Chapter 5: "Selected Applications"
Part 1 out of 2

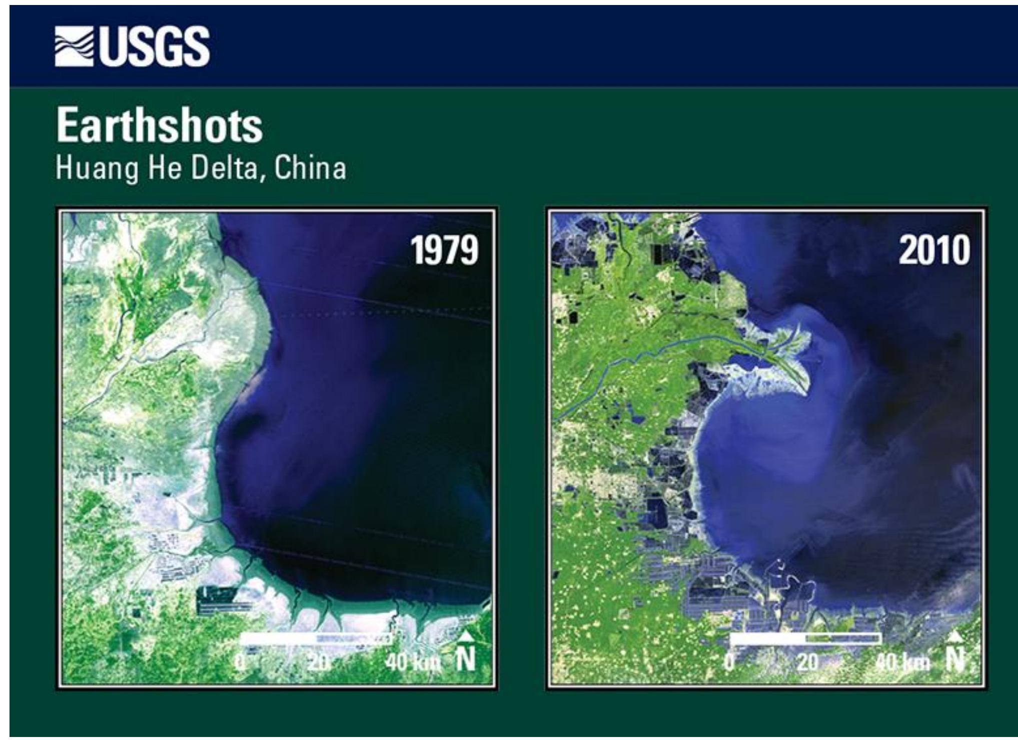
Remote Sensing & Image Interpretation have been widely used in national defense, agriculture, forestry, mining industry, mapping & surveying, urban construction, disaster prevention & ecotype, etc.

This chapter is intended to develop an understanding of the use of the image interpretation technology, in some selected applications.

Chapter 5: "Selected Applications"
Water Resource Applications

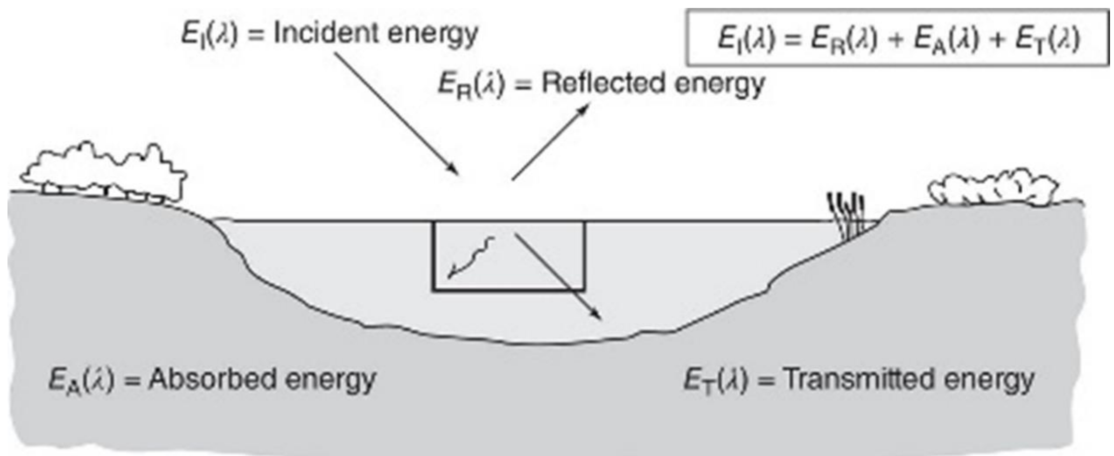
Water Resource Applications:

Image interpretation can be used in a variety of ways to help monitor the quality, quantity & geographic distribution of water.



Chapter 5: "Selected Applications"
Water Resource Applications

How sunlight interacts with clear water bodies?



Most of the sunlight that enters a clear water body is absorbed within about two meters of the surface. The degree of absorption is highly dependent on the wavelength. The best light penetration is achieved between the wavelengths of 0.48 & 0.60 μm.

Chapter 5: "Selected Applications"

Water Resource Applications

How sunlight interacts with clear water bodies? (continue)

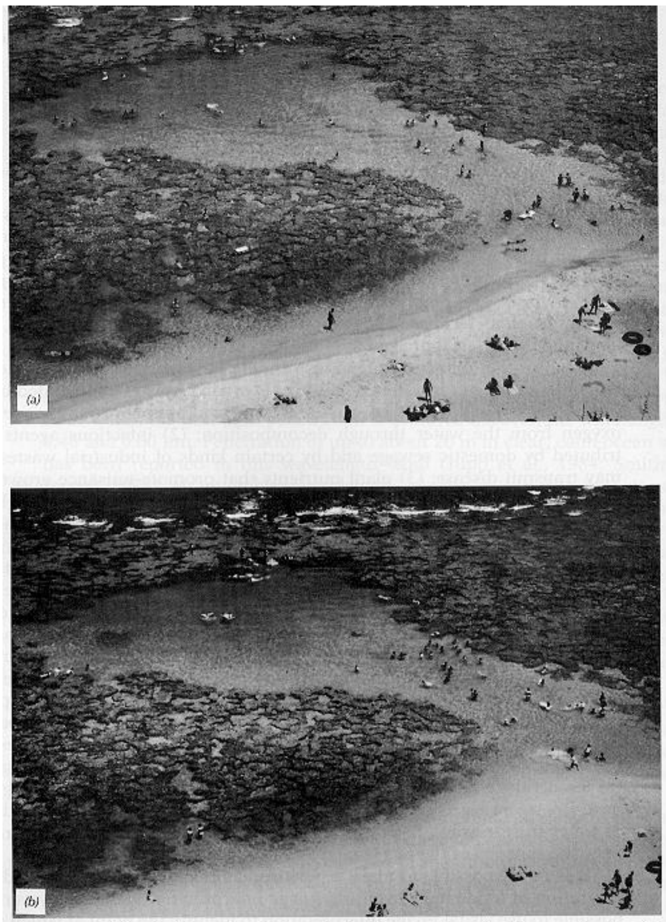


Figure 4.20 Black and white copies of color and color infrared photographs, Hanauma Bay, Island of Oahu, Hawaii: (*a*) normal color film (0.40 to 0.70 μm); (*b*) color infrared film with a Wratten No. 15 filter (0.50 to 0.90 μm); (*c*) color infrared film with a Wratten No. 29 filter (0.60 to 0.90 μm); (*d*) color infrared film with a Wratten No. 87 filter (0.74 to 0.90 μm).

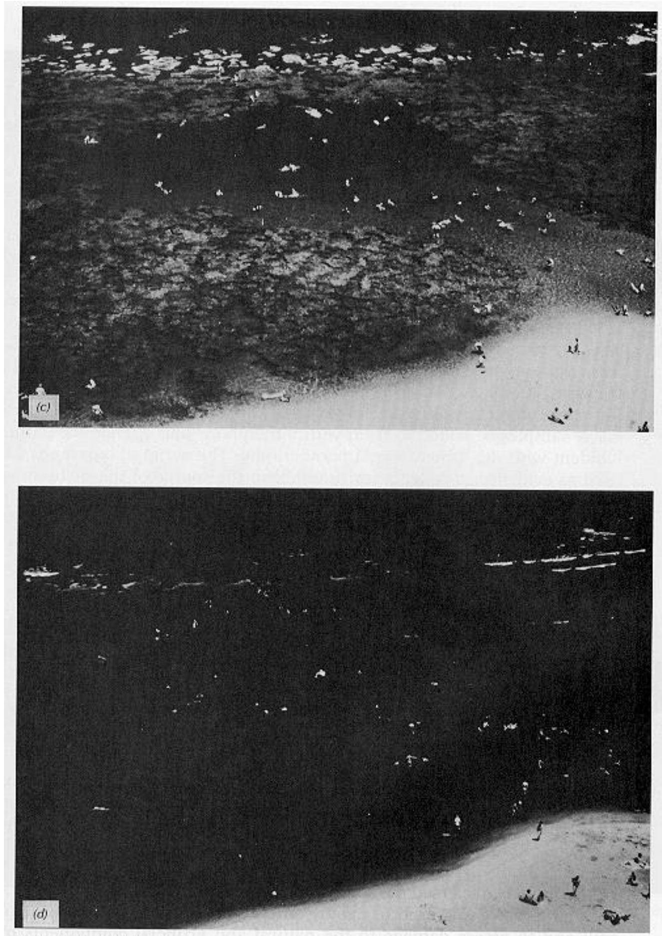


Figure 4.20 *(Continued)*

Chapter 5: “Selected Applications”
Water Resource Applications

Groundwater Locating:

Knowledge of groundwater location is important for both water supply & pollution control analysis.

The identification of topographic & vegetation indicators of ground water & the determination of location of groundwater discharge areas, (i.e., springs & seeps), can assist great deal in the location of the potential well sites, dams & reservoirs.

Estimating of groundwater supplies can also be made, indirectly, based on the interpretation of vegetation & crop types, & irrigation methods.

Chapter 5: "Selected Applications"
Water Resource Applications

Groundwater Locating: (continue)

It is also important to be able to identify ground water recharging zones in order to protect them from activities that would pollute the groundwater supply.

The occurrence & movement of groundwater is controlled by many factors such as rock types, landforms, geological structures, soil, land use, rainfall etc.

Studies have shown that if Remote Sensing data are first used to delineate prospective zones & further followed up by hydro-geological & geophysical surveys, higher success could be achieved besides saving time, cost, & effort.

Chapter 5: “Selected Applications”
Water Resource Applications

Flood Damage Estimation:

Remote Sensing technology along with Geospatial Information System (GIS) has become the key tool for flood monitoring in recent years.

The central focus in this field revolves around delineation of flood zones & preparation of flood hazard maps for the vulnerable areas.

Digital elevation model (DEM) is considered to be the most effective means to estimate flood depth from remotely sensed or hydrological data.

Chapter 5: "Selected Applications"
Water Resource Applications

Flood Damage Estimation: (continue)

Because disasters & emergencies often have fast changing, broad impact on a large spatial extent, decision-makers require the rapid re-characterizing of the area using Remote Sensing techniques.

Image interpretation techniques help document the need for disaster relief & can be utilized by insurance agencies to assist in assessing the value of property losses.

Flood damage assessment across large areas can be facilitated by the use of satellite images; however, exact information has to be estimated by large-scale photographs.

Chapter 5: "Selected Applications"
Water Resource Applications

Flood Damage Estimation: (continue)

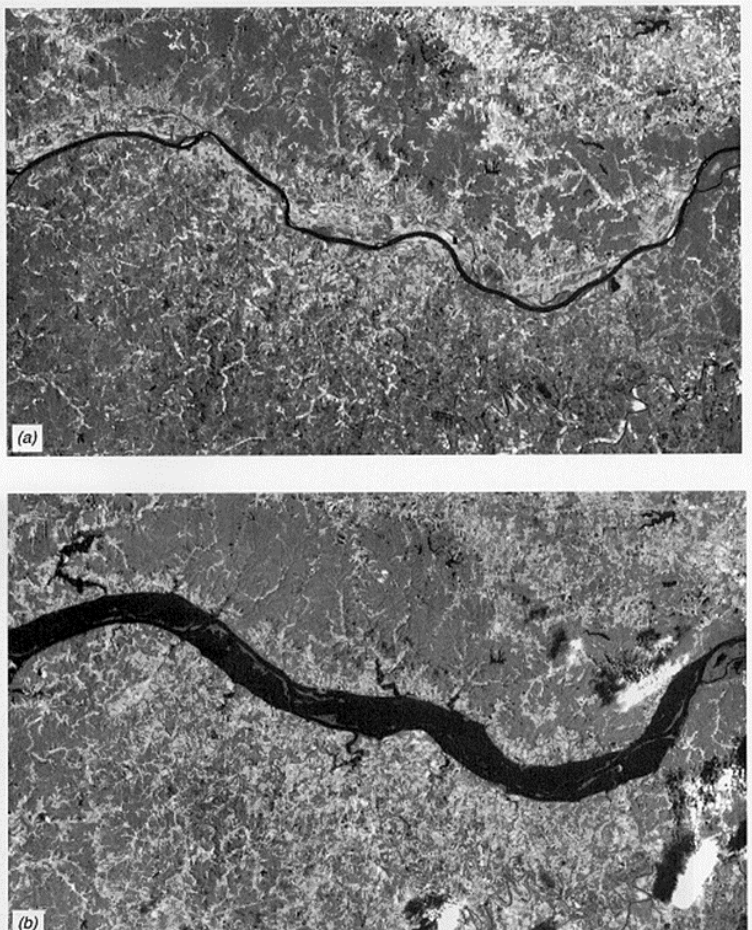


Figure 4.25 Satellite images (composite of Landsat TM near- and mid-infrared bands) of the Missouri River near St. Louis. Scale 1:570,000. (a) Normal flow conditions, July 1988. (b) Flooding of a severity expected only once every 100 years, July 1993.

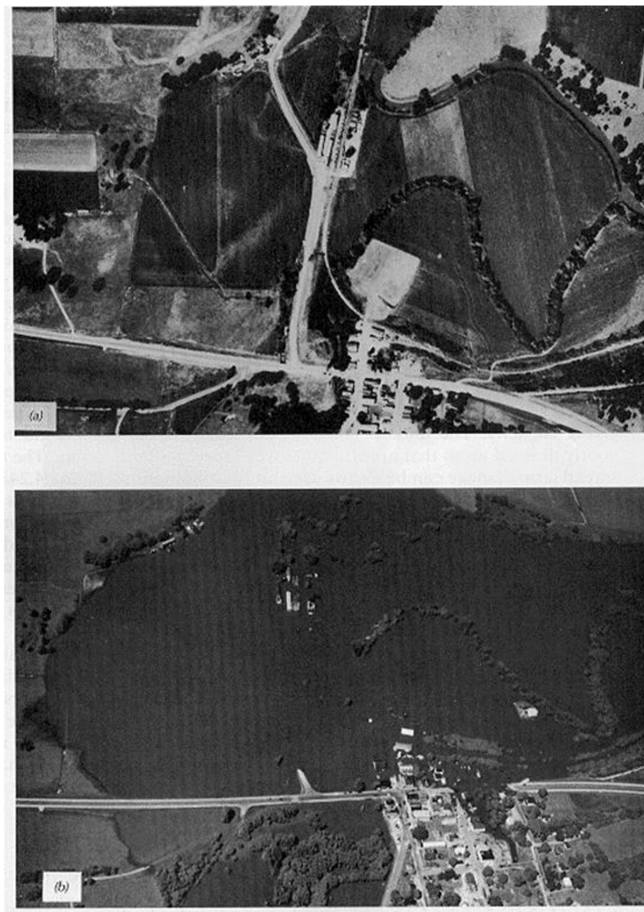


Figure 4.24 Black and white copies of panchromatic and color infrared aerial photographs showing flooding and its aftereffects, Pecatonica River near Gratiot, WI: (a) USDA–ASCS panchromatic photograph. Scale 1:9000. (b) Oblique color infrared photograph, June 30. (c) Oblique color infrared photograph, July 22. (d) Oblique color infrared photograph, August 11. The flying height for photos (b) to (d) was 1100 m.

Chapter 5: "Selected Applications"
Water Resource Applications

Water Pollution Detection:

Water is considered polluted when the presence of impurities is enough to limit its use for domestic, industrial purposes or when water becomes undesirable for aquatic life.

Chapter 5: "Selected Applications"
Water Resource Applications

Water Pollution Detection: (continue)

Aerial photographs & satellite image provide means of detecting & assessing the extent of some forms of water pollution.

In general stream pollutants enter bodies of water from man-made "point sources" or from diffused sources.

The source & extent of water pollutants may thus be readily ascertained; however, measurements of values, such as chemical concentrations & exact water temperatures, must still be obtained by field sampling.

Chapter 5: "Selected Applications"
Water Resource Applications

Water Pollution Detection: *(continue)*

Color or color-IR films at scales of 1:5,000 to 1:10,000 are often recommended for studies of water quality.

Materials that form films on the surface of water, such as oil, can also be detected through the use of photographs satellite imagery.

The principal reflectance differences between water & oil films in the spectrum occur between 0.3 & 0.45 μm.

Oil slicks on sea water can be detected using imagery from radar & thermal energy between 8 to 14 μm when there is a temperature differences between oil films & the adjacent water.

Chapter 5: "Selected Applications"

Part 2 out of 2

Environmental Assessment Applications

The environment virtually involves everything in the world around us; this includes, natural, physical, biotic, abiotic & human socio-economic features.

Chapter 5: "Selected Applications"

Environmental Assessment Applications

Environmental Assessment Applications: *(continue)*

Many human activities & related projects produce potentially adverse environmental effects. Examples include the construction & operation of highways, railroads, airports, industrial site landfills, hazardous waste, etc.

Real-time imaging is effectively used to monitor the spillage of hazardous materials, vegetation damage, & threats to natural drainage & human welfare.

Image interpretation may also be used to help locate potential sites for drilling & sampling of hazardous wastes.

Chapter 5: "Selected Applications"
Environmental Assessment Applications

Environmental Assessment Applications: *(continue)*

Large-scale aerial photographs have been used to identify of failing septic systems. Analysis of the photographic characteristics of color, texture, site, & association are used to identify these kinds of problems.

Stereoscopic viewing is also impotent because it helps the analysis to identify slopes, relief, & direction of surface drainage.

Remote Sensing & GIS are the only technique that can provide complete approach to the study of total environment while still make visible the different interrelationships that exist within the different biophysical components.

Chapter 5: "Selected Applications"
Urban & Regional Planning Applications

Urban & regional planning can be defined as the orderly regulation of the physical facilities of a city to meet the changing economic & social need of a community including the development of plans for future industrial expansion.

Figure 4.26 Multidate aerial photographs illustrating urban change, southwest Madison, WI (scale 1:20,000): (a) 1937; (b) 1955; (c) 1968; (d) 1990. [(a–c) USDA–ASCS photos. (d) Courtesy Dane County Regional Planning Commission.]

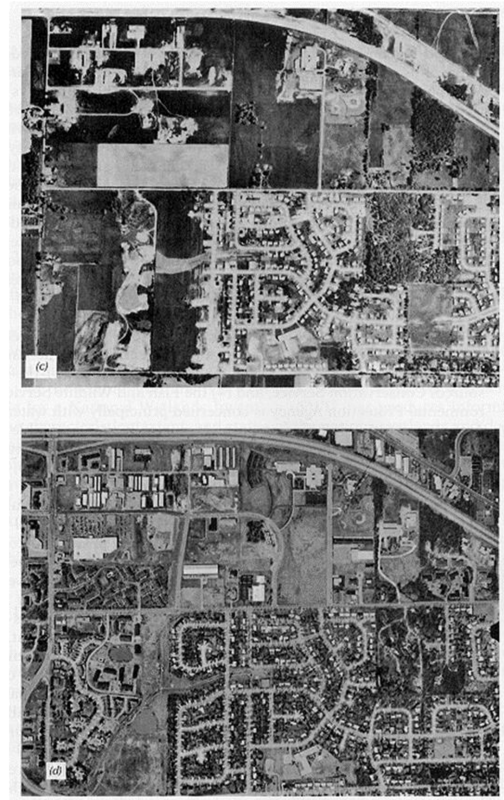


Figure 4.26 (Continued)

Chapter 5: "Selected Applications"
Urban & Regional Planning Applications

Urban & Regional Planning Applications: *(continue)*

The change in land use from rural to urban is monitored to estimate populations, predict & plan direction of sprawl for developers.

Multi-temporal images provide city administrators with a complete, continuous, cost-effective, view of the city & its environs.

Image Interpretation can assist in several of urban & regional planning activities such as, population estimates, housing quality, & traffic studies, etc.

Chapter 5: "Selected Applications"
Urban & Regional Planning Applications

Urban & Regional Planning Applications: *(continue)*

Urban change detection mapping & analysis can be facilitated through the interpretation of multi-data images.

Ideally, change detection should involve data required by similar sensors using the same spatial & spectral resolution & viewing geometry.

Sensors operating in the visible & IR portions of the spectrum are the most useful & most commonly used data sources for land use analysis.

Chapter 5: "Selected Applications"
Urban & Regional Planning Applications

Urban & Regional Planning Applications: *(continue)*

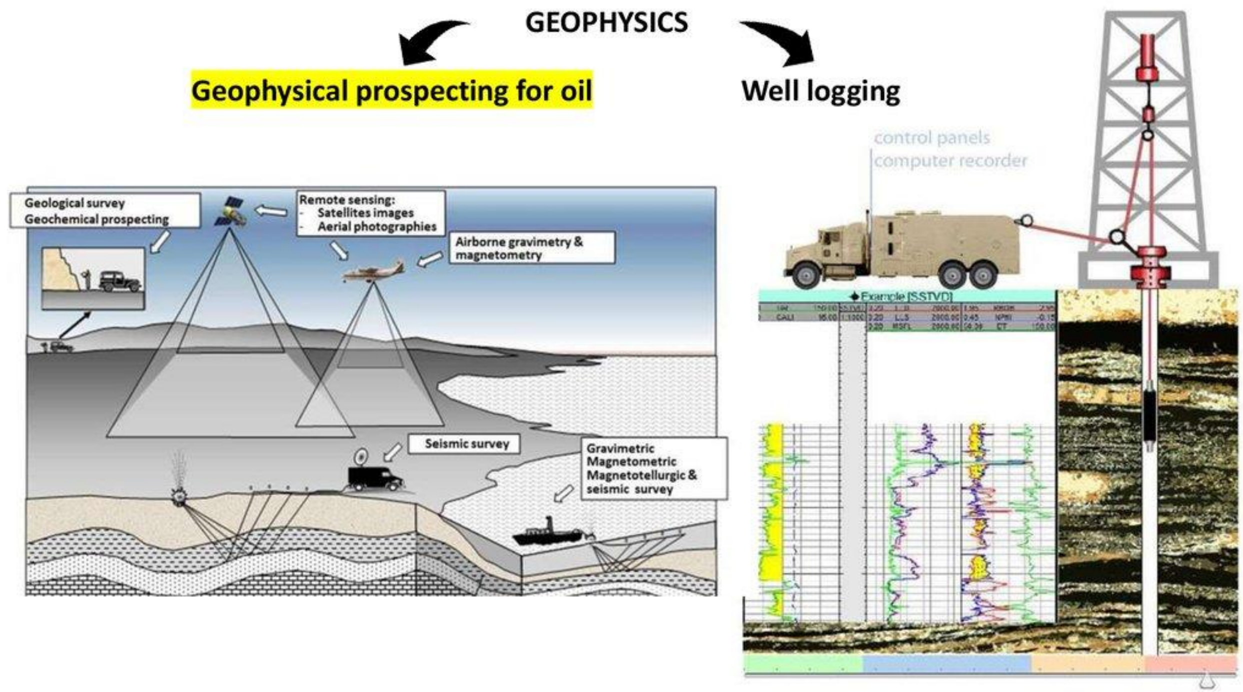
Rural & urban change detection & mapping applications requires:

- *high resolution images to obtain detailed information, &*
- *multi-spectral optical data to make fine distinction among various land use classes.*

Often anniversary dates are used to minimize sun-angle & seasonal differences.

Chapter 5: "Selected Applications"

Oil Exploration Applications



Remote Sensing & Image Interpretation have proven to be valuable tools in exploration of minerals & energy resources, especially in poorly mapped regions. Satellite images may be analyzed for surface evidences as direct indications of the under laying hydrocarbon.

Chapter 5: "Selected Applications"
Oil Exploration Applications

Oil Exploration Applications: *(continue)*

Geological studies of the oil reserves may employ digital treated satellite images to facilitate the collection of geological information about the surface of the earth & the features of the underlying geological structures that are likely to contain petroleum deposits.

Imageries recorded by satellite with multispectral scanners are used to draw & interpret geologic maps.

Radar imageries are also used to obtain information to draw & interpret geological maps.

Chapter 5: "Selected Applications"
Oil Exploration Applications

Oil Exploration Applications: *(continue)*

The search for oil in unexplored onshore areas normally follows a pattern, beginning from regional reconnaissance & culminates with drilling wildcat wells.

A typical exploration program proceeds as follows:

- *1. Regional R.S. reconnaissance survey to locate sedimentary basins that are essential for the formation of oil fields.*

Chapter 5: "Selected Applications"
Oil Exploration Applications

Oil Exploration Applications: *(continue)*

- *2. Reconnaissance geophysical surveys.*

  Aerial magnetic surveys are made to produce maps that record the intensity of the earth's magnetic fields.
- *3. Detailed image interpretation, both aerial & space images are used, 3-D stereoscopic images are recommended.*
- *4. Seismic surveys, explosives or mechanical devices are used to transmit waves.*
- *5. Wildcat wells drilling to estimate the oil production feasibilities.*

That’s the end of Chapter 5