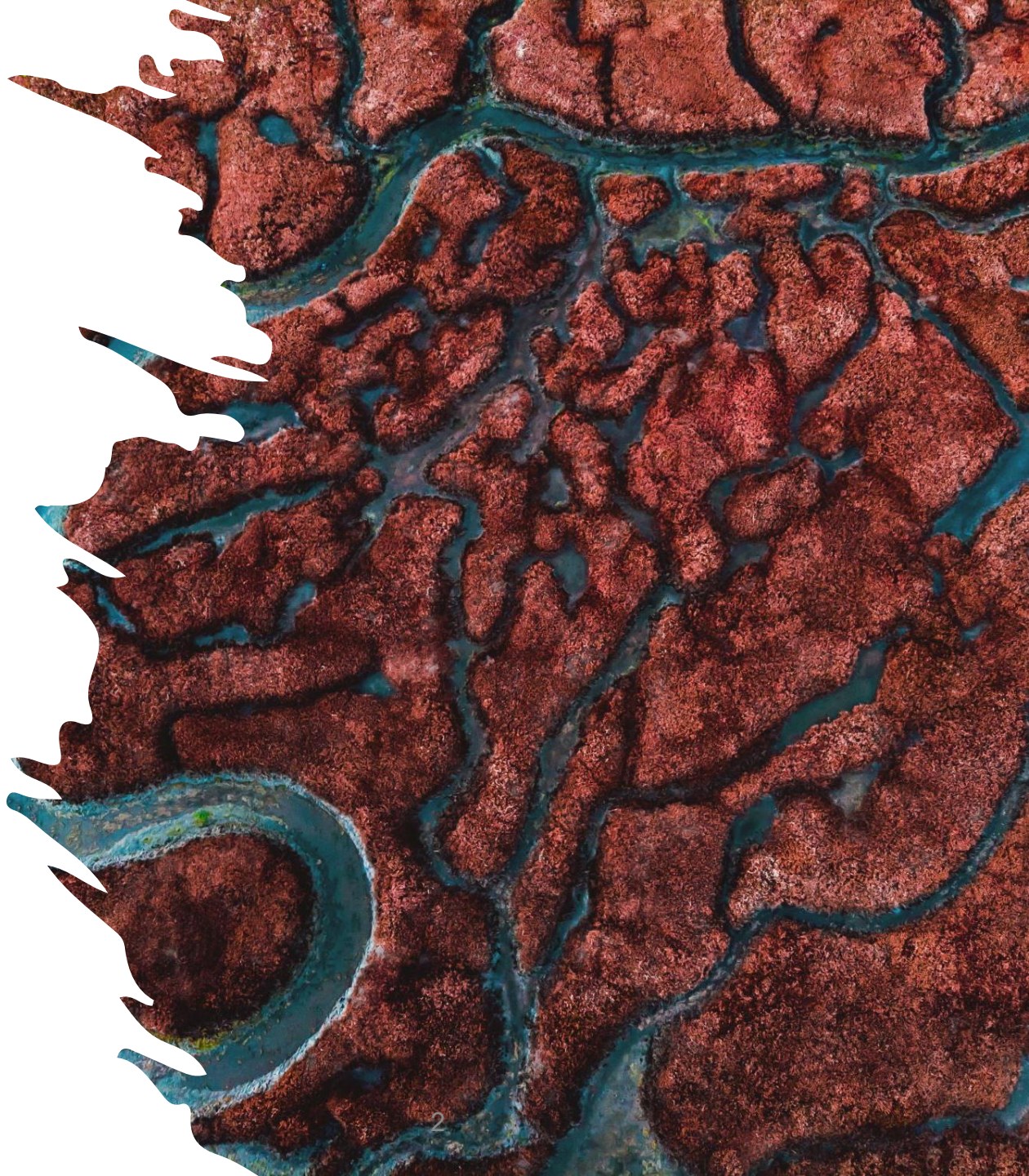
Geophysical methods

Chemical and Geotechnical analysis of the surface

- Chemical analysis of the surface soil and rocks are carried out by geochemical methods. Geotechnical methods, such as the mechanical properties of rocks and surface, are measured. Remote sensing from satellite is the most recent development for a low cost geological survey.



Remote sensing

- Remote sensing from satellite is the most recent development for a low cost geological survey.
- Solar radiation from the Earth's surface varies in intensity and frequency depending on the sub-surface property. This observation is collected via satellite to predict the sub-surface structure. In order to image the sub-surface structure, historical geological data collected previously by gravimetric, magnetometric, and seismic surveys are used.
- The final image is obtained by geological imaging software (GIS).

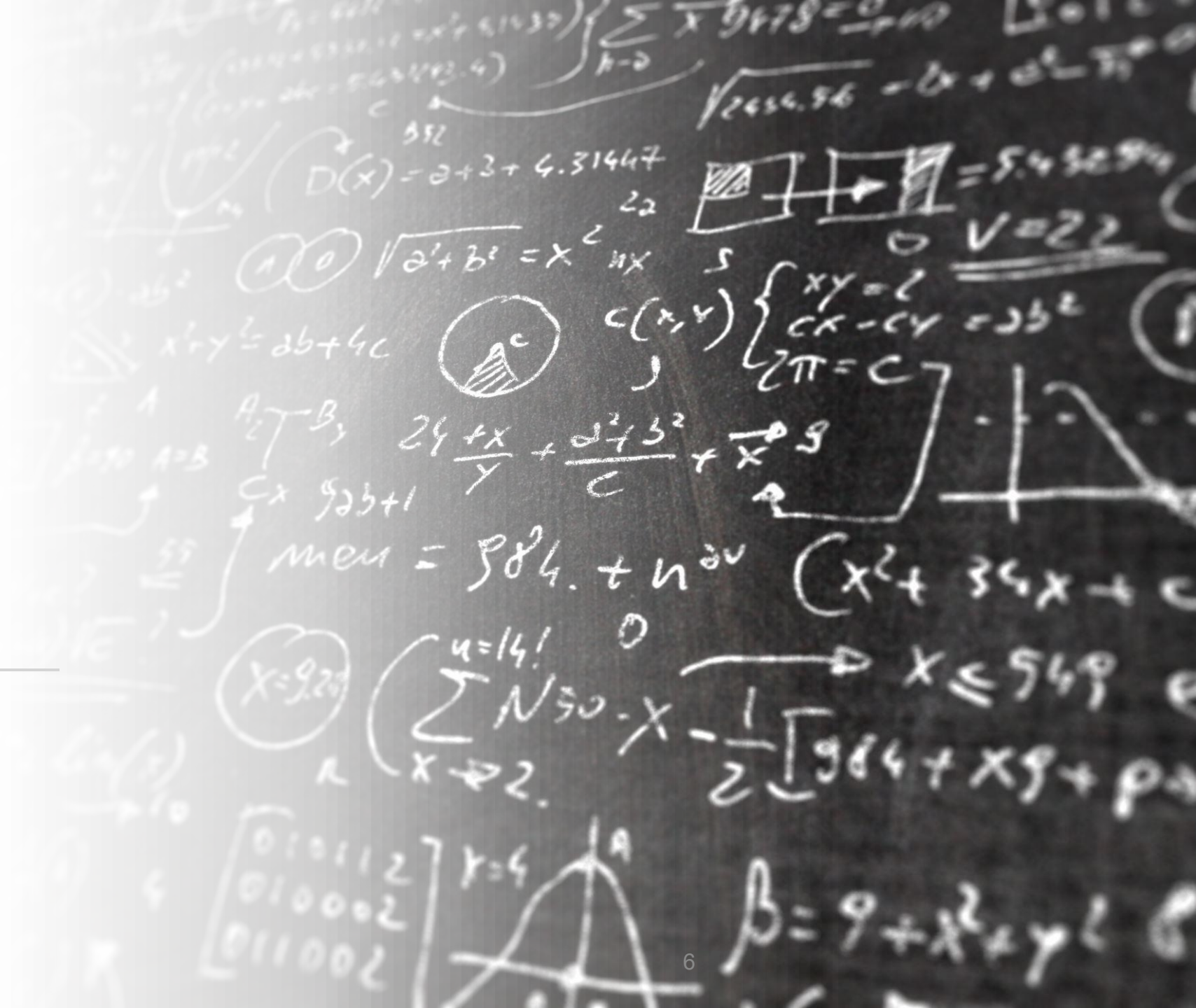
Why the Remote Sensing method is not applicable during nighttime or places incapable of reflecting solar radiation?

- The ocean surface absorbs substantial amounts of solar radiation, however, extrapolation from the land surface in the vicinity of the sea can be accurately predicted but is not applicable for the deep-sea area. A radioactive or gamma-ray survey is also used in the exploration.

Geochemical methods

- Geochemical methods employ chemical analysis of the cuttings (rock samples cut by drilling bit) and core (a narrow column of rock taken from the wall of a drilled hole) of the drilled site.

GRAVIMETRIC METHOD



GRAVIMETRIC METHOD

Gravity of the earth's surface varies with distance from the surface of Earth and the type of material, such as salt, water, oil, gas, or mineral matter.

The measurement of a small variation of gravity or acceleration due to gravity is recorded with accuracy and the data are converted to retrieve a geological structure of the sub-surface of Earth.

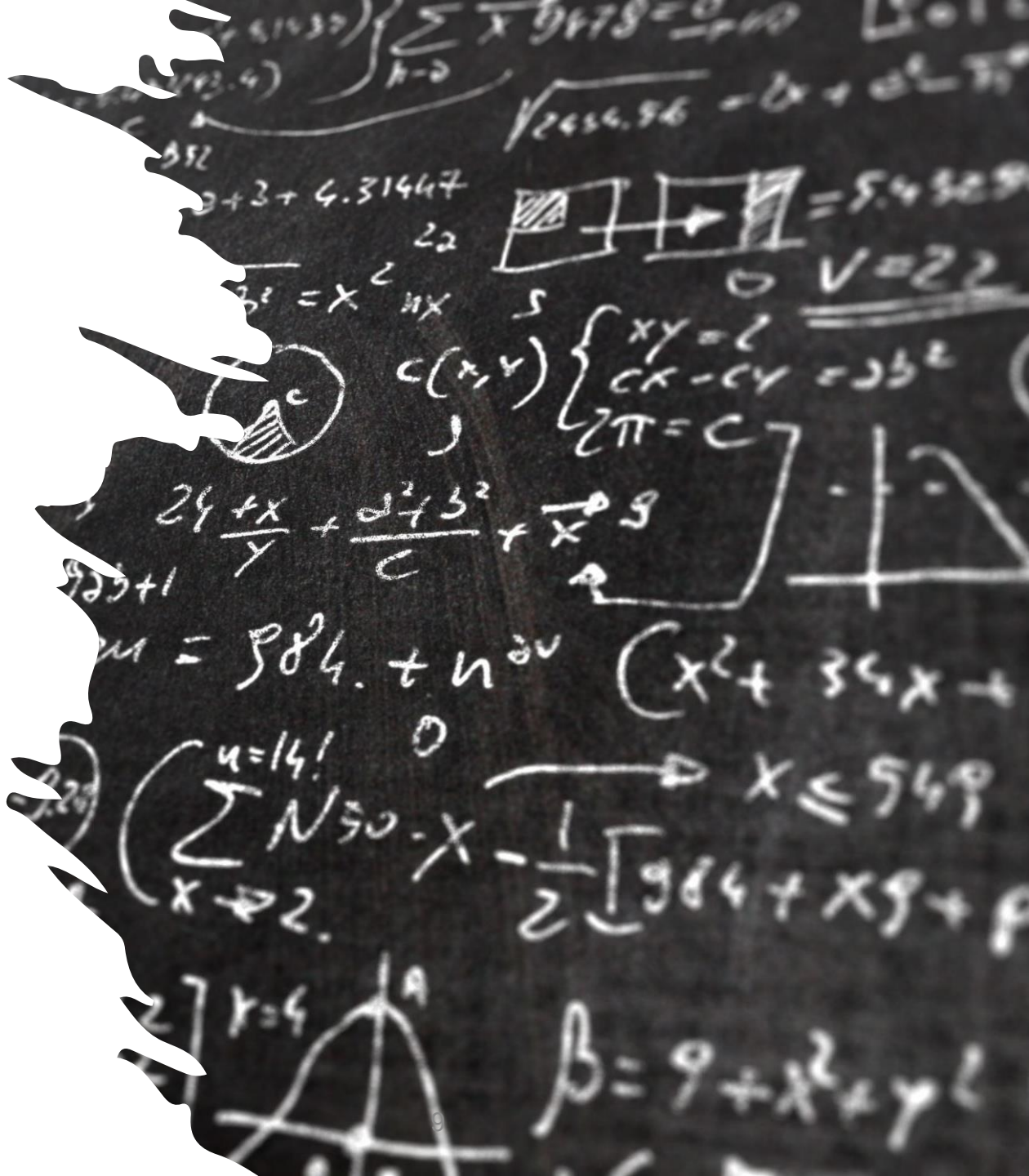
What are the gravimeters?

A gravimeter is a very sensitive instrument, usually a spring-type balance with high resolution and accuracy capable of detecting a minute variation in gravity.

Porous and oil-containing rock layers and salt have lower density compared to the surrounding non-porous and hard rock layers. Thus, a gravimetric curve is acquired and analysed for the location of deposit.

MAGNETOMETRIC METHOD

Exploration Techniqu



MAGNETOMETRIC METHOD

Earth has its own magnetic field that varies from one location to another owing to the different structural materials of rocks and also the presence of solar-charged particles received by Earth.

Both the gravimetric and magnetometric methods are done simultaneously to predict a reproducible sub-surface structure. After the zone is confi rmed by gravimetric and magnetometric surveys, a seismic survey is carried out for a clear image of the sub-surface structure.

What are the magnetometer?

- A variation of magnetic fi eld strength is recorded by a sensitive instrument, called a magnetometer. Igneous non-porous rocks are found to be magnetic as compared to sedimentary rocks containing organic deposits. Thus, a magnetometric survey can also be used to locate oil deposits.

SEISMIC SURVEY

- This technique uses a sonic instrument over a desired site to correctly locate the prospective basin structure.
- In this method, a sound signal generated by the explosion method (explorers call them mini-earthquakes, which are artificially created by explosives) is transmitted through the earth's surface under study and reflected signals are detected by geophones located at specified positions. The frequency and time of the reflected signal varies with the density, porosity, and the type of reflecting surface. Various rock deposits at different depths vary with density and porosity. Seismic reflection can measure this change as it travels below the surface. Computer simulation software is used for imaging the sub-surface structure.

STRATIGRAPHY

- Correlations are established between wells, fossils, rock and mud properties, before and during drilling operations for the final prediction, and this technique is known as stratigraphy.

- https://www.youtube.com/watch?v=VLBzMvsiYq8