IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

DAMAGE ASSESSMENT OF A RECENT SYRIA-TURKEY EARTHQUAKE OCCURRENCE USING INSAR TECHNIQUE OF MICROWAVE REMOTE SENSING

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Abstract :

The level of destruction caused by an earthquake depends on a variety of factors, such as magnitude, duration, intensity, time of occurrence, and underlying geological features, which may be mitigated and reduced by the level of preparedness of risk management measures. Geospatial technologies offer a means by which earthquake occurrence can be predicted or foreshadowed; managed in terms of levels of preparation related to land use planning; availability of emergency shelters, medical resources, and food supplies; and assessment of damage and remedial priorities. This research covers surveys the geospatial technologies employed in earthquake research and disaster management. The objectives of this research covers are to assess: (1) the role of the range of geospatial data types; (2) the application of geospatial technologies to the stages of an earthquake; (3) the geospatial techniques used in earthquake hazard, vulnerability, and risk analysis; and (4) to discuss the role of geospatial techniques in earthquakes and related disasters. The research covers past, current, and potential earthquake-related applications of geospatial technology, together with the challenges that limit the extent of usefulness and effectiveness. While the focus is mainly on geospatial technology applied to earthquake research and management in practice, it also has validity as a framework for natural disaster risk assessments, emergency management, mitigation, and remediation, in general..

***IndexTerms* - Remote sensing, earthquake, geospatial, hazard, review.**

INTRODUCTION

Hospital or health care waste is generally named & popular as biomedical waste. The world health organization defines biomedical An earthquake is the ground shaking caused by the sudden energy release in the earth's crust or upper mantle of the Earth. Earthquakes can differ in length from those that are so small that they are barely felt to those that are so powerful that into the air, wreaking havoc on entire cities. The seismicity, or seismic activity, of an area, is the frequency, type and size of earthquakes experienced over a period of time. Seismometer measurements are used to measure earthquakes. For the whole globe, the moment magnitude is by far the most prevalent scale about which earthquakes bigger than roughly magnitude five registered. Earthquakes create seismic waves, which are vibrations that travel through the Earth's interior or along its surface. There are two types of seismic waves: body waves and surface waves. Body waves travel through the interior of the Earth, while surface waves travel along the Earth's surface. P-waves (primary) and S- waves (secondary) are the two types of body waves. Surface waves include Rayleigh waves. Earthquakes occur anywhere in the earth where there is sufficient stored elastic strain energy to drive fracture propagation along a fault plane. The sides of a fault move past each other smoothly and a seismically only if there are no irregularities or asperities along the fault surface that increases the frictional resistance. Most fault surfaces do have such asperities, which leads to a form of stick-slip behavior. Once the fault has locked, continued relative motion between the plates leads to increasing stress and, therefore, stored strain energy in the volume around the fault surface. This continues until the stress has risen sufficiently to break through the asperity, suddenly allowing sliding over the locked portion of the fault, releasing the stored energy

NEED OF THE STUDY.

The Earth's crust consists of seven large lithospheric plates and numerous smaller plates. These plates move towards each other (a convergent boundary), apart (a divergent boundary) or past each other (a transform boundary).Earthquakes are caused by a sudden release of stress along faults in the earth's crust. The continuous motion of tectonic plates causes a steady build-up of pressure in the rock strata on both sides of a fault until the stress is sufficiently great that it is released in a sudden, jerky movement. The resulting waves of seismic energy propagate through the ground and over its surface, causing the shaking we perceive as earthquakes

3.1Classification of earthquakes

KSE-100 index is an index of 100 companies selected from 580 companies on the basis of sector leading and market The Earth's crust consists of seven large lithospheric plates and numerous smaller plates. These plates move towards each other (a convergent boundary), apart (a divergent boundary) or past each other (a transform boundary). There are four different types of earthquakes. Tectonic earthquakes Volcanic earthquakes Collapse earthquakes Explosion earthquakes

3.2 Impact of earthquakes

Among natural hazards, geophysical hazards are one of the most common as well as one of the most life-endangering ones. When referring to geophysical hazards earthquakes, (dry) mass movements, and volcanic activity normally come to mind describing "an unforeseen and often sudden event that causes great damage, destruction and human suffering". There are, therefore, natural hazards that lead to natural disasters leading to vulnerabilities, which usually include urban development in risk-prone locations, population growth, environmental degradation, land use changes, weak governance, climate change as well as poverty, and inequality Earthquakes can result in the ground shaking, soil liquefaction, landslides, fissures, avalanches, fires and tsunamis. The extent of destruction and harm caused by an earthquake depends on: magnitude. intensity and duration.

3.3 Data collection

Data collection and analysis on the turkey earthquake would involve gathering and analyzing relevant data and information on the event

RESEARCH METHODOLOGY

In this project, we have used InSAR and microwave remote sensing to predict earthquakes. The methodology involved the following steps:

1.Acquiring InSAR data: We have obtained InSAR data from two different radar images taken at different times. These images were acquired from the European Space Agency's Sentinel-1 satellite.

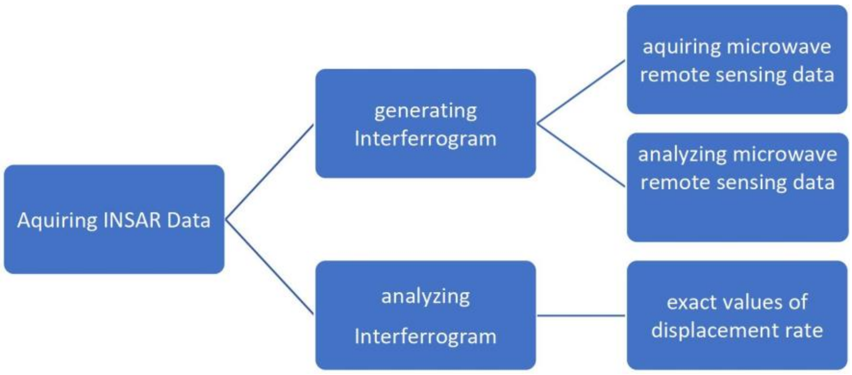
2.Generating interferograms: We have used the InSAR data to generate interferograms using the StaMPS software. The interferograms show the displacement of the ground surface between the two radar images.

3.Analyzing interferograms: We have analyzed the interferograms to identify areas of ground deformation that may indicate the occurrence of an earthquake. We have used the Small Baseline Subset (SBAS) technique to filter out noise and improve the accuracy of the results.

4.Acquiring microwave remote sensing data: We have obtained microwave remote sensing data from the Advanced Land Observing Satellite (ALOS-2) PALSAR-2 sensor. This data provides information about the dielectric properties of the subsurface materials.

5.Analyzing microwave remote sensing data: We have analyzed the microwave remote sensing data to identify areas of geological faults and fractures that may be associated with earthquakes. We have used the Radarsat Antarctic Mapping Project (RAMP) algorithm to process the data.

Flow chart for methodology



3.2 Data and Sources of Data

Remote sensing and microwave is a group of imaging techniques that provides geospatial information about area, generally from a spaceborne or airborne platform. The remote sensing techniques that are most applicable to earthquake science/ engineering are optional satellite imagery synthetic aperture radar (SAR)

3.3 Theoretical framework

Variables of the study contains dependent and independent variable. The study used pre-specified method for the selection spatial resolution of SAR is already impressively good due to chirped pulses and aperture synthesis. The value of interferometry for SAR is, in the first instance, to resolve the ambiguity of direction that results in topo

This side-looking geometry is required for radar imaging so that time delay is approximately equivalent to distance along some reference surface. However, if the topography is variable, then the time delay is not equivalent to distance along the reference surface and the resulting image exhibits the topographic distortions of foreshortening and layover. This was attributed to the fact that the radar could not differentiate signals that arrive back after similar echo delay times but from different look directions. If we can determine the difference in angle between these two echoes, then we would be able to account for the distortion due to topography and in so doing determine the nature of that topography. For SAR, the interferometric approach requires taking two measurements displaced in the across-track direction.

The interferogram is the first step in interferometry. Ultimately, however, what is of interest is to convert the phase differences into a look angle and thereafter a measure of height above a reference surface. As before our reference surface can be an average terrain height, or a standard terrestrial reference surface (a datum). The latter would mean the final products would be in a standard geographical coordinate system

3.4 Differential SAR Interferometry

SAR interferometry is principally used for determining geometrical heights (topographic or vegetation canopy) as described in the previous sections. However, there is a very exciting extension to InSAR called differential interferometry, or DifSAR, which has now become common place in the field of geophysics, vulcanology and glaciology for the measurement of small ground and ice movements. spatial resolution of SAR is already impressively good due to chirped pulses and aperture synthesis. The value of interferometry for SAR is, in the first instance, to resolve the ambiguity of direction that results in topo

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The latter would mean the final products would be in a standard geographical coordinate system. However, a small (less than 10 wavelengths or so) systematic movement of the surface between the two image acquisitions has a completely different effect. "Systematic" implies that the relative positions of the surface scattering elements within a pixel remain constant, but that the absolute range distance to that surface area from the instrument is changed. This small change in range will result in a phase difference between the before and after images. It can be noted that the same geometry arises if we move the sensor by a small distance rather than the ground surface.

The important dimension in DifSAR is the component of the motion in the slant range direction, not the absolute surface motion. The resulting range displacement, DR, is therefore given by

3.4.1 environmental impact assessment

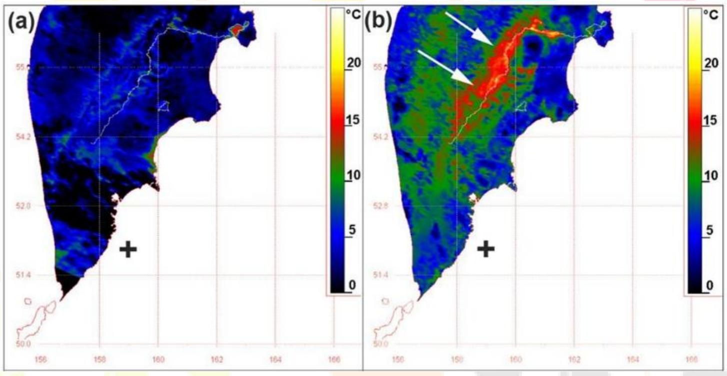
A second example of ground deformation comes in the form of environmental impact assessment. Throughout the 20th century there have been significant changes in ground water (including sea level rise), subterranean mining activities and urban construction (including underground transportation). Such changes can impact on urban areas in the form of subsidence, the slow sinking of land. Since this movement is of most relevance in urban areas, and the movements is on the scale of centimeters over a

few years, InSAR is ideally suited to map such changes. Urban areas are good targets for short to medium-term InSAR as they provide bright backscatter returns and do not change significantly over time, so they remain coherent over many months to years.
The other discipline where small movements of the surface are of interest is glaciology. The slow creep of glaciers down a valley or the progression of an ice- sheet can be mapped with great precision using InSAR, thus aiding the modellers in their understanding of ice flow. Ground-based survey techniques and GPS provide some ground control, but are unable to offer the frequent and wide coverage available from spaceborne SAR systems.

3.4.2 SAR polarimetry and polarization descriptors

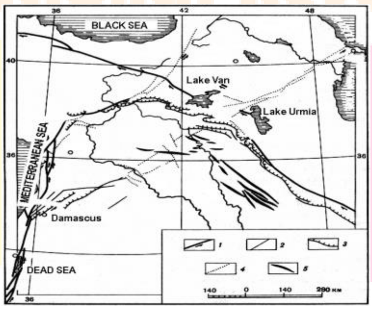
SAR is an active microwave remote sensing technique dedicated to acquire the large-scaled 2D coherent image of the earth's surface reflectivity It transmits microwave pulses and receives the backscattering from the illuminated terrain to synthesize a high spatial resolution image. Such an active operation enables SAR an all-day working capacity independent of solar illumination. In addition, operating in the microwave region of electromagnetic spectrum avoids the effects of rain and clouds, which allows SAR an almost all- weather continuous monitoring of the earth surface. Polarization characterizes the vector state of the electromagnetic wave. The polarization state of wave will change when interacting with a ground object. By processing and analyzing such change of polarization, we can obtain the material, roughness, shape, and orientation information regarding the object. The core of this change is the (Sinclair) scattering matrix ½ S of the object, which transforms the incident electric filed EI into the scattered electric filed ES There are various InSAR software packages available for processing and analyzing Interferometric Synthetic Aperture Radar (InSAR) data.

3.4.2.1 Thermal anomaly

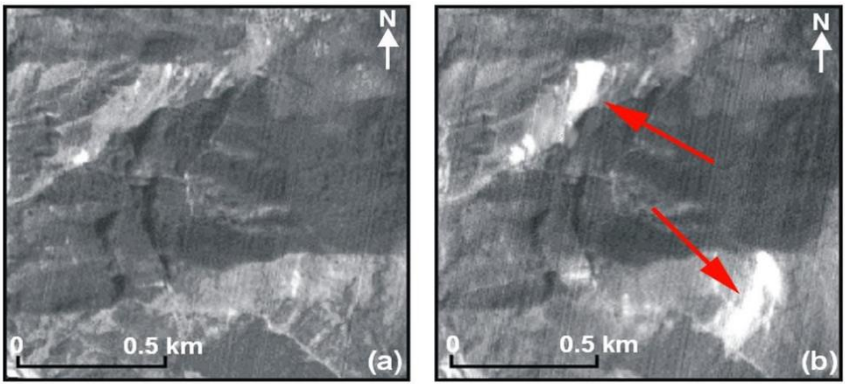


3.4.2.2 Deformations

The first application of satellite images in seismology was related to structural geology and geomorphology. Active faults and neotectonics were the research aims Epicenter zones of recent earthquakes were studied on the space images. Image interpretation depended on visual methods. The interpreter selected faults with sharp borders, shift of river valleys, etc. One example of such an application is

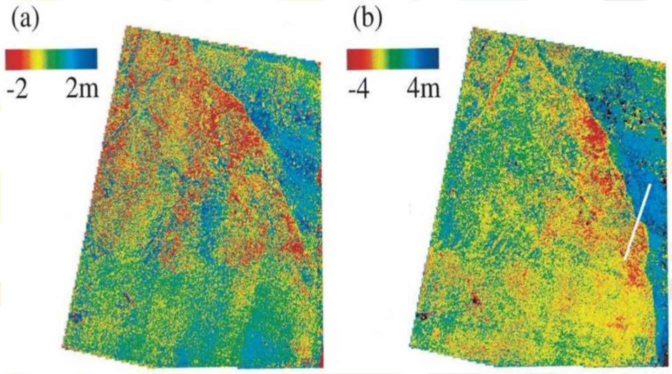


3.4.3 SUFRACE DEFORMATIONS MAP



Lineament analysis has become the new step in the application of optical data sensors in seismology. Time series of alignment distributions on the Earth's surface are investigated before and after an earthquake. Significant changes in alignment distributions (density, direction) were recorded before an earthquake

3.4.3.1 Horizontal ground displacement



3.4.3.2 Observed co-seismic interferogram

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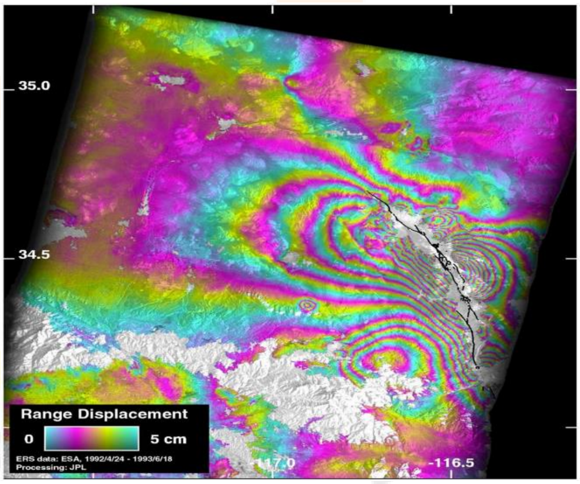
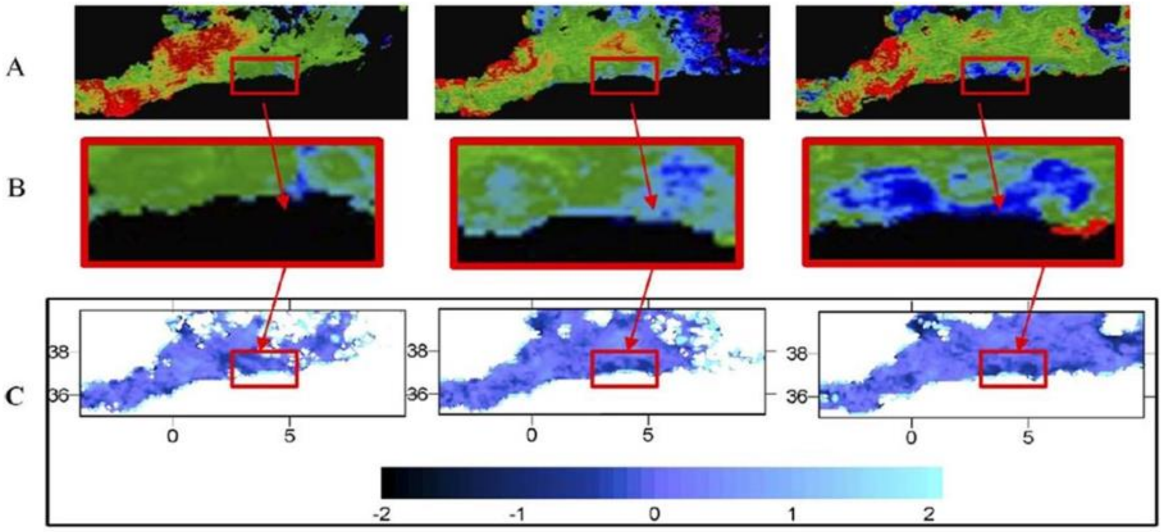


IV. RESULTS AND DISCUSSION

4.1 The calculations from INSAR data of turkey and Syria death toll from earthquakes in has surpassed 50,000 people—including 45,968 confirmed deaths in Turkey and 7,259 in Syria.



THESE METHODS WHERE USED TO FIND THE DAMAGE RATIO USING INSAR TECHNIQUE AND REMOTE SENSING SOME ARE PROVEN IN ABOVE MENTIONED IMAGES

(A) THESE IMAGES REFERS TO NORMAL LANDS WHICH IS BEFORE EARTHQUAKE

(B) THIS IMAGE REFERS BEGINNING OF EARTHQUAKE

(C) THIS IMAGE REFERS THAT EARTHQUAKE FULLY STARTED AND EXPANDS

SOME NUMERICAL CO-ORDINATES WHERE USED FOR MENTIONING THE SEISMOGRAPHIC VALUE ACCURATELY AS -2,-1,0,1,2. -2 REFERS TO VERY LOW LEVEL -1 REFERS TO EARLY STAGE OF EARTHQUAKE 0 REFERS TO NO VALUES 1 REFERS TO START AGE OF EARTHQUAKE 2 REFERS HIGHEST SEISMOGRAPHIC VALUE OF EARTHQUAKE AND THIS THE FINAL RESULT AND DISCUSSION OF THIS PROJECT

REFERENCES

1. Radiation of the earth as an indicator of seismic activity. Doklady Akademii Nauk SSSR 1988, 301, 67–69. [Google Scholar]

2. Tronin, A. Satellite thermal survey—A new tool for the study of seismoactive regions. Int. J. Remote Sens. 1996, 17, 1439–1455. [Google Scholar] [CrossRef]

3.Genzano, N.; Aliano, C.; Corrado, R.; Filizzola, C.; Lisi, M.; Mazzeo, G.; Paciello, R.; Pergola, N.; Tramutoli, V. RST analysis of MSG-SEVIRI TIR Gornyi, V.I.; Sal'Man, A.G.; Tronin, A.A.; Shilin, B.V. Outgoing infrared radiances at the time of the Abruzzo 6 April 2009 earthquake. Nat. Hazards Earth Syst. Sci. 2009, 9, 2073–2084. [Google Scholar] [CrossRef]

4. Jing, F.; Singh, R.P.; Sun, K.; Shen, X. Passive microwave response associated with two main earthquakes in Tibetan Plateau, China. Adv. Space Res. 2018, 62, 1675–1689. (Google Scholar] [CrossRef)

5. Ding, Y.; Mao, W. Microwave Brightness Temperature Anomalies Associated with the 2015 Mw 7.8 Gorkha and Mw 7.3 Dolakha Earthquakes in Nepal. IEEE Trans. Geosci. Remote Sens. 2020, 60, 4500611. [Google Scholar] [CrossRef]

6. Bhardwaj, A.; Singh, S.; Sam, L.; Bhardwaj, A.; Martín-Torres, F.J.; Singh, A.; Kumar, R. MODIS-based estimates of strong snow surface temperature anomaly related to high altitude earthquakes of 2015. Remote Sens. Environ. 2017, 188, 1–8. [Google Scholar] [CrossRef]

7. Qin, K. De Santis, A.; Cianchini, G. Preliminary analysis of surface temperature anomalies that preceded the two major Emilia 2012 earthquakes (Italy). Ann. Geophys. 2012, 55, 823–828. [Google Scholar] [CrossRef]

8. Tronin, A.A.; Hayakawa, M.; Molchanov, O.A. Thermal IR satellite data application for earthquake research in Japan and China. J. Geodyn. 2002, 33, 519–534. [Google Scholar] [CrossRef]