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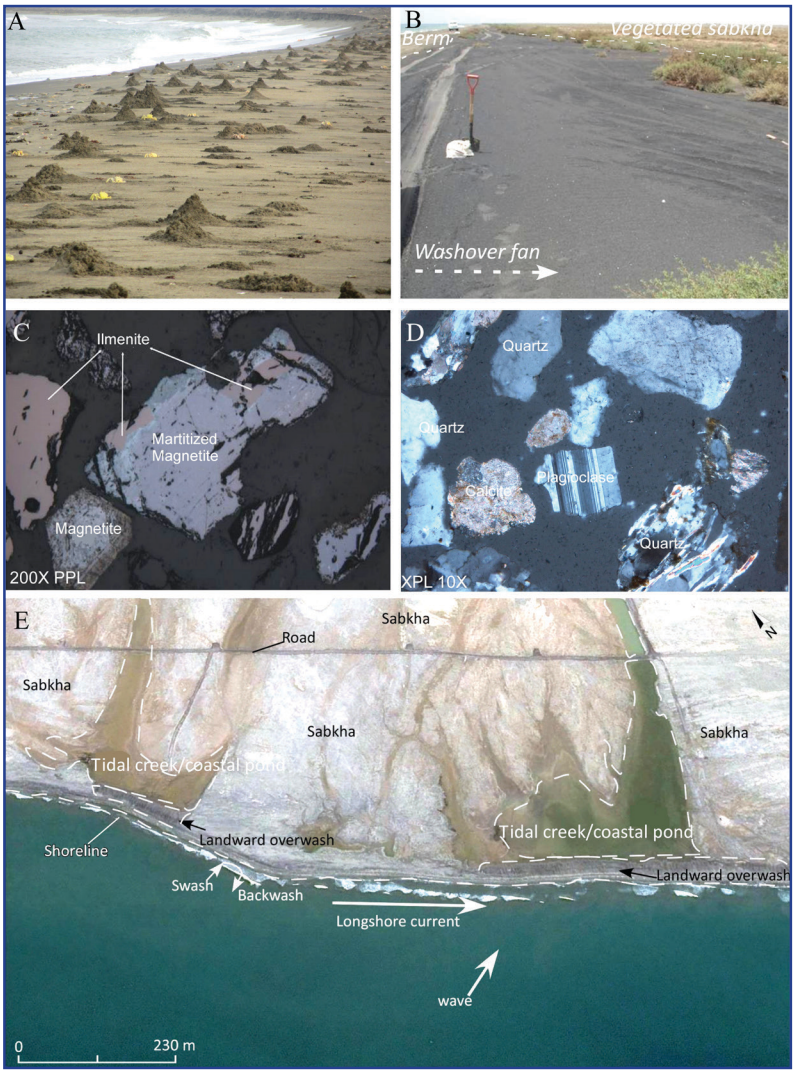
هيئة المساحة الجيولوجية السعودية
SAUDI GEOLOGICAL SURVEY

MODERN SEDIMENTARY FACIES, DEPOSITIONAL ENVIRONMENTS, AND MAJOR CONTROLLING PROCESSES ON AN ARID SILICICLASTIC COAST, AL QAHMAH, SE RED SEA, SAUDI ARABIA

The facies and environments along the arid siliciclastic coast of the Red Sea in Al Qahmah, Saudi Arabia are studied to establish a depositional model for interpretation of ancient rocks deposited in rift settings. Field and petrographic studies of 151 sediment samples in an area of 20 km^2 define seven main facies types: beach, washover fan, tidal channel, dune, sabkha, delta, and wadi (seasonal stream). The wadi and delta facies are composed of poorly to moderately well-sorted, gravelly, medium-to-fine sands. Deltafront sands are redistributed by southward longshore currents to form a beach. Beach facies are composed of well-to-moderately sorted fine sands with minor gravels, which contain high concentrations of magnetite, ilmenite, garnet, pyroxene, amphibole, epidote, titanite, and apatite grains, indicating strong winnowing. Crabs and other burrowers destroy primary sedimentary structures and mix sediments in the foreshore and backshore of the beaches. Wind and storm surges rework foreshore and backshore sediments to form washover fans. Sabkha facies occur extensively in supratidal depressions behind beaches, are flooded by rainstorms and spring tide, and capped by a 5-cm-thick crust composed of interlaminated halite, quartz, albite, minor gypsum and biotite, and rarely calcium carbonate. Halite occurs as thin sheets and gypsum as nodules with a chicken-wire structure. Clastic fraction in sabkha sediments ranges from coarse silt to coarse sand with moderate sorting, and is transported by currents and wind. Tidal inlets and tidal creeks assume abandoned wadis and are filled with muddy sand. Sand dunes and sand sheets are 1-7 m high and widely distributed due to variable wind directions. Fine-grained dune sands are moderately well sorted, whereas sheet sands are coarser and poorly sorted due to vegetation baffling. Most eolian sands are sourced from beach deposits. This suite of complex riverine, wave, tidal, wind, chemical, and biological processes form the facies mosaic along the arid Al Qahmah coast, which is strongly affected by climate-driven evaporation and coastline morphology (**Article published in the *Journal of African Earth Sciences 140: 9-28 - Nabhan and Yang)***.



A) Mounds of sand excavated by ghost crabs on fore beach. B) Beach berm and washover fan with a high concentration of heavy minerals, appearing as black sand. C) Photomicrograph showing ilmenite, martitized magnetite and magnetite. Note the lamellar intergrowth of ilmenite over magnetite. D) Photomicrograph of quartz, plagioclase feldspar and calcite in beach berm sand. E) A close-up satellite image showing the wave direction, tidal creek/coastal pond, and large coastal washover gans over the beach in the study area.

REGIONAL EXPLORATION OF SELECTED MINERAL OCCURRENCES IN THE AFIF TERRANE IN THE ARABIAN SHIELD, KINGDOM OF SAUDI ARABIA

The main objective of this project was to identify and discover promising metallic and non-metallic mineral occurrences for detailed future exploration programs to delineate and recommend for mineral resource development. This report presents the results of this mineral exploration and geologic mapping that were done in selected areas in the Afif terrane.

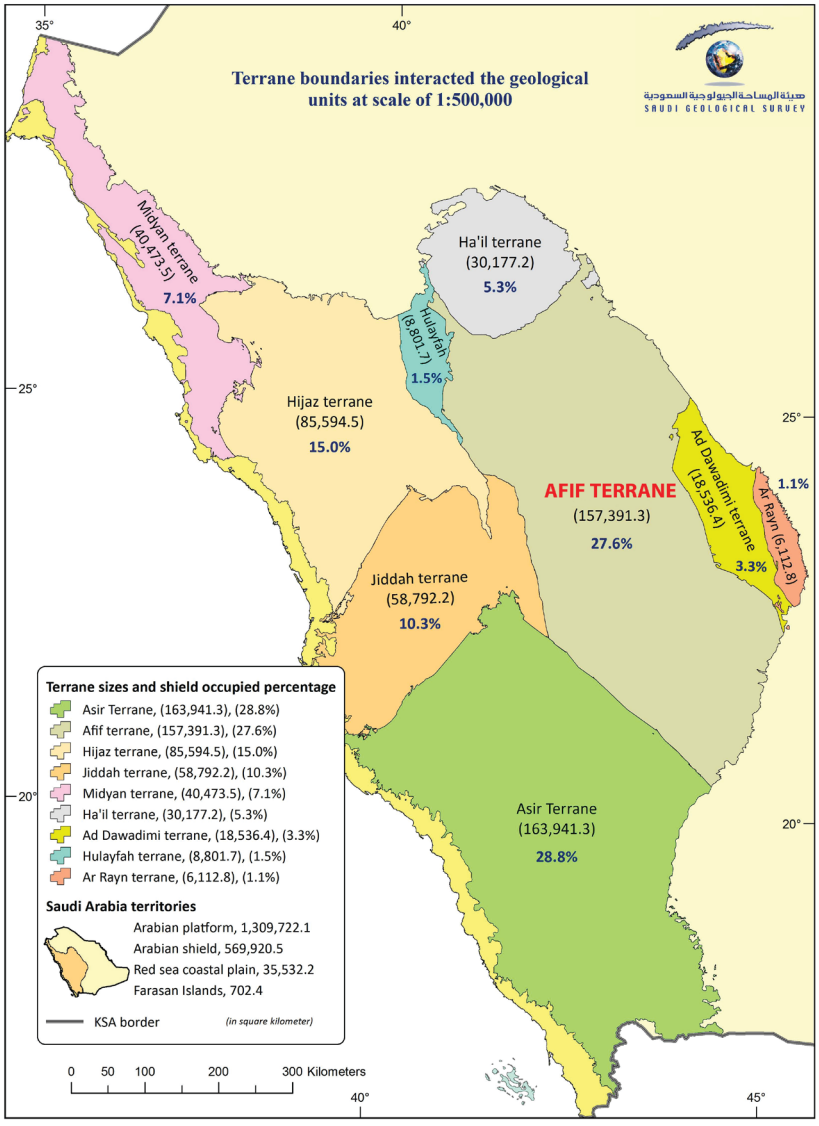
The Afif terrane is located about 700 km northeast of Jeddah City. This terrane trends 165° NW-SE over an area of 144 km by 70 km. It covers a total area of 157.4 km^2 and represents 27.9 percent of the Arabian Shield. The Afif terrane is one of the largest terranes in the Arabian Shield. It hosts more than 900 metallic and non-metallic mineral localities that were documented in the Mineral Occurrences Documentation System (MODS).

Six gold occurrences were visited and evaluated, which are considered as auriferous gold bearing quartz veins, namely: the Dib Umm Kharit North and South, the Al Himar-North, the Shaib Al Hufayyirah (Al Himar), the Shaib Mibhil Al Janubi (Jabal Al Usaybiyat West), the Shaib As Saqqar-W (Jabal Dhiby South), and the Al Baayith mineral occurrences. Four copper-molybdenum mineral occurrences were also visited: the Jibal Humurrah, the Wadi Qimran, the Hadabat Al Uwayja, and the Himam Ash Shahad.

Th gold-bearing quartz veins were found in the northern and central areas of the Arabian Shield. These six gold occurrences, particularly the Dib Umm Kharit North and South, are considered to be top priority, given the sizes of their mineralized areas and the presence of different structures in them. The average gold grade of the 37 samples from these areas is 2.36 ppm gold, with a maximum at 15 ppm. One hundred ninety forty samples were collected from the main ancient dump and from the outcrops, divided into 149 and 45 samples, respectively.

Four selected mineral occurrences of copper and molybdenum in the Afif terrane were also included in this study. These mineral occurrences are the Jibal Humurrah, the Wadi Qimran, the Hadabat Al Uwayja, and the Himam Ash Shahad. Forty-five chip samples were collected from these four areas. Most of the samples display disseminated molybdenites within the quartz vein that cut the granitic rocks. All of these occurrences need further exploration works to determine their viability as resources.

Seven mineral occurrences were also discovered during the general survey in the Afif terrane. Five of these occurrences were classified as quartz vein type, one as granite type, and another as syenite (***SGS-OF-2023-1, Abdullah Al Jehani and others***).



Tectonostratigraphic terranes of the Arabian Shield

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