Fifty Years of Geosciences Teaching and Research at KFUPM

The Earth Sciences have been at the heart of KFUPM's academic program since the university was first established about 50 years ago. The early geologists in the Kingdom of Saudi Arabia focused on the search for and extraction of natural resources, an important endeavor that fueled Saudi Arabia's expanding industrial economy and brought petroleum to world markets. Today the Earth Sciences Department works to gain a better understanding of our planet's history and its future, the energy and resource base that supports a global society, geological and environmental hazards that affect a growing population, a changing climate, and the challenge of sustainability for future generations.

The Earth Sciences Department is one of the leading academic centers for geoscience research in the Kingdom of Saudi Arabia. We contribute strongly to KFUPM's continuing rise in the ranking of world universities, and we have forged new links with the petroleum industry and with other academic departments worldwide. An example of this collaboration is the new Saudi Aramco – KFUPM – Stanford trilateral agreement, which covers a wide range of initiatives that include research in unconventional gas to CO2 capturing and sequestration, joint student supervision, joint field trips.

Geosciences research at KLFUPM is organized into three broad research sections: Geology, Geophysics, and Environmental Sciences. All graduate students, research and academic faculty belong to one of these sections.

The Geology Section is concerned with understanding the processes that drive the Earth system, and in the formation and evolution of Earth's sedimentary environments. Our research ranges from the study of the taxonomy and diversity of fossil organisms to the mineralogy and compositions of dust grains and their affect on human health. Despite its breadth, our research is complementary - research on the surface processes of the Earth has implications for petroleum exploration and water resources, their sustainable development, and environmental impacts.

We are concerned with the sedimentological and structural evolution of sedimentary basins, including their stratigraphic and depositional evolution, tectonics, diagenesis, paleoenvironments and surface processes. This wide range of activities is centered around a multidisciplinary group of earth scientists who are committed to evaluating both fundamental geological processes, and their application to understanding the nature, origin and occurrence of natural resources, especially petroleum. To achieve this we are involved in surface and subsurface investigations, using a combination of traditional field-based methods and state-of-the-art technologies for geological, geophysical and geochemical data acquisition, processing, analysis and three-dimensional visualization.

Geophysics is the study of the Earth by quantitative physical methods and includes measurement of physical properties and modeling of the physical behavior of natural materials. Our research in geophysics within the department underpins many of our research projects in a wide range of subject areas from exploration of hydrocarbons, the development of advanced seismic techniques, to studies of the earth's internal structure. We work to understand active and passive seismics, surface waves, seismic interferometry, petrophysics and computational geophysics. To do this we develop advanced technology for the quantitative observation and measurement of changes in physical properties of the subsurface. There is also a major cross-disciplinary activity within the group related to carbon-dioxide capture and sequestration, and the continuing search for unconventional resources.

Environmental Sciences are concerned with the impact of human activities on Earth's environment and vice-versa. This is a broad remit that covers a range of topics, including climate change, pollution, and land use in developed areas. Our environmental Geologists work with local industries and government

agencies to monitor and assess environmental hazards and to suggest strategies for remediation of environmental problems. Increasingly, the study of natural processes such as volcanic eruptions, tsunamis, and sea level change caused by the melting of polar ice are topics that attract major interest.

The Reservoir Characterization group is a unique interdisciplinary team that combines world-leading techniques in advanced measurement and multi-scale modelling. The group undertakes pure and applied research in petroleum reservoir geology, micropaleontology, sedimentology, geochemistry and petroleum geophysics. The Reservoir group carries out basin-scale analysis of clastic and carbonate depositional systems within contrasting tectonic and climatic settings, evaluates different types of petroleum reservoirs, their heterogeneities, and how these influence hydrocarbon distribution, and fluid recovery. The group develops solutions to some of the most pressing problems facing energy companies today: the sustainable production of earth resources, the development of new energy sources, and mitigating environmental impacts and risks.

We are currently working on a number of multi-disciplinary projects that use integrated subsurface datasets (core, wireline-log, 3D seismic and production data), insights from outcrop analogues and novel modeling techniques to characterize geology and fluid flow in hydrocarbon reservoirs. This work spans the traditional disciplines of geoscience and petroleum engineering, and is carried out both by graduate students and faculty members, in collaboration with colleagues from Saudi Aramco and other companies.

Faculty and students in the KFUPM Earth Sciences Department work to expand our understanding of Earth and its history and dynamics, environmental changes, natural resources, hazards, and sustainability through fundamental and applied scientific research. In an intellectual, friendly, and productive working environment that supports fundamental research and promotes collaboration, they build links between the Earth Sciences Department, industry, and other disciplines to address increasingly complex problems of importance to a global society. Today, KFUPM Earth Sciences graduates form the core of highly-trained professionals that provide energy to the world.


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