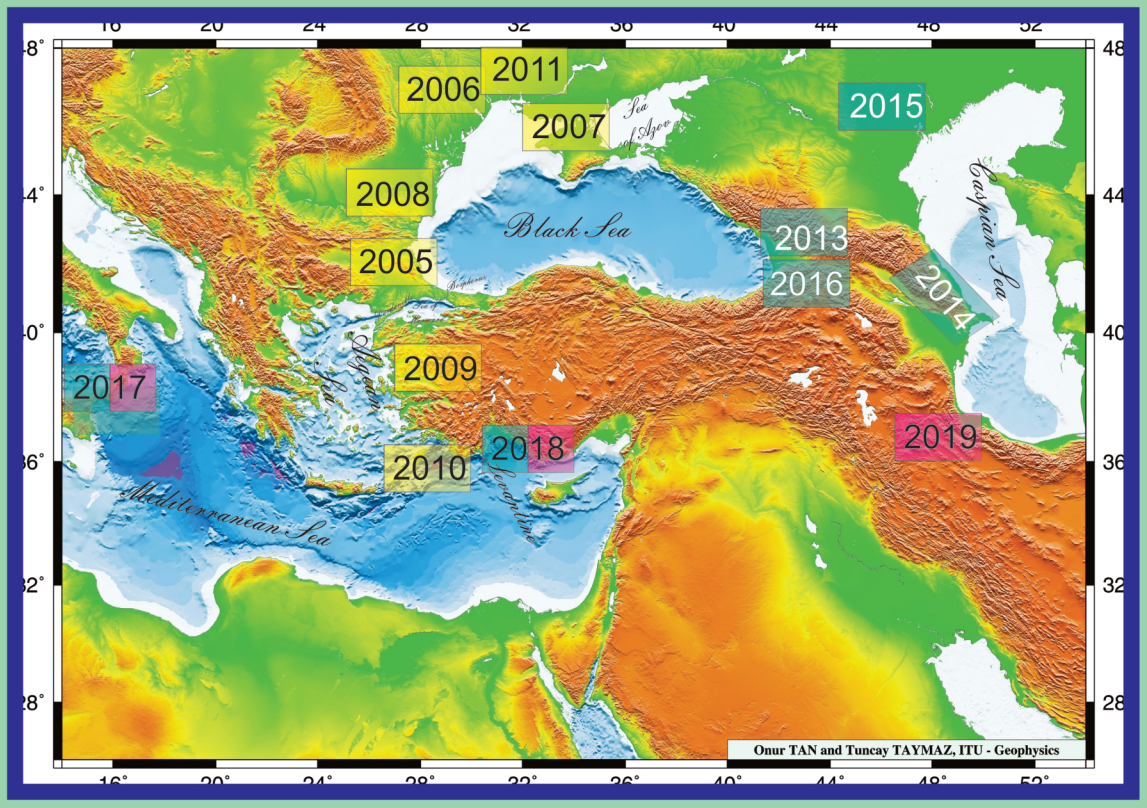
Iranian National Institute for Oceanography and Atmospheric Science (INIOAS)

Ministry of Industry, Mine and Trade
Geological Survey of Iran

Iranian National Institute for
Oceanography and Atmospheric Science
Geological Survey of Iran,
I.R. Iran, Tehran and Guilan Province
11-18 October, 2019

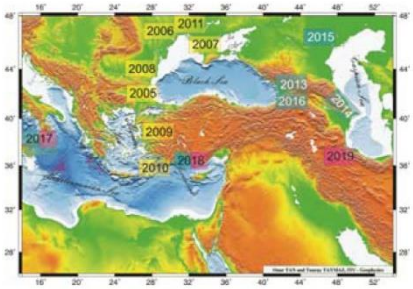


FIELD TRIP GUIDE

INQUA IFG 1709 POCAS "Ponto-Caspian Stratigraphy and Geochronology" (2017-2020)

The Third Plenary Meeting and Field Trip of INQUA IFG 1709F POCAS, Tehran and Guilan Province, I.R. Iran, 11-18 October 2019

Iranian National Institute for Oceanography and Atmospheric Science
Geological Survey of Iran, I.R. Iran, Tehran and Guilan Province 11-18 October, 2019



INQUA Focus Group SACCOM: 1709F "Ponto- Caspian Stratigraphy and Geochronology (POCAS)"

Co-Leaders: Valentina YANKOHOMBACH (Canada,Ukraine), Tamara YANINA (Russia)
Secretary: Redzhep KURBANOV (Turkmenistan)

ORGANIZERS:

INQUA IFG 1709 POCAS
October 11-18, 2019, Tehran, I.R. Iran

FIELD TRIP GUIDE

Organizers and Sponsors:

Iranian National Institute for Oceanography and Atmospheric Science (INIOAS), Tehran, I.R. Iran

Avalon Institute of Applied Science, Winnipeg, Canada

Authors: Hamid Lahijani
Hamid Nazari
Fereidoun Biglari

Field Trips

The field trip locations are in Guilan Province in the south west Caspian coast.

Distance of the capital city of Guilan province, Rasht from Tehran is around 350 Km. The accommodation for three nights will be organized in Rasht, Guilan Province. On the last day field trip (17 Oct), we will return to Tehran.

14 Oct:
Departure from INIOAS though Tehran-Qazvin and Qazvin-Rasht high ways, Shemshak Formation near Rudbar, Rashi cave, Marlik Iron Age Cemetery, Shahran Iron Age Cemetery and Saravan loess, Accommodation in Rasht, in Guilan University Guest House or Hotels Based on the weather condition and accessibility by bus, some part might be dismissed.

15 Oct:
Visiting old beach deposits near Rasht, Qale Rudkhan Castle and Masuleh, accommodation in Guilan University Guest House and Hotels in Rasht.

16 Oct:
Traveling to Talesh, Gisum coastal fault and coast, visiting Abkenar south of Anzali Lagoon, Anzali Spit. Accommodation in Guilan University Guest House and Hotels in Rasht.

17 Oct:
Check out from Guest House and Hotel, visiting Sefidrud Delta, Kiashahr Lagoons and Old Sefidrud, afternoon return to Tehran

General travel map for field trip

Geology of Alborz, early rifting and south Caspian basin formation

Development and evolution of Tethys basins during geological history from the Precambrian to Paleogene has been considered by many geoscientists. The first sign of various basins propagation of Tethys which resulted in separation of super continents, ancient lands (such as Eurasia, Gondwana) and blocks or microplates among them, are found in the Precambrian. One of these old basins in the north of Iran has been called OrthoTethys, its evidence can be found in the primary structures in Alborz range and its Precambrian units.

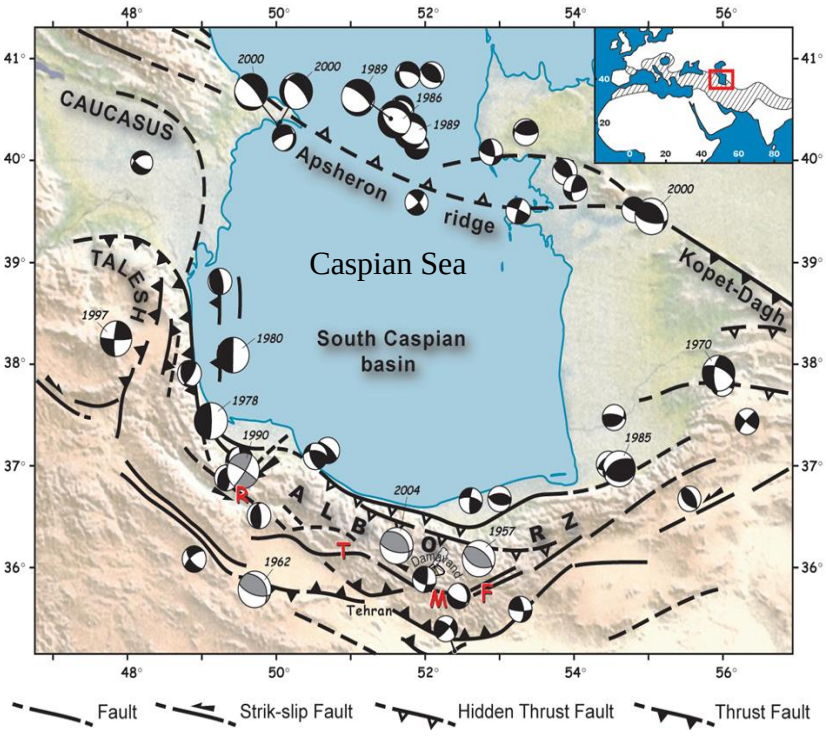
Some other researchers believe that the Ordovician and Silurain volcanic series of Iranian Plateau and Alborz were formed after genesis of Early Tethys basin or Paleotethys due to extension shear system along the Paleo-Tethys between Turan plate and Alborz-Kopet-Dagh belts. By increasing the rate of subsidence in the Permain basin, the dominating marks of extension system between Iranian microcontinents and Arabian plate were recorded, however, the related alkaline volcanic rocks of the Neotethys rifting found in Triassic succession. In addition, the most important tectonic changes of the Caspian and Black seas occurred in the Triassic time. Structural upheaval of Tethys basins among blocks and plates, such as Turan in the north Kopete-Dagh, Caucasus, Alborz, Sabzevar, Central Iranian microcntinents and Arabian plate in the south is traceable periodically. The succession of extension and compression tectonic events resulting from opening and closing of such basins during Assynitic–Pan African and Alpine orogenies which sometimes correspond to metamorphic facies from Caledonian and Hercynian orogenies, resulted in tectonic evolution of sedimentary basins in the areas impressed by various orogenies. Alborz as an extended block in active tectonic zone and impressed by most distinguished geological events in both supercontinents of Eurasia and Gondwana is evolved between two ancient continents. The total of thinning and thickening of Alborz basement during ancient events in comparison to other parts of Iran indicate approximately constant rate and little negative gradients due to thickness decrease of crystalline crust and lower crust towards Caspian basin.

Detachment folding system with uplift of ancient facies in hanging wall of basic fault in north Alborz is one of the apparent features of central part of this structural block that occurred in flower structure. More folding and movement in western part of this fault comparing to eastern part, is another structural feature in the area.

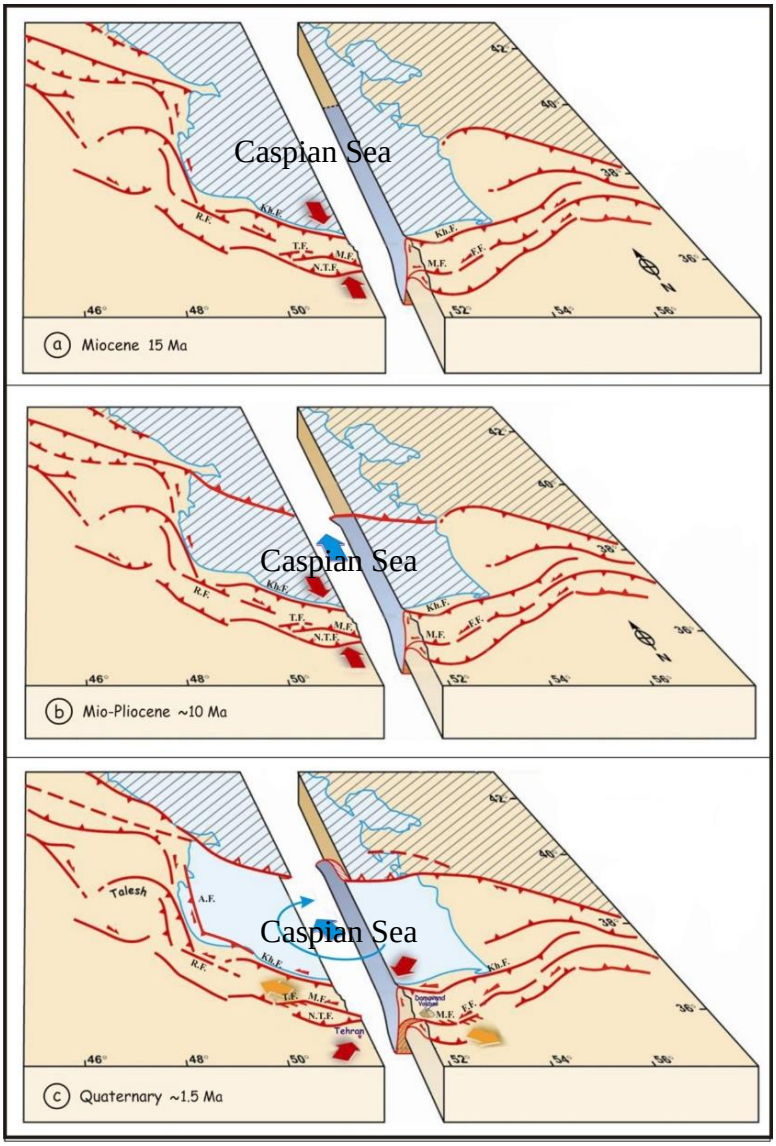
North Alborz , Mosha and Taleghan faults as principal faults appearing in internal part of Central Alborz, where some propagation faults like the North Tehran and Khazar can be derived from them to the south and north side of Central Alborz.

The tectonic activity in the Alborz mountain range, northern Iran, is due both to the northward convergence of central Iran toward Eurasia, and to the northwestward motion of the South Caspian Basin with respect to Eurasia inducing a left-lateral wrenching along this range.

These two mechanisms give rise to a NNE-SSW transpressional regime, which is believed to have affected the entire range for the last 5±2 m.y. Central Alborz which is mostly corresponds to the E-W trending mountain range bounding the Caspian Sea to the South, as an active train belonging to the Alpaine-Hymalian seismic belt. It connects the Talesh and the Lesser Caucasus trains of the West and the Eastern Alborz structures to the East. Central Alborz has different geological units from Precambrian to Quaternary ages. These units assembled in complexes systems of thrusts and folds which deformed during several orogenesis related to the closure of Tethyan basins .Since Neogene, Iran is undergoing the N-S collisional process between Arabian and Eurasian plates and the lateral push of the northwards converging Indian plate along its eastern shear border. The internal domain of central Alborz is not affected by a transpressional regime but by an active transtension with a WNW-ESE extensional axis, the transtension is young (middle Pleistocene). It postdates an earlier N-S compression and may have been initiated when the South Caspian Basin started moving. The recent transtensionale tectonic appears contemporaneous with the volcanic activity of the Damavand and Taleghan area. Several large historical earthquakes occurred along these inherited structures, which represent a high seismic potential.



After Ritz et al.,2006



After Nazari 2015

Fault bordering Karaj Formation and Upper Red Formation, in the west Manjil

Fault bordering Karaj Formation and Upper Red Formation, in the west Manjil

Shemshak Formation of Jurassic in the north Manjil showing sandstone and conglomerate materials of which transported from southern Russian platform before south Caspian rifting

Signature of the Caspian Sea level, river avulsion and coastal development

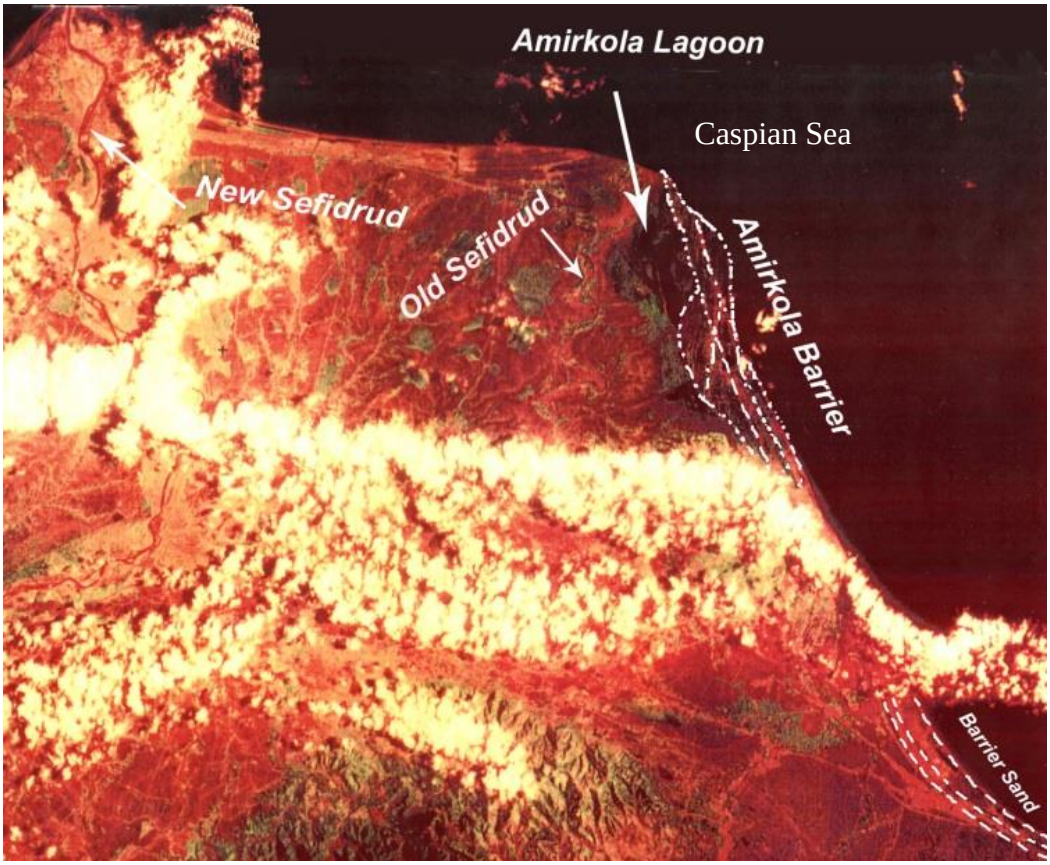
The Iranian coast of the Caspian Sea encompasses coastal landforms and geomorphology that developed during its long geologic history and the Caspian environmental changes. Geological factors along the Iranian coast have a fundamental control on the general outline, orientation and slope of the coastal areas. The Alborz mountain range with major fault systems that bordering the south Caspian sub-basin have dictated the convex morphology of this coast. Another influence of geology on this coast is sediment supply from the catchments basin into the shoreline. Main portion of coarse sediments are bring to the coast by rivers, especially in the central Guilan, where gradients are steep and coarse-grained materials are readily transported by floods. The southward longshore currents account is another source of sediments to the Iranian coast. The sediments that supplied to the coast by different ways are re-distributed by waves and wave induced currents along the shore.

Southward longshore currents on the west Guilan changes direction as eastward in the Central Guilan, which have great effect on the coastal morphology. Lagoons and bays are formed behind the barrier beaches, which developed in the central Guilan. From west to the east the Anzali, Zibakenar, Kiashahr, Amirkola, are the major lagoons which separated from the Caspian Sea by spits and bars.

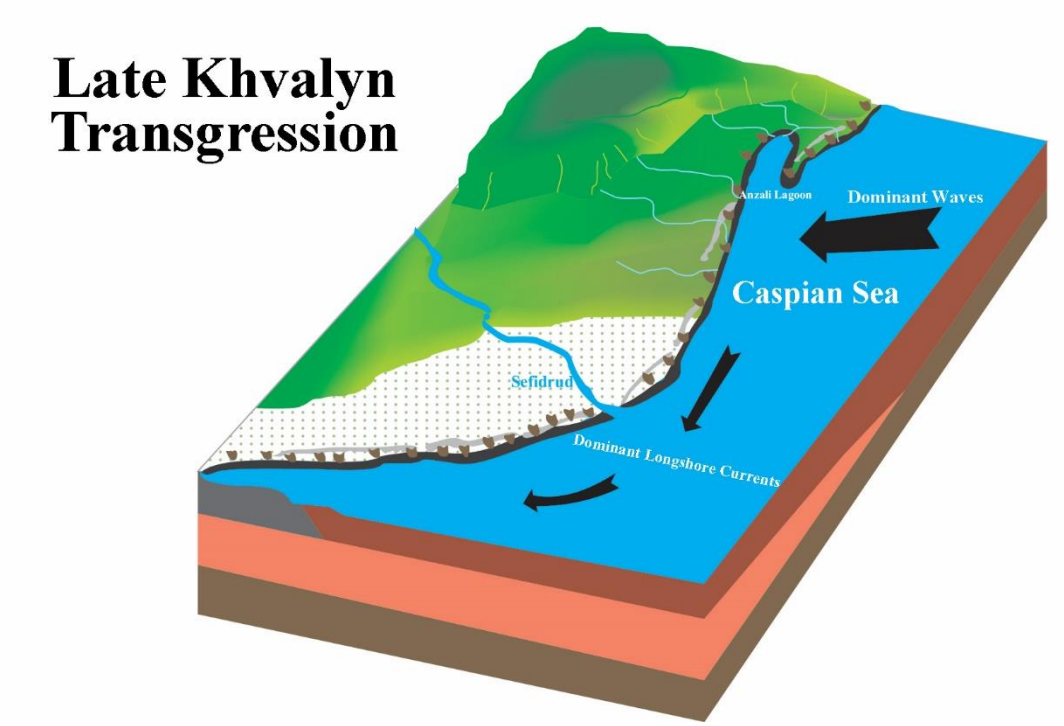
The shoreward and landward slope in the central Guilan is suitable for barrier- lagoon development under rapid Sea-level rise. They have analogous features on the other parts of the Caspian coast, so there are two types of lagoon on the central Guilan coast, first one is formed due to bar and spit growth and the second are due to impact of sea-level rise. Sefidrud River is the main sediment supplier in the central Guilan. Sefidrud River course has changed frequently between Anzali and Langerud, the last one occurred in the late 19^{th} century. In that time, Sefidrud passed through a wide shallow lagoon and incised the shoreline near the Kiashahr (30km eastward of the old mouth) flowing to the Caspian Sea. This old shoreline is distanced 3 km from the present shoreline in new Sefidrud delta region. The old shallow lagoon is buried by a 20 cm thick organic matter layer in the Sefidrud valley. This lagoon probably formed due to sea-level rise of the Little Ice Age that shows the features of the second type of lagoon. The new Sefidrud delta and two lateral lagoons (Zibakenar in west and Kiashahr in the east) are developed during the past century.

High sedimentation in the central Guilan, climate and vegetation have hided the past sea level signature. A few old beaches are exposed near Rasht and Anzali, the former probably belongs to the Late Khavalyn and the latter to the first millennia AD.

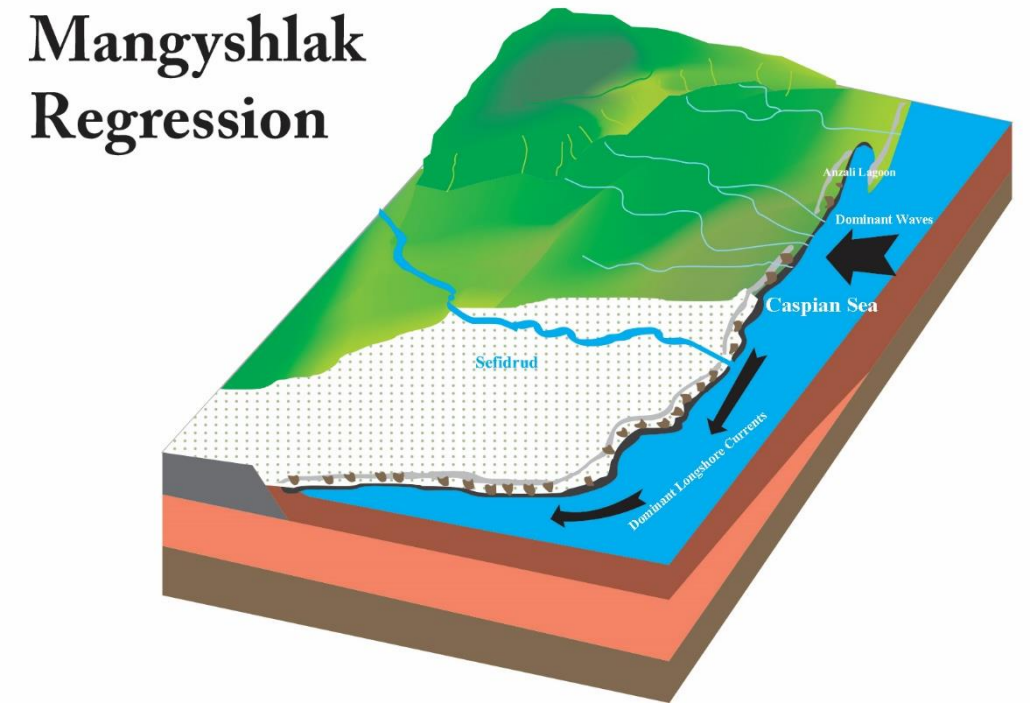
Sefidrud Delta plain in the central Guilan



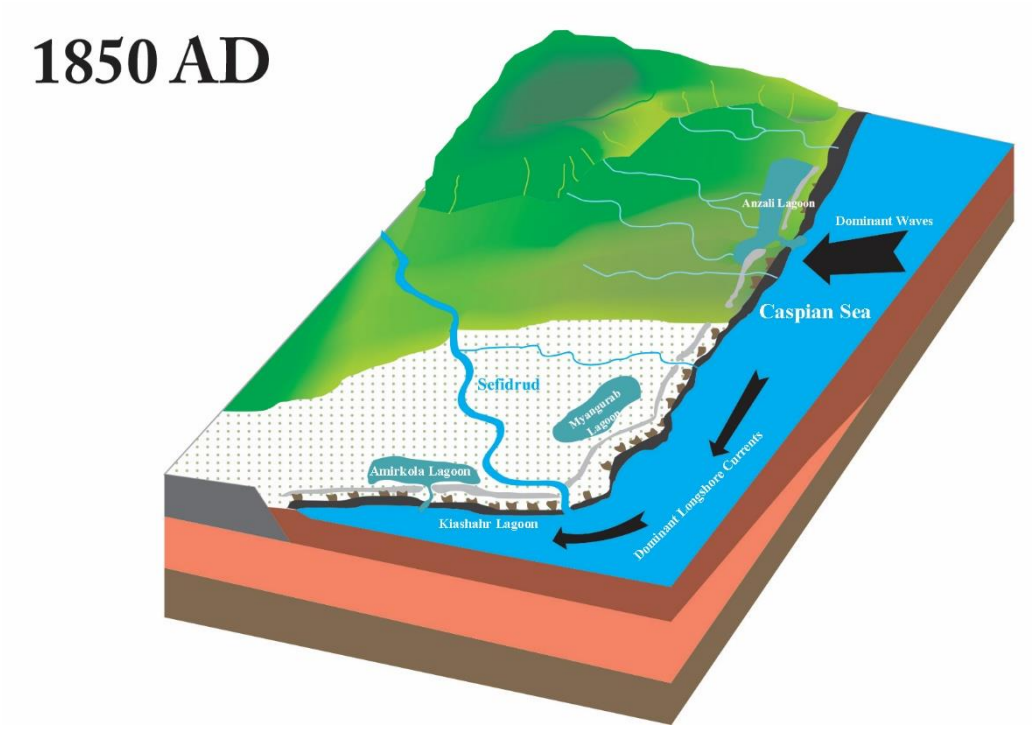
Shoreline progradation in the old Sfidrud area



Late Khvalyn shoreline in the cental Guilan, old Anzali Lagoon and Spit formed behind the present Lagoon



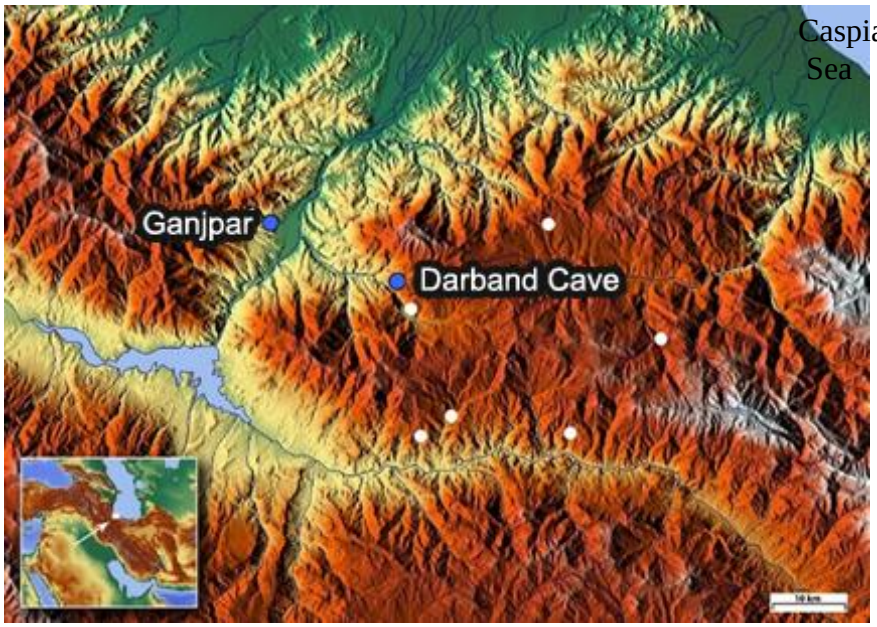
Mangyshlak shoreline in the cental Guilan, old Anali Lagoon and Spit now located in depth of around 20m in front of the present spit and desplayed in the bathymetry map



Shoreline in the cental Guilan in the late 19th century before the last Sefidrud Avulsion, burried freshwater lagoon located in the west of Sefidrud

Geoarchaelogy of the Central Guilan

Darband-e Rashi Cave



Darband-e Rashi Cave is a late Lower Paleolithic site on the north side of a deep tributary canyon of the Siahrud River, a tributary of the Sefīd-Rūd River. Darband consists of a larger cave and a smaller one, called espectively "Kohil-e Gar" and "Jav-Kohile" by the local people, each measuring 60 and 30 meters in length. The openings of both caves face towards the south. The caves floor is covered in some parts with flowstone, which point to water penetration into both caves and carbonate deposition. Darband-e Rashi Cave was tested in 2012 under the direction of Fereidoun Biglari, National Museum of Iran.

General view of Darband caves

A 2x1 m test pit, oriented east-west, was dug near the western wall. This test pit which excavated to a depth of 1 m bellow the present floor, mostly included natural deposits. Four sedimentary units were identified in this test pit that mostly consisted of silty clay. The test pit yielded a small collection of lithic artifacts. Second test pit (2x1 m) was dug in the central part of the cave in north-south direction. Maximum depth of this trench was 46 cm bellow the present floor. At this depth, a surface densely covered with limestone fragments, faunal remains and lithic artifacts was encountered. This floor was inclined toward the cave entrance. Location of all archaeological finds as well as natural rocks was carefully recorded and documented. Human bones and several potsherds were also found around two pits dug by illegal excavators at the rear of the cave. These finds probably belong to one or more Iron Age burials.

Excavations at Darband cave, 2012

The faunal remains collected from the disturbed deposits numbers approximately 1000 specimens and the test pit 2 yielded more than 90 specimens. These remains included different anatomical parts of large-size carnivores (mostly cave bear), and dear, wild sheep and goat, rabbit and other species. The faunal assemblage from test pit 2 include bear, dear and wild sheep and goat. A considerable number of remains – such as teeth, mandible, and vertebra - belonged to bears. Several animal teeth were dated by Uranium Series method.

A total number of 13 lithic artifacts including flakes, tools and a core were found in test pit 2 and 29 artifacts including flakes, tools and debris were found in test pit 1. Disturbed deposits also contained a sizeable number of lithic artifacts. On the basis of recent finds from 2012 excavation, it can be concluded that Darband lithic industry is dominated by flake production and typologically, the tools include side-scrapers, denticulates and notches. The presence of a complete and a broken biface suggests that the industry can be attributed to Acheulian techno-complex.

The presence of large numbers of cave bear and brown bear remains and sparse stone artifacts at the site indicates that Darband primarily represents a bear den. The co-occurrence of artifacts and bear bones does not imply human predation or scavenging. Because there are no clear cut marks, except a few burning signs on the bear bones, they probably accumulated through natural processes.

Darband Cave is currently the only known Lower Paleolithic cave site in Iran with absolute dating and hence provides an opportunity to study late Lower Paleolithic hominin adaptation to this key region at southwest of the Caspian Sea.

Marlik Iron Age Cemetery

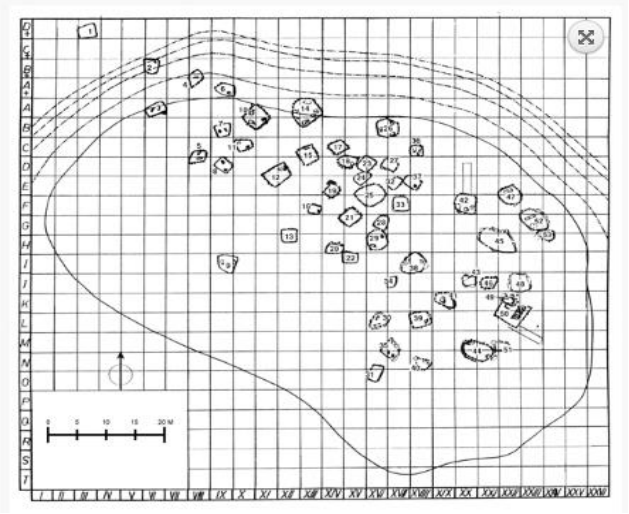
It is an elite burial ground of the late 2nd-early 1st millennium BCE in the Sefidrud Valley, Roudbar region. Mārlik (called so for the abundance of snakes in the area) was recorded in

the fall of 1961 during a survey by an expedition from the Archaeological Service of Iran on the banks of the Gowharrud River, a tributary of the Sefidrud River in Rudbār.

The mound of Mārlik seems to be a rocky outcrop capped by several meters of sediment. It is surrounded by olive groves and fruit gardens owned and maintained by local villagers, overlooking rice paddies on the lower slopes of the valley. Following a testing of the mound, a team began large-scale excavations at Mārlik from October 1961 to November 1962 under the supervision of ʿEzzat-Allāh Negahbān, then professor of archaeology at the Tehran University.

ʿEzzat-Allāh Negahbān and a sample of Mārlik finds. After Negahbān, 1996

Golden Cup depicting Griffin on top band. Excavated at Marlik. First half of first millennium BC.



Distribution of Mārlik tombs. After Negahbān, 1996

In total, fifty-three tombs were discovered at Mārlik. The tombs were dug into the overlaying sediments of the mound, sometimes hitting and penetrating into the underlying bedrock. The tomb constructions vary from roughly dug pits lined with stone to fairly well-constructed examples with walls made from stone slabs bound together with mud mortar. The stone used in the tombs is mostly local, but in some tombs one could see yellowish slabs brought from the headwaters of the Gowharrud, some 15 km to the south. A few, evidently more important, tombs are entirely made of this imported stone, a potential indication to the social significance of the occupant. The tombs range in size from fairly small (1.5x1x1 m [Tomb 4]) to relatively large (7x4.5x2.5 m [Tomb 52]). Most tombs yielded very little or no large skeletal remains, perhaps a result of natural deterioration of organic material and rodent activity. In the handful of tombs, where partial skeletal remains where preserved, the body seemed to have been laid on its side on a large, flattened slab, surrounded by grave goods.

The grave goods, numbering over 25,000 individual items, constitute the largest collection discovered from any cemetery of the Early Iron Age anywhere in the Near East. The collection includes gold, silver, and bronze vessels of different shapes and sizes, from plain to highly decorated examples, mosaic glass and frit vessels, ceramic and metal figurines and statuettes of animals and humans, a wide range of personal ornaments and pottery vessels, stamp and cylinder seals, a wide assortment of tools and weaponry, as well as horse trappings and miscellaneous items. Thanks to a series of publications by Negahbān, as well as secondary publications including some in more popular venues, a series of stamps published in 1960s to commemorate the discovery, and the use of imagery from Mārlik finds on Iranian banknotes from 1960s and 1970s, Mārlik has come to occupy a prominent place in collective national patrimony of the Iranians.

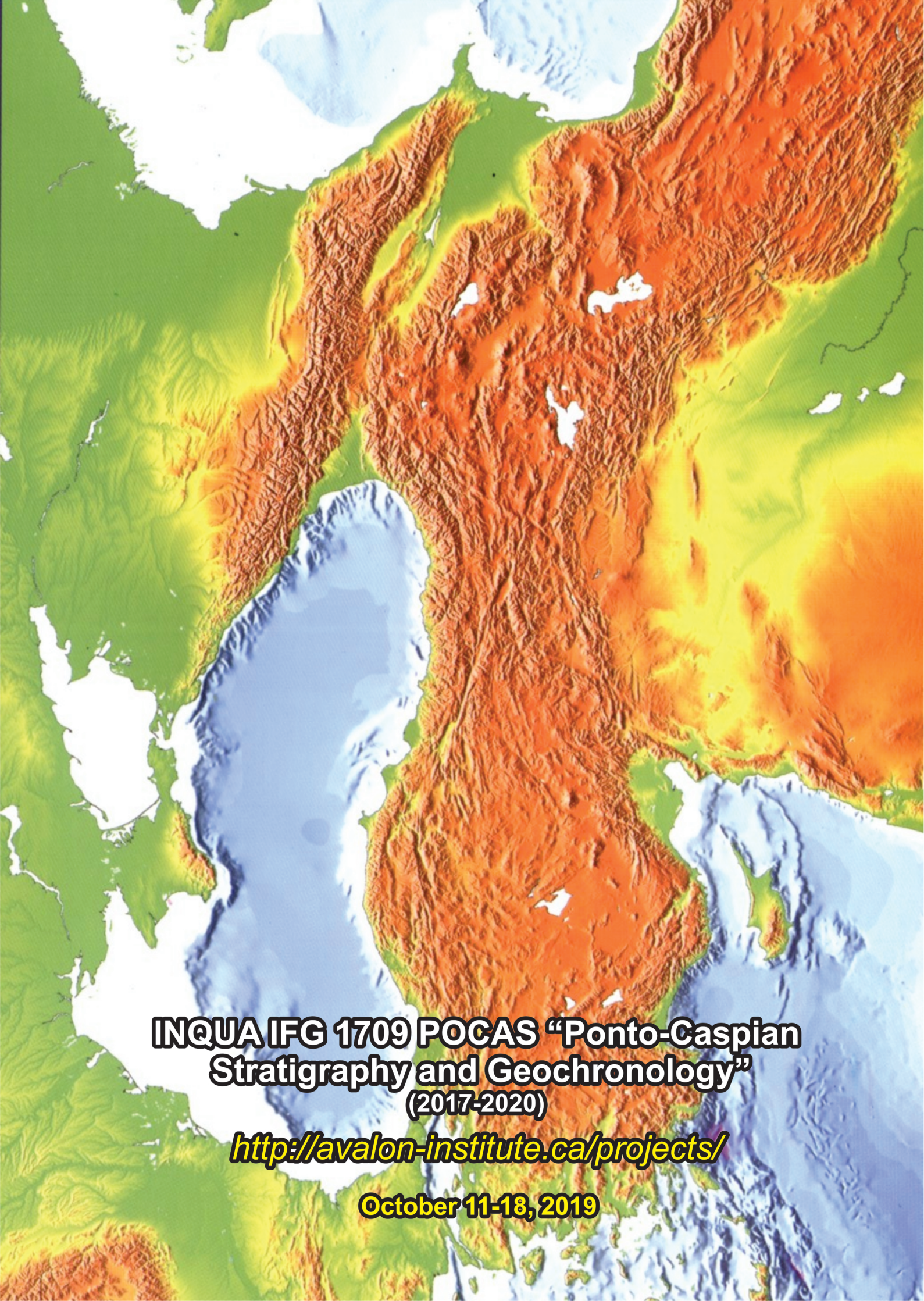
Qale Rudkhan Fort

Rudkhan Castle is a brick and stone fort that has been built during Sassanid Dynasty (224-651 AD). It is located on the climax of a forest mountain at elevation of 700 m in the south Fuman, Guilan Province.

Masulle Village

Masulle is an old village (since 1000 AD) in the suburb of Fuman, Guilan Province. Houses have been built in the forest mountains, courtyards and roofs serve both as pedestrian areas..


N
Caspian Sea
دریای خزر
Scale 1: 270,000
Visiting sites
Gilan Province
استان اردبیل
Ardabil Province
استان زنجان
Zanjan Province
استان قزوین
Qazvin Province
استان مازندران
Mãzandarãn Province
RASHT
Tãlãb-e-Anzali
(Mordãb-e-Anzali)



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