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## Consequent increase of the Caspian level in the coastal zone of the Republic of Azerbaijan (according to aerospace data)

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### Keywords

Level of the Caspian Sea  
Azerbaijan coastal zone  
Flooding

### Abstract

The results of the study of fluctuations in the level of the Caspian Sea and its effects on the coastal zone of the Azerbaijan Republic are presented. During the period 1978 - 1995, the level of the Caspian Sea grew rapidly. Estimates of flooded areas by administrative areas are given, as well as other negative phenomena in the coastal area. For a detailed study of the state of flooding of the Azerbaijani coastal zone when raising the level of the Caspian Sea, we compile maps of flooding of all extents of coastal lines. The map of the flooding of the Azerbaijani coastal zone is made up of aerospace photographs.

## 1. Introduction

The Caspian Sea is of particular interest to scientists because of its history of fluctuations in both area and depth, which offer clues to the complex geological and climatic evolution of the region.

Approximately 5 million years ago, the Caspian Sea separated from the Black Sea as a result of tectonic and climatic processes and formed its own independent basin.

Its elongated form extends almost 750 miles (1200 km) from north to south, and its average width is about 200 miles (320 km). At present, it covers an area of about 145,000 square miles (391.000 km<sup>2</sup>). The Caspian Sea is not only an economic source, but also a climatic regulator of this region.

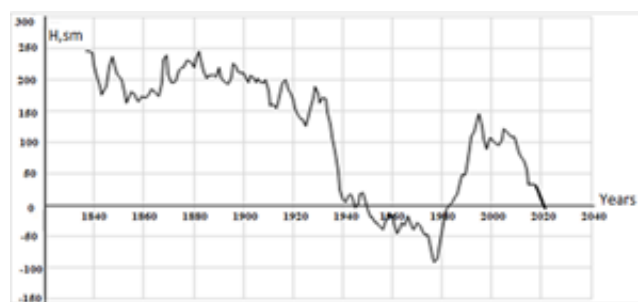
## 2. Method

During these many years, there have been considerable fluctuations of the sea level (Figure 1). Short - term wind fluctuations can cause rises up to seven feet, though the average is about two feet. Barometric pressure changes can cause similar fluctuations. Tidal variations are only a few inches. And the seasonal rises, induced by high spring water in rivers, are not much more.

At present, it is established that more than half of the coastal territory of the Republic of Azerbaijan was in conditions of flooding of the coastal zone during the rise

of the level of Caspian Sea by 2,5 meters between 1978 - 1995, the flooding maps of all the length (about 800 km) of coastal lines are drawn up. For this purpose, the aero - cosmic photo, data of regular instrumental measures of Sea level and expedition works in coastal zone were used. The map of the flooding of Azerbaijani coast is drawn up with materials decoding aero - cosmic photo using the literature and the fund materials, also with topographic and subject - matter plans. So, about 100 maps of flooding were drawn up in 1:25000 scales. On the basis of the coastal zone of the Republic of Azerbaijan, 26.5 mBS. (Figure 2).

The morphometric characteristics and the square of flooding of 11 administrative regions of the Republic of Azerbaijan situated in the coastal zone of the Caspian Sea are given in the Table 1.



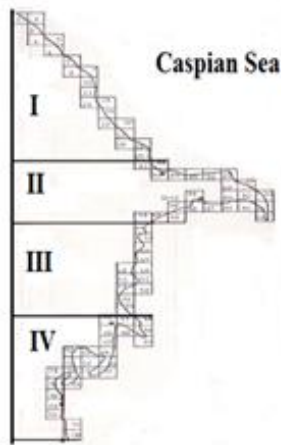
**Figure 1.** Change in the level of the Caspian Sea (1837 – 2021)

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**Figure 2.** Layout of maps in the Caspian coastal zone (scale 1:25000)

**Table 1.** Areas of flood of the coastal zone in the administrative regions

The name of areas	Length of a coastal line, km	The area of flooding, sq. km
The Hachmas	66.0	20.70
The Shabran	20.7	10.40
The Siazan	39.6	6.10
The Hizy	26.1	5.10
The Baku - merry	289.6	38.20
The Saljan	11.7	0.60
The Neftchala	94.6	132.70
The Qizil- Aqaj Bay	102.0	239.00
The Masalli	31.5	26.70
The Lenkoran	35.1	4.10
The Astara	21.1	0.90
Total	738.10	484.50

It is received, that at flooding the coastal zone of the Azerbaijan Republic is divided into 4 characteristic regions:

- From river Samur to Apsheron
- Apsheron peninsula
- From Apsheron peninsula to delta of the river Kura
- From the river Kura to river Astara

It is revealed that as a result of the rising in the level of the Caspian Sea for the period 1978 - 1995 on all extent of the Azerbaijani coastal zone the processes of flooding occurred. The total area of the flooded territories is 484.5 square kilometers.

The greatest flooding comes from sea level rises, and the coastal region threatens from the delta of the river Kura in Astara River. It accounts for about 80% of the area of possible flooding at sea level. The housing and economic objects located on all extent of a coastal zone which is under the threat of flooding is defined by the flooding Atlas

- 50 settlements
- 250 industrial enterprises
- 60 km of highways
- 10 km of the railway
- 30000 hectares of winter pastures
- 10000 hectares of the irrigated earths
- Recreational objects on 200 thousand persons. (Aliyev, 2001)

Reasons for Sea fluctuations many contributing factors, that could effect the rise as runoff inflow, precipitation over the sea itself and evaporation from the sea surface. The water balance of the Caspian depends directly on climate changes, taking place on all territory of the Caspian Sea basin which, in tum, is greatly influenced by the Volga River which provides more than 80% of the lakes volume. Some scientists have suggested that sea level variations are due to tectonic processes taking place in the region of the Caspian. But a study of geomorphologic processes for the last 200 years shows that the tectonic activity in the region is very weak. (Aliyev, 2010).

Since 1996 a non-stationary regime has been observed in the level regime of the Caspian Sea, which continued until 2004. From 2005 to the present (2021), the sea level has been continuously decreasing at a rate of 7-8 sm/year. At present, the decrease is about 1.9 m (Figure 1). In forecasts based on climatic factors, it is agreed that the lowering of the Caspian Sea level will last at least until the middle of the XXI century (Aliyev, et.al. 2021, Aliyev and Veliyev, 1999).

### 3. Conclusion

As a result of the processing of aerial images, it was determined that during the rise of the sea level by 2.5 m in 1978-1995, approximately 50 thousand ha of our coastal area was flooded. At this time, many negative incidents occurred in the coastal areas. The sea level has been decreasing since 1996, and currently a decrease of 190 sm is observed. It is predicted that the level of the Caspian Sea will decrease by 2050 years.

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