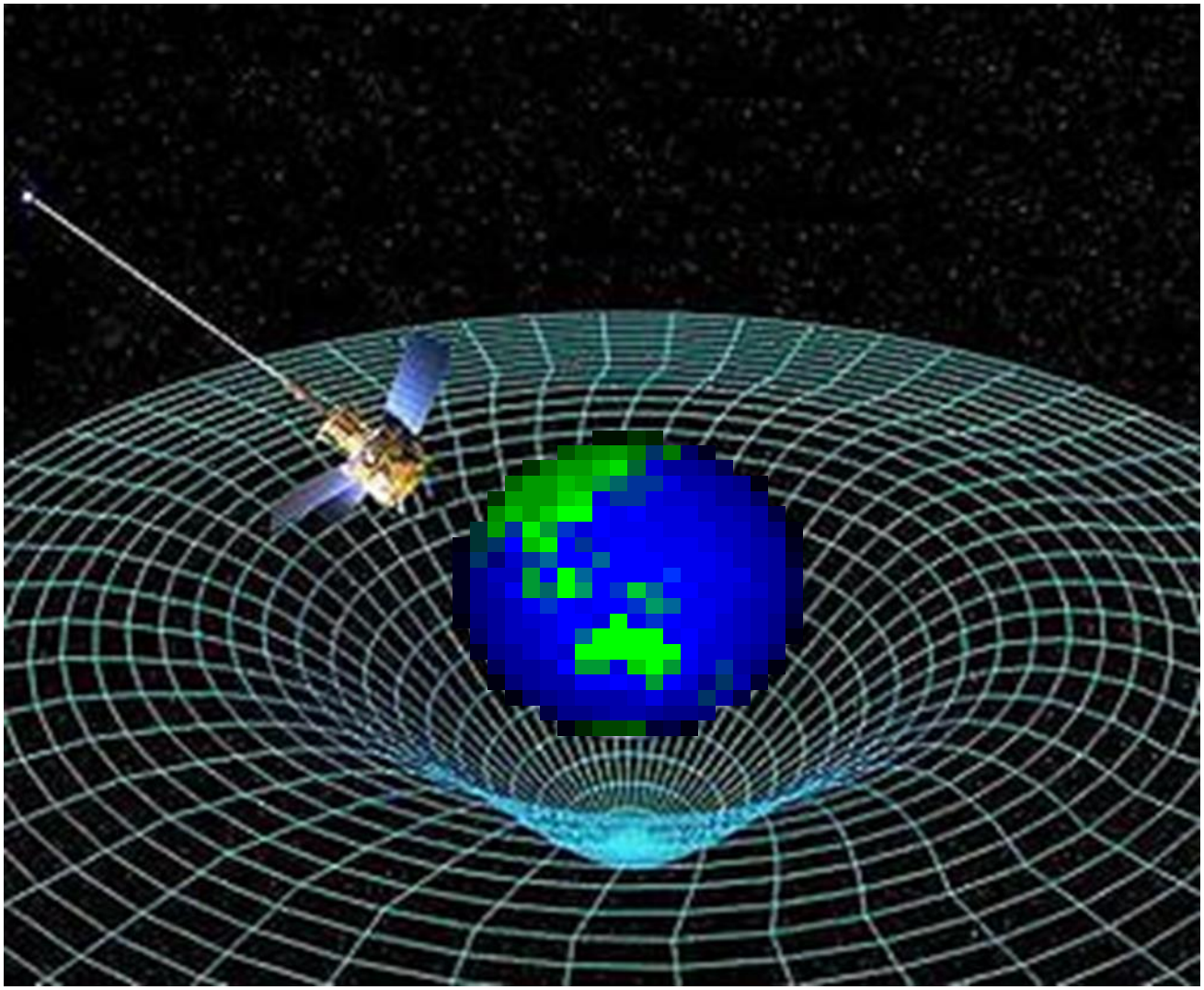


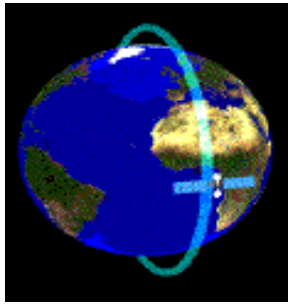
4- Public awareness on water issues, including promotion of water conservation techniques should be fostered.

5- A regional database on water resources is needed to serve as a tool for analysis monitoring and decision making.

6- Capacity building means dealing with deferent components: Education, training and transfer of knowledge research, institutions building and institutional development it is a fundamental component.







Thank you very much for your attention