# Chapter 9

## DISCUSSION AND SYNTHESIS

### THE GREAT RANN OF KACHCHH

Kachchh basin is a pericratonic palaeo-rift graben located in the western continental margin of India. The basin is included in the zone V category of the seismic zonation map of India because of the active nature various E-W trending faults in the basin. The voluminous literature available on the area mainly deals with the pre-Quaternary tectonic and sedimentary evolution of Kachchh basin (Biswas, 1987; Biswas, 1999; Maurya et al., 2017). The Quaternary stratigraphy and neotectonic history of the basin is not fully understood and remains incomplete. The Rann of Kachchh is a crucial Quaternary terrain of western India, which has witnessed some of the best-known earthquakes in the Indian subcontinent (Rajendaran and Rajendaran, 2001). However, very little information exists on sedimentology, stratigraphy and neotectonic aspects of the Rann sediments. Earlier studies carried out indicate that the Rann basin mainly comprises of fluvio-marine and fluvial Pleistocene sediments overline by Holocene marine sediments which have witnessed continuous sedimentation until very recent times (Tyagi et al., 2012; Khonde et al., 2017a; Khonde et al., 2017b). The evolution of the Great Rann of Kachchh has been linked to tectonic activity in recent times (Roy and Merh, 1981). The basin was filled by sediments supplied from the Indus drainage basin while the surface has been smoothened by the frequent earthquakes (Platt, 1962). However, limited information exists on the sediments comprising the Ranns of Kachchh and its Quaternary evolutionary history.

Understanding the geological evolution of the Rann of Kachchh essentially requires a chronologically well constrained subsurface stratigraphy and palaeoclimatic/ environmental implication during the deposition of sediments in the basin. The present study is an attempt to reconstruct the geological evolution of the Rann basin through a comprehensive approach that involves, the study of depositional conditions, sedimentation pattern and its relationship with the Holocene Sea level fluctuations.

## SEDIMENTATION PATTERN IN GRK

### Greenlandian Stage

The sediment records of the GRK basin suggest that the basin is dominated by fine grain sediment (Maurya et al., 2013). The depositional variation noted from the GRK covers the entire range of tidal flat setting and sedimentation under shallow marine condition. The present high-resolution study of sedimentation pattern from the GRK basin through the Holocene period delineates the past depositional conditions and its evolution throughout this period. The relationship between the depositional conditions in GRK is established to decipher sediment nature.

The record from the southern part of the basin shows deposition prior to Holocene stage. The core experiences fluvial condition of sediment deposition which marks the fluvial unit of the core. The fluvial record is missing from the central basin core as the bottom most part shows marine influenced sediment deposits. The fluvial deposition terminated much prior to the central basin core which conclude the extend of the fluvial condition of deposition was limited to the southern part of the basin. The transformation towards the marine dominated sediments was noted during the Greenlandian Stage from in the GRK basin. The deposition from the central basin continued under transgression where the clay sized particles clearly show inverse trend that is characterised by lower to higher abundance from bottom upward in the core record. The central basin recorded the sub tidal depositional condition whereas the sediments from the southern part of the basin shows high occurrence of peat formation under estuarine of marshy condition of deposition.

The sedimentation rate from both the core ascertains the different deposition condition during the said stage where Berada core showed suppressed 1.06cm/y sedimentation rate whereas Dhordo core showing 8.71 cm/y. The sedimentation rate in the central basin was higher than the sedimentation rate in the southern basin. On comparing the sedimentation rate of different depositional conditions, it was noted that estuarine condition receives less sedimentation in comparison with other depositional conditions (Van Santen et al., 2007). Overall, the tidal range were surpassing the present Berada core location and was extended more towards landward at the present KMF

(Kachchh Mainland Fault). The Berada core marks the mouth of the estuarine during Greenlandian Stage.

### Northgrippian Stage

During the later part of Greenlandian and early Northgrippian Stage the GRK received deposition under sub tidal condition where high percentage of sand deposition was encountered from the Dhordo core. The Berada core from the southern part of the basin also showed increase in sand percentage experiencing the similar condition of deposition. This high energy condition of deposition shows the limit of the high tide still holds its extension towards the KMF surpassing the Berada core location. This deposition condition is in cohesion with the fluctuating but high sea level in the Northgrippian Stage. This points to the fact that Berada core may have still been in marshy condition and under tide influence but with changing and fluctuating high and low tidal reaches/ marks. At the end of this stage the transition from the sub tidal condition towards the intertidal condition is recorded in the GRK basin where the Berada core was exposed to the surface denoting the presence of high sea level than the present.

### Meghalayan Stage

The Meghlayan Stage has the highest clay content in entire core records (least sand content) which indicate relatively lower energy of deposition in the central basin of GRK. The sediments from the central and southern basin show characteristic light brown colour which indicates that the region would have been under very shallow water column. Abundance of marine microfossils from these sediments of GRK also advocates its active marine connectivity throughout Meghalayan Stage. The present study considers the dying of the major rivers during the aridity ceased the coarse-grained sediment supply to the basin. However, its connection with the Arabian Sea under a macrotidal setting would have brought fine grained sediments via coastal currents (Khonde et al., 2017a; 2017b). The deposition under regression is indicted by the lithological variation present at the depth of 9 m in the Berada core and at 7 m in the Dhordo core. This phase of regression is marked by high percentage of sand content from the Berada core and presence of anhydrite minerals in the Dhordo core. The high presence of sand particles and anhydrite minerals from the top part of the cores relates to the evolution towards the present supra tidal condition of the basin. The present condition supports the enhancement of soil formation and resulted in the lithological variation of the GRK basin. The lithology of the cores during Meghalayan Stage indicates deposition in the exposed environment. This stage marks the deposition under supra tidal condition which rarely experiences high tide inundation.

## HOLOCENE SEDIMENT ACCUMULATION CURVE

Sea level variability on the glacial-interglacial scale is significantly explored and several curves are available for comparison (e.g., Camoien et al., 2005; Goisan et al., 2011). However, due to the complex nature of earth processes it is not that straight forward to laterally extend the sea-level changes on temporal scale. There are several factors like- local tectonic processes, landscape changes, modification/erosional processes, preservation of sea-level indicators in a particular region, resolution (lateral and vertical) of studies conducted on local/regional scale that may lead to misinterpretation of the sea-level reconstructions (Tyagi et al., 2012; Maurya et al., 2013). Due to the tectonically active nature, it is challenging to interpret the sea-level changes in the GRK basin (Chowksey et al., 2011a, 2011b; Maurya et al., 2017; Khonde et al., 2017a, 2017b). Therefore, with the facies succession and radiocarbon dating we deduce the signature of sea-level changes in the GRK basin. The derived sea-level curve from the present study is compared with the global sea-level curve by Fairbanks (1989) and currently available sea-level curves for the western coast of Indian subcontinent (Hashimi et al., 1999; Kale and Rajaguru, 1989). Based on the past ~10 kyr in Dhordo and Berada cores, four major/significant change in the sea-level of the GRK basin were observed.

Great Rann of Kachchh is known to have accumulated huge pile of sediments during Quaternary period. Based on geomorphological characteristics, it is generally believed that the inherently saline sediments of the Great Rann basin were deposited during the Holocene in an embayed gulf with the surrounding raised land masses forming the source of the sediments. The chronological age of both the cores were used to reconstruct the sea level of GRK basin and its response to depositional sequences.

Below the temporal changes in the grain size parameters (Chapter 6), its possible depositional environments (Chapter 5), sediment accumulation and its relationship with the sea-level changes on the global changes as well as changes occurred along the western continental margin of India following the standard references.

### Greenlandian Stage

On temporal scale, there are three and five distinct units observed in the Dhordo and Berada core respectively. Each units record association with the sea level changes or climate/tectonic episodes as described below. Based on the chronological data from the two cores, i.e., central basin (~60 m core length) and southern part of the basin (~50 m core length) the marine influenced sedimentation initiated during the Greenlandian Stage (Maurya et al., 2013; Khonde et al., 2014; Khonde et al., 2017a, b; Kumar et al., 2021). The Berada core recorded fluvial influenced sediment estimated to be of later than Holocene period although the dating is yet to be carried out, for instant it can be estimated to be earlier than Holocene based on the surrounding of the core site area which are mainly of Tertiary sequences (Figure 9.1) (Maurya et al., 2013). The fluvial sediment at the core site may have been deposited in response to rapid sea level rise after a low-level stand during LGM where the sea level is estimated to be 120 m below present sea level.

The central part of the GRK basin records relatively high sedimentation during this stage. It is evident from the bottom most part of the core showing fining upward sequence between 10.6 to 9.3 ka BP with higher sand content (8-20 % rapidly fluctuating). However, a decrease in sand content is noted from ~9.3 toward 6.5 ka BP. The sediments in this part were dark and light gray coloured. This part is also characterised by the presence of high frequency laminations of coarser sandy and finer muddy sediment intercalation of varying thickness (Figure 9.1). The coarser grain size of sediment is the result of high sedimentation rate (8.71 cm/y to 2.37 cm/y) in response to post glacial rising sea level rise during ~10.6 to 9.3 ka BP. High sedimentation rate is reported from the similar marginal marine settings around the world during this stage (Limmer et al., 2012; Hori and Saito, 2007; Song, 2017). The microfauna content in these sediments indicate the existence of shallow marine environment during the deposition of these sediments (Khonde, 2014; Maurya et al., 2013). Sedimentation in the GRK basin during this time could have occurred under post glacial rapidly rising transgressive sea with ample sediment accumulation space. Moreover, the rapid sediment transport from fluvial landscapes, precipitation and sediment availability from the hinterland favoured the high sedimentation during this stage. The marine nature of the GRK sediments in this stage therefore provides the minimum age of the marine transgression into the basin (Fig). Furthermore, the accommodation space for such high sedimentation under rapidly advancing post glacial sea level would have provided by the structurally controlled subsidence of the GRK basin (Tyagi et al., 2012; Maurya et al., 2016; Sharma et al., 2020; Kumar et al., 2021).

For high sedimentation rate a huge sediment supply from potentially distal source such as Himalayan region (Khonde et al., 2017a) requires a large drainage network that could pass through Thar Desert and its margins with sufficient precipitation during this stage. This also points to strengthening monsoonal conditions during this stage which is also observed elsewhere, for example north-western Indian continental and marine records (Fleitmann et al., 2003; Gupta et al., 2003; Clift et al. 2008).

Sediment availability and release of huge sediments after the post glacial strengthening monsoonal conditions is well known phenomenon (Owen et al., 2002; Clift et al., 2008). During the transport of these sediments in post glacial fluvial channels might have contained some proportion of the aeolian sediments with it. This is seen through the trimodal distribution of sandy sediments in this part attests mixing of the desert sands in minor proportion with the distal sediment flux. The proportion of the desert sand must have been insignificant as the sorting of these sediment is poor to very poor in nature. Global sea level trends during the early Holocene period clearly show rapid rise in the sea level (Fairbanks, 1989; Camoin et al., 2004; Hori and Saito, 2007). However, the Dhordo core data matches well with Hashimi et al. (1995) curve for the western Indian continental margin. During this time the sediments were depositing at ~35 meters below present day mean sea level. However, the data differs by ~ 5 meters (30 mbsl) with the curve given by Kale and Rajaguru (1989). The southern part of the basin recorded comparatively low sedimentation rate of 1.2 cm / year during the Greenlandian Stage (Figure 9.1). The break in sedimentation was recognise (gradual but distinctive) at the base of the Berada core where the site goes from fluvial dominant to completely marine dominant at depth of 39 m. Comparatively low sedimentation in the southern part of the basin is due to the approaching shoreline under rising sea level where the presence of peat layer is encountered which is deposited under stagnant water present around the core region. The sea transgression may have resulted in the marshy environment or estuarine environment, which further resulted in the accumulation of organic material brought by the approaching fluvial sediment to the core site. The Berada core records sedimentation under Estuarine or marshy environment which was established in response to the rising sea level after LGM (Figure 9.1).

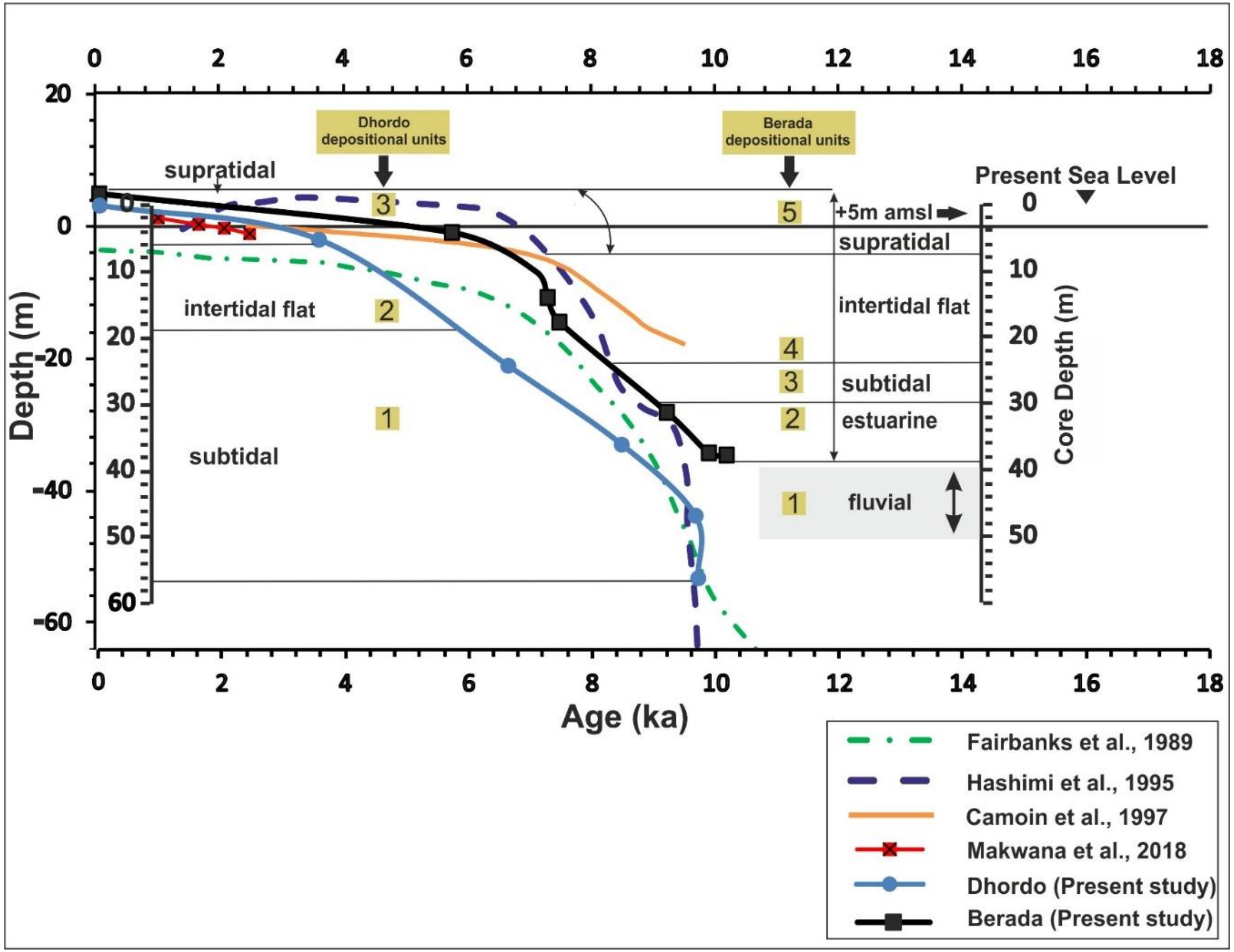


**Figure 9.1** Accumulation curves for the Dhordo and Berada cores and the respected depositional units of both cores. The sea-level curves for the last 11 kyr are illustrated based on Fairbanks et al., 1989; Hashimi et al., 1995; Camoine et al., 1997; Makawana et al., 2018).

High abundance of core mangrove pollens like *Rhizophoraceae* and *sonnarracia* quantifies the sediment deposition under stagnant water which is an ideal condition for organic matter accumulation. Comparing the sedimentation rate of different depositional conditions, it was noted that estuarine condition receives less sedimentation in comparison with other depositional conditions (Van et al. 2007). This stage is recorded as the period of high sea level stand worldwide and period of maximum delta initiation. Moreover, the sea level curve at this depth given by Hashimi et al., 1995 and Kale and Rajaguru, 1989 also shows high jump in the sedimentation, which is in agreement with the sedimentation rate of the GRK basin (Figure 9.1).

**Northgrippian Stage**

During the Northgrippian Stage the central and southern part of the basin shows same condition of sediment deposition where the central basin shows high jump in the sand particle which reaches to 35 % coupled with coarsening upward sequences. The sourthen part of the basins records high sedimentation rate under sub-tidal condition. This record from the southern basin matches with the record of the sea level from the western continental margin (Hashimi et al., 1995) and the global sea level data produced by Fairbanks (1989). The mismatch between sediment accumulation curve of Hashmi et al., 1995 and the central basins sediment accumulation curve can be on account to neotectonic activity which is one of the key features controlling the sedimentation in central basin. The Dhordo core site sediment-water interphase remained between 18 to 4.5 meters below msl which shows misfit with the global sea level by ~ 5 to 6 meters (Fairbanks, 1989), by 4 to 9 meters with Kale and Rajaguru (1985) and ~17 to 7 meters with Hashimi et al. (1999). This difference in the sea-level is in confirmatory with the interpretations from the sedimentological data that suggests the tectonic subsidence in the basin during this time frame. The chronology from the southern part of the basin shows that the Berada core was exposed during the Northgrippian Stage. This is in agreement with the Hashmi et al., 1995 sea level data which points towards presence of 3 m high sea level than present during Mid Holocene (Figure 9.1). The Dhordo core from the same stage continues to receive sediments under intertidal depositional conditions.

## Meghalayan Stage

The Meghalayan Stage can be considered as a stage of regression in GRK basin where both the cores show low sedimentation rate. This stage also marks the lowest sedimentation rate in the entire section of the cores. Decreased sedimentation rate in this zone goes lowest ~ 0.14 cm/y in Dhordo core from the central basin. In the upper half of the Dhordo core, there is increase in sand proportion during the past ~1500 years which most likely related with the regressive processes and sediment reworking till recent when GRK dried (Figure 9.1). The depositional environment for the upper part of this zone appears to be under tide dominated macrotidal regime and in intertidal to supratidal that is justified by presence of light brown coloured sediments with the salt crystals (gypsum, anhydrite crystals) in these sediments. The present core location is roughly 3 meters above mean sea level (Fig. 6) and the drill site very occasionally undergoes marine inundation during the strong wind events when the SW monsoonal winds flow in summers. These waters go further east of drill cores 30-40 km inland in north of Khadir Island and little beyond. From the chronological controls and sedimentation pattern, it appears that within past 1500 years the Dhordo core site changed from subtidal-intertidal to supratidal settings. From the southern part of the basin the lithological variation is noted at the depth of 9 m and increase in the sand content records the highest from the Berada core which could be estimated at the evolution to the present condition with enhancement of soil formation. The lithological variation indicates deposition in the exposed environment. The stage marks as the supra tidal zone in the core which rarely experiences the marine water.

## PALAEOENVIRONMENTAL CONDITIONS IN GRK

The cores raised from the Rann of Kachchh were analysed using multi proxy aspects which include physical grain size analysis, environmental magnetism and palynological studies to delineate the palaeoenvironmental and depositional conditions of the area.

Grain size distribution of both the cores were investigated to reconstruct the lithostratigraphy and depositional environments. There are some significant changes in lithology and sediment texture observed in some parts of the cores. It contains some significant amounts of reworked material, but continuous sedimentary sequence is believed to be found. Based on textural characteristics, the Dhordo core can be subdivided into (1) slightly sandy slightly clayey silt, (2) slightly clayey silt, (3) very slightly sandy slightly clayey silt (4) very slightly clayey sandy silt and Berada core is subdivided into (1) slightly sandy slightly clayey silt, (2) slightly clayey silt, (3) very slightly sandy slightly clayey silt (4) very slightly clayey sandy silt (5) slightly clayey sandy silt (6) fluvial sediment. In general sediments are silty clay to clayey silt with minor amount of sand in both the cores. The sand dominated lithologies are observed in the Dhordo core at 19 m depth which accounts to 35% of the sand, whereas sand content is anomalously increased from the top part of the Berada core (40%). The EV parameters are taken into consideration to decipher the palaeoenvironmental changes during the Holocene period where the magnetic parameters seek to identify casual links between magnetic properties and climatic/environmental histories/origins. Changes in sediment magnetic properties are linked with the formation, transportation, deposition and post-depositional alterations of magnetic minerals under the influence of a wide range of environmental processes (physicochemical processes) and therefore serve as diagnostic tracers over long periods of time. The variations in magnetic concentration ($\chi$lf, SIRM), grain size ($\chi$ARM, $\chi$ARM /SIRM, $\chi$ARM /($\chi$lf) and mineralogy (S- ratio) parameters have been demonstrated to be an excellent proxy of past climatic fluctuations. The palynological studies for the two core mainly focused on the linkage of paleoenvironmental variation and its impact towards the evolution of vegetation pattern in the GRK basin. The palynological study carried out on the two raised cores from the basin revealed the dominance of core mangrove taxa, such as *Rhizophora* spp., *Bruguiera* sp., *Sonneratia* sp., *Avicennia* sp., as well as the peripheral mangrove taxon (*Nypa*).

The variation derived from the multipoxy study for palaeoenvironmental changes and depositional condition during the Holocene period in GRK are discussed below.

**Greenlandian Stage**

This stage is marked as stage of transgression in the sea level where the Dhordo core shows the presence of lamination. Dhordo core records this time slice with highest sedimentation rate as a rapid response to the post glacial climate change (Maurya et al. 2013; Khonde et al. 2017a). During this stage, the susceptibility (($\chi$lf) values vary from 21 – 24 $*10^{-8}$ $Am^2kg^{-1}$ (~60 - ~50 m depths) by decreasing values from bottom to up (Figure 9.2a). This transition is significant as it denotes high to low concentrations in the magnetic minerals, which anticorrelates with the silt percentage in the Dhordo core record. Sedimentologically, the deposition of fine-grained sediments with 10% of sand particle indicates relatively high sedimentation rate.

The magnetic parameters such as S-ratio and soft IRM shows more than average values suggesting high abundance of magnetite mineral denoting wetter conditions during this stage which relates with the presence of thinly laminated silt present at these depths (Maurya et al., 2013, Khonde, 2013). This stage in Dhordo core is mainly dominated by muddy sediments texturally classified as clayey silt to silty clay. The transition from silty clay to clayey silt shows gradually shift in the energy of deposition (Chen et al., 2004; Conroy et al., 2008). The Berada core from the southern part of the basin also shows finned grained sediments coupled with presence of 5 to 10 percent sand particles indicating the sediment deposition under similar palaeoenvirionmental condition as that of Dhordo core (Figure 9.2a). The persistence of the fine-grained lithology in both the cores is remarkable (Figure 9.2a and Figure 9.2b). The granulometric magnetic parameter $\chi$ARM/SIRM and $\chi$ARM are sensitive towards finer sediments whereas low values of this parameter show the coarsening of the magnetic grain size (Maher, 1988). The relative increase in finer sediment flux indicated by increasing trend of $\chi$ARM/SIRM, which shows the gradual strengthening of monsoonal conditions from both the cores. In the Dhordo core $\chi$ARM/SIRM and $\chi$ARM shows lower to average values inferring the presence of mixture of MD-SD particles at the same time. These parameters points toward the strengthening of monsoon under increasing humid conditions. Moreover, Berada core shows high to low $\chi$ARM/SIRM value along with S-Ratio which ranges between 6 to 5 suggesting the moderate influx of finer sediments, this may be in response to gradual build-up of monsoon during 8.5 to 7.5 ka (Figure 9.2b) (Partiyal et al., 2014) in similarity with the conditions presents in the central basin of GRK. The presence of this conditions in the central basin and southern margin of the basin is also projected by the mangrove pollen like *Rhizophoraceae* and *sonnarracia* at the vicinity of the Dhordo core and Berada core. The early Holocene is considered as a stage of stronger monsoon (Gupta et al., 2003). The multi proxy analysis carried out by Prasad et al., (2013) from the sediments of Wadhwana Lake, Gujarat suggested excessive wet climate and high lake stand during ~7500 to ~6795 cal yr BP. The data produced from the analysis on the sediments of Arabian Sea carried out on G. bulloides reveals that weaking of southwest monsoon around ~ 8 ka.

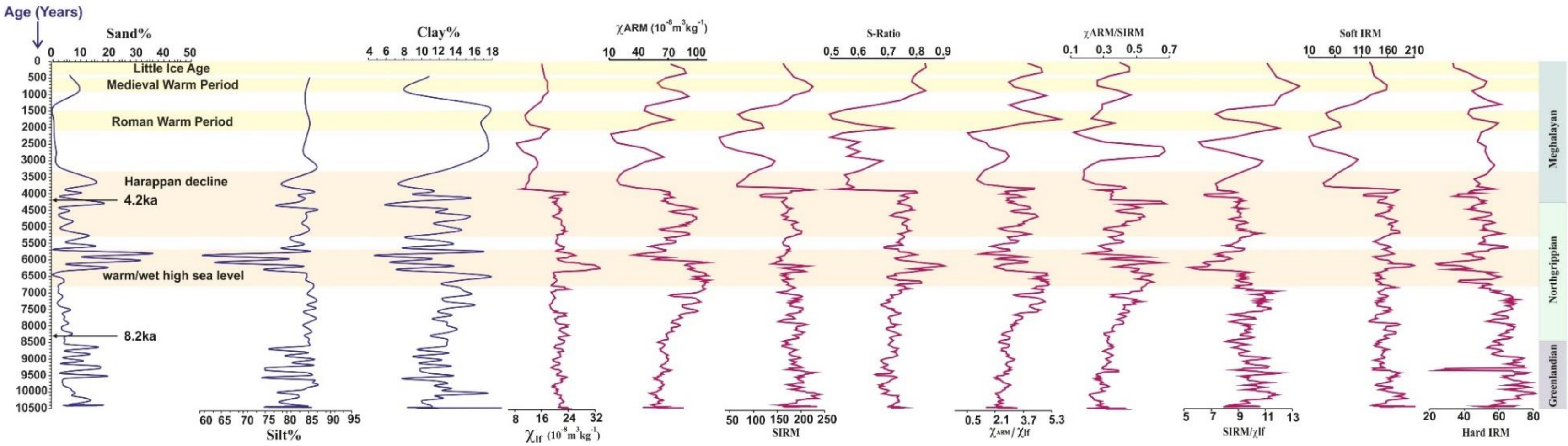


**Figure 9.2a** Graphical representation of Environmental magnetic parameters and Grain size variation in Dhordo core during Holocene period.

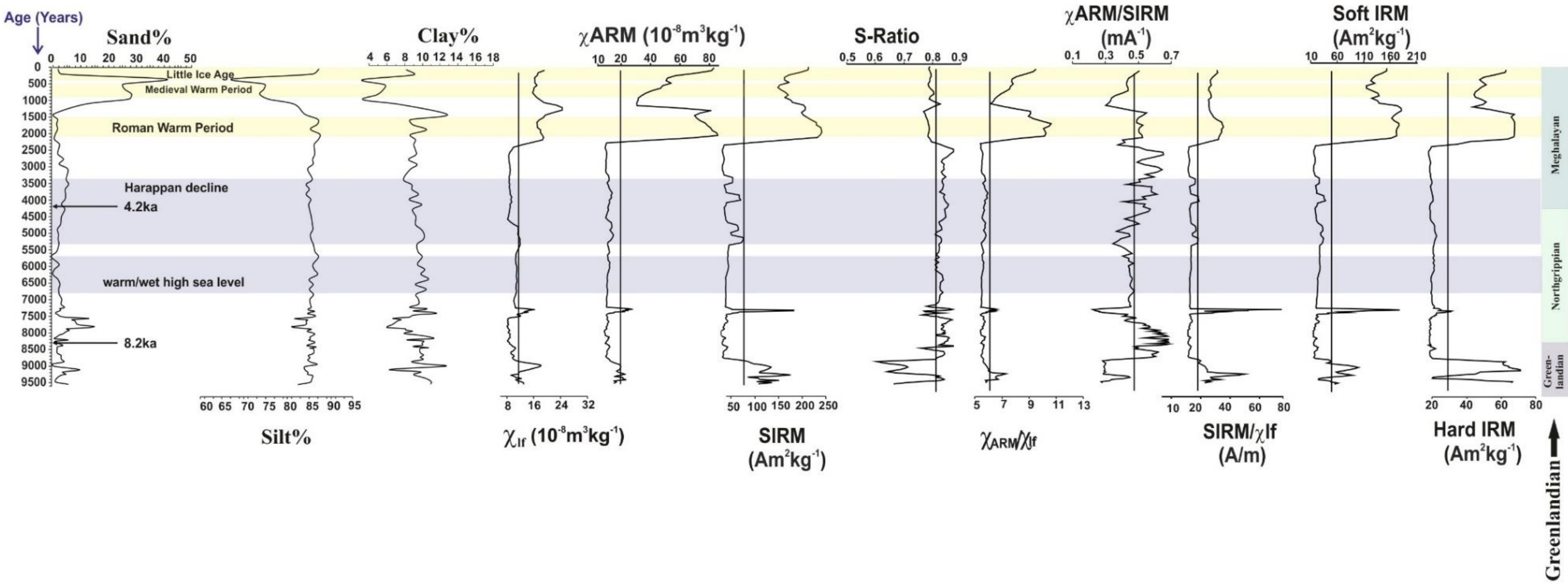


**Figure 9.2b** Graphical representation of Environmental magnetic parameters and Grain size variation in Berada core during Holocene period.

Overall, this stage from the data shows gradual built up of humid and monsoonal conditions during ~8 ka with strengthening of monsoonal conditions post ~7.5 ka.

**Northgrippian Stage**

In the central basin core record, a decrease in the value of the $\chi$lf suggest decrease in concertation of magnetic minerals 30- 28 m depth (~8 ka). Moreover, the decrease in the trend of S-Ratio from 30- 28 m depth (~8 ka) also suggest the downfall in the development of ferrimagnetic minerals. The coupled relation of low values of ($\chi$lf and S-Ratio shows lower input of magnetic minerals which shows the decrease in the intensity of monsoon conditions. In contrast to the Dhordo core, the Berada core records the presence of high ($\chi$lf values from 30 to 27 m depth suggests the presence of high magnetic mineral concentration during ~8 ka (Figure 9.2a). This could be due to extinction of mangrove forest around the Berada core as suggested by the high presence of core mangrove pollen during ~8 ka. Whereas the increase in the clay percentage and decrease in the silt, fine sand percentage shows the lowering of the sediments influx which relates to the low energy conditions prevailing in the area (Sandeep et. al., 2017).

The Dhordo core from 30 -20m shows that the $\chi$lf value remains at around 21.6 $*10^{-5}$ $Am^2kg^{-1}$ and the S-Ratio hovers around the average mark with increase toward the 27 m depth (~7.5 ka) is indicative of high magnetite content (Thompson and Oldfield, 1986; Sangode et al., 2001, 2007; Basavaiah and Khadkikar, 2004). The increment reflected in $\chi$ARM and $\chi$ARM/SIRM values shows finer flux of sediment with gradual increasing energy condition (Thompson and Oldfield, 1986). This increment is also reflected by increase in silt percentage. The Berada core shows high value of ($\chi$lf and S-ratio from 25 m to 19 m like Dhordo core during the same time frame pointing towards the depositions of sediment under high monsoonal conditions (Figure 9.2a and Figure 9.2b). Overall, during ~8 ka GRK basin shows reduction in monsoonal conditions with sub-arid to sub-humid type of climate. The strengthening in the monsoonal conditions was noted during the latter part of Northgrippian Stage in the GRK basin. The data also collaborates pollen evidence from Himalayan region which predicts strong monsoon during mid Holocene (Phadtare, 2000). This condition noted from GRK basin from the study is also in agreement with the continental record from the lake sediments of Nal Sarovar, Gujarat which documents a short spell of wet climate during ~ 6.2 ka. This stage is known for high increase in precipitation which documents for the strong monsoon precipitation during early mid Holocene (Singh et al.,1990; Roy and Singhvi., 2016).

**Meghalayan Stage**

This stage is reflected in the Dhordo core from <20 m (Fig. 4) and from <14 m in Berada core. The decline in concentration dependent parameter $\chi$lf marks the stage of aridity in GRK basin. The topmost part of the cores shows the dominance of Hematite mineral reflected by the S-ratio which points towards the onset of aridity during this stage. The rapid evolution of central basin under fluctuating withdrawal of the sea and the basin witnessing sediment deposit under regression condition and weak palaeoenvironmental condition (Khonde et al., 2017: Maurya et al., 2013: Khonde at al., 2013).

The southern margin of the basin shows some minor contrast nature related to magnetic signature under climatic variation where it shows high value of $\chi$lf along with increase in sediment grain size (Figure 9.2a). The S-Ratio shows decreasing trend along with $\chi$ARM/SIRM and with increment in HIRM pointing towards the input of hematite/goethite of coarser nature (Figure 9.2b). The presence of gypsum from the top portion of the Berada and Dordo core is indication of deposition under arid condition. The sediments show decrease in chemical weathering which implies the sediments to have deposited in oxidising condition (Khonde et al., 2016). The particle size analysis shows the increase of fine sand and at the same time decrease in the values of silt and clay on the top portion of the core. The core site suffers the withdrawal of the sea, which probably opens the accommodation space for the sediments to be deposited (Khonde et. al., 2017a; Khonde et al., 2017b; Maurya et al., 2013). The core location from the southern margin (Fig.1) is the location where the many ephemeral rivers (locally controlled) deposit their sediments. The onset of aridity phase (~5 ka.) perhaps resulted in the regression of the sea where the locally derived sediments (coarse to medium coarse) started accumulating at that locality. However, the increase in the sediment coarsening is also linked with the increase in sediment flux but in view of the magnetic data we could not find any signature of increase in the ferrimagnetic minerals as the S-Ratio shifts towards lower-than-average mark. The marine record shows the evidence of reduced monsoon wind strength from the Arabian Sea (Gupta et al., 2003). Staubwasser et al., (2003) carried out $\delta^{18}$O analysis which shows ~4.7 cal kyr BP was associated with lakes drying in NW India. The reduced and dry phase in the topmost sections correlate well with the dry event, recorded globally and in the Indian subcontinent (Gupta et al., 2003; Dixit et al., 2014).