Sea Level Fluctuations: Inferences from Religious and Archaeological Records and their Oceanographic Evidences

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In different religions the description of "Pralaya", "Khand Pralaya" and devastating flood is present in one form or the other in the light of the modern sea level fluctuations data.

Awareness of the fact that sea level was not constant has played a dominant role in many events in the history of mankind. These evidences are found in the form of geological, archaeological, anthropological and historical records. Besides these, a number of indirect evidences are available in the sacred books of many religions of the world, for example the Hindu religion believes in the occurrence of "Pralaya" or "Khand Pralaya" depending upon geographical extent of the flooding.

भागीशानिकत्यानं प्राची विकास विकास

"At the end of the last Kalpa, there occurred a Pralaya caused by reason of Brahma's slumber, when all the worlds, the earth and the rest were deluged by the Ocean". (Srimad Bhagavatam. Book 8, Chapter 24, Sloka 4-9).

Manu was the wise old man who got hints of such phenomenon and survived during "Pralaya" due to migrations.

The Holy Quran describes the devastating flood which took place during prophet Noah's time. He was competent enough to understand Nature's warning and started preparing an Ark at a place which was situated sufficiently very much away from any likelihood of flooding or submergence. Quran describes this event in the following words:

"So we inspired him (with this message) Construct the Ark within our right and under our guidance: then when comes our command and the fountains of the earth gust forth, take thou on board pairs of every species, male and female and thy family". (S XXIII, 27).

The Bible also describes a similar event as:

Then the lord said to Noah, "Come into the ark ... for after seven more days I will cause it to rain on the earth forty days and forty nights, and I will destroy from the face of the earth all living things that I have made". (Bible Chapter Genesis, 7).

Another instance of a reference to sea level change was during Lord Rama's time. when Nal and Neel, who were the architects in the army provided the bridge between Rameshwaram and Sri Lanka. This can be explained when one realised that during the period of the Ramayana, position of the mean sea level during that time was lower to bridge the gap. The stones to bridge the gap which they used attained the property of floating after their touch. They may have been pumice stones which have this characteristic of floating in water and bridging was possible due to the then shallow sea (shallower than present). During the "Dwapara Yuga" Lord Krishna established "Dwarka" in the coastal belt with a word of caution that Dwarka will submerge as described in Srimad Bhagavalam:

व धोधनभनुष्य व बदात्व जां जहाशान निवक्षितितांत्र के इ तथा प्रचे कोक्याताः कार्यस्यं कंडिय-काहित्यः प्रदेश तथा निकारितं तथा देववार्यकांत्रतः व ध्वयंत्रवातियांडक्रकेश्व अववर्धार्थतः वश्य दुर्ज्यं व शायित्रंत्र्यं सहायस्वयोग्यस्थितात् व लगुद्दः समर्थेडव्यस्यं पूर्वं व हार्वाय्यति वश्य वर्षेत्रव वया स्वयं व्यव कोब्येडवं वयस्त्रत्यः इ अविकारिकार्यः व्यवस्थिति विद्याद्वाः इत्यं व वृष्णस्यं स्वयंवेद् यया स्वयं व्यवस्थित This race has been already burnt up by the curse, and is going to perish by mutual strife. Seven days from now this city will be submerged by the ocean" (Srimad Bhagavatam, Book 11, Chapter 7 Shloka 3 & 4).

This leads us to two possible inferences: (i) there was an understanding that sea level was not stable and that their knowledge at the time was advanced enough to provide prediction. One may ask if he knew pretty well that the city is going to submerged then why did he build it? May be based on the concept of "Cost and effect"? (ii) the technology was available to reclaim the land from the sea for urgent use.

Reasons for the drowning of land as reported in religious books can be classified as flood due to sea level changes or rainfall. Emiliani (1976 a, 1976 b) based on a study of marine sediment from the Gulf of Mexico indicated that there was indeed a universal flood and this flood came from the sea rather than from the sky.

In view of the foregoing the key question is - whether the above indications of sea level fluctuations and related phenomena available in different religions and archaeology can be substantiated with scientific records, or on the other hand, can scientific explanations be provided for mythological references to sea level change? If so, where are such records? Records of sea level fluctuations and related climatic changes are preserved in seabed in the form of layered sediments and can be studied through proxy data like faunal contents and sedimentological characteristics of the sediments. Longer geological records show that once upon a time, about 280 million years ago there was a major marine transgression when an arm of sea reached deep into Madhya Pradesh. There are several evidences which show that over 200 million years ago in place of Himalayas there was a large sea known as the "Tethys". However, our immediate interest is with the relatively shorter time span of the last 11,000 years B.P. (known as Holocene in geological literature) as it

covers recent human history and culture.

Our earlier geological studies from the west coast of India indicate that about 10,000 years B.P., sea level was 60-90 m below the present and climate changed from warm and to warm and humid (Nair and Hashimi, 1980; Hashimi and Nair, 1986). A subsequent intensification of monsoon was also inferred. Historical records also indicate that total rainfall during the Indus valley civilization was double than the present (Singh et al., 1986) and the sea level was about 2-6 m higher than the present.

History of global sea level changes for the past 8,000 years was presented by Fairbridge and Hillaire (1977). To resolve the possible cycles from these records Negi and Tiwari (1988) have performed maximum entrophy spectral analysis. They have demonstrated stable periodicities of 1083 and 634 years in sea level fluctuations and correlated well with planetary cycle of 1133 and 567 years respectively within error limits. Astronomical variations of 550-1100-1650 years are known and are related periods to earth/moon orbital motion. According to Fairbridge (1982) peak years in ice melting in Scandinavia as counted in the varved lake sediments are at 10,500; 9,950; 9,400 and 8,900 years B.P. Analyses of biological records in the form of tree rings from Japan also revealed the cycle of 523 years which reflect 567 years cycle within the error of dating. The above converging evidences indicate conclusively a cycle of about 550 years in sea level and climatic changes.

The catastrophic astronomical events not only changed sea levels but left their signatures in archaeological events. A correlation has been established between the Little Ice Age in Europe which had its origin in year 1443 - a year of "all planetary conjunction" witnessed perigeal spring tide, catastrophic tide, flooding etc. Formation of East India Company in 1600 AD and subsequent colonisation of Asia, South America, Africa by Europeans, were in fact associated with deterioration of

climate.

Dhavalikar (1988) has reported some of the ports like Sopara which also went out of use during this period. Negi and Tiwari (1988) have stated that confirmation of the characteristic time units allows us to predict that human race must have gone through 20 such phases ("anthropological waves") during the last 11,000 years. If we consider the cycle of about 550 years then there should be 6 phases of transgression of sea and submergence of Dwarka during the time span from 1500 B.C. to present day (Negi and Tiwari, 1988) assuming no tectonic movement. This inference is very close to Rao's marine archaeological findings (1987).

The rise and fall of sea level and related climatic phenomenon have not only forced ancient man to migrate in the course of a rise but also helped them to flourish along the coast during low level. Even now, man is worried about consequenses of rise in sea level in the next century due to global warming associated with the greenhouse effect. As a consequence, it is feared that many world wide coastal establishments will be affected adversely (Nigam, 1989). It is hoped that the data generated for sea level and other paleoclimatic changes on the basis of records from the scabeds will be useful to substantiate the veiled references in religious and archaeological records on the one hand and also to generate predictive models for the welfare of future generation of mankind on the other hand.

Acknowledgements

The authors are thankful for their interest and encouragement to Dr.B.N. Desai, Director and Shri P.S.N.Murty, and to R.R. Nair, Assistant Directors for their constructive suggestions. We are also thankful to Dr.S.R.Rao, Emeritus Scientist, for providing the necessary references, reviewing the manuscript and suggesting the improvement. The secretarial assistance from Miss Geeta Menon is

also acknowledged. One of us (R.N.) acknowledges the financial assistance from DST, New Delhi.

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