

# **Indian Paleomonsoon and Environmental changes by Marine sediment cores**

**Submission of Final Report for UGC – Major Research Project  
2013 – 2016  
F. No.42-444 /2013 (SR)**

**Submitted To**

**UNIVERSITY GRANTS COMMISSION  
NEW DELHI – 110 002**

*Submitted by*  
**Dr. V. YOGANANDAN**



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NEW DELHI – 110 002

**PROFORMA FOR SUBMISSION OF INFORMATION AT THE TIME OF SENDING  
THE FINAL REPORT OF THE WORK DONE ON THE PROJECT**

1. TITLE OF THE PROJECT: **Indian paleomonsoon and environmental changes by marine sediment cores**
2. NAME AND ADDRESS OF THE PRINCIPAL INVESTIGATOR: **Dr. V.Yoganandan, Assistant professor, Department of Marine Science, Bharathidasan University, Tiruchirappalli-620 024**
3. NAME AND ADDRESS OF THE INSTITUTION: **Bharathidasan University, Tiruchirappalli-620 024**
4. UGC APPROVAL LETTER NO. AND DATE: **42-444/2013 (SR), 30.03.2013**
5. DATE OF IMPLEMENTATION : **30. 07. 2013**
6. TENURE OF THE PROJECT : **31. 03.2017**
7. TOTAL GRANT ALLOCATED : **Rs. 14,77,800 /-**
8. TOTAL GRANT RECEIVED : **Rs. 9,23,800 /-**
9. FINAL EXPENDITURE : **Rs. 12,79,344 /-**

## 10. OBJECTIVE OF THE PROJECT

- To identify intervals of strong and weak monsoon events using geochemical and stable isotopic proxies
- To delineate the cyclicity of strong and weak monsoon events during the Holocene
- To establish Holocene monsoon variability and their link to the solar forcing and Indian Ocean sea surface temperature
- To understand the influence of Indian summer monsoon in marine paleoproductivity.

## 11. WHETHER OBJECTIVES WERE ACHIEVED

**YES**

## 12. ACHIEVEMENTS FROM THE PROJECT

- This work strengthen paleoclimate and paleoceanography data for South Eastern Arabian Sea region and this is the first time high resolution data was generated for this region.
- This project data was presented in high level two international conference such as Italy and USA and several national conference or workshop. The data we generated through this project was appreciated by may subject expert
- This study can be used for educational purpose for Marine Geology and paleoceanography studies.

## 13. SUMMARY OF THE FINDINGS

In this study, we investigated a 4.82 m gravity core collected from the South Eastern Arabian Sea at water depth of around 513m during the **313<sup>th</sup> cruise of Ocean Research Vessel Sagar Kanya**. Totally 291 sediment samples were processed using standard methods, as given in Gupta and Thomas (1999). Dry sediment samples containing benthic foraminifera were sieved

over 125µm sieves and split into suitable aliquots of ~300 specimens, and then identified and counted. Here, benthic foraminifera census data were generated and identified 19 important species. Based on the standard literature benthic foraminifera are identified genus and species level. On the other hand Specimens were counted and their percentages were calculated. The chronology of core SK-313/GC-01 was developed based on five accelerator mass spectrometer (AMS) <sup>14</sup>C dates obtained on mixed planktonic foraminifera **from the Rafter Radiocarbon Laboratory, New Zealand.**

Through this studies we reconstructed high resolution paleomonsoon trend from South Eastern Arabian Sea for the Holocene section and Oceanographically important benthic and planktonic foraminiferadiversity and abundance were reconstructed for this region. We also identified strong and weak monsoon period for the Holocene section.

#### 14. CONTRIBUTION TO THE SOCIETY

The societal benefits of this project is high and few of them are

- This project provide high resolution regional paleoclimate data. This can be used to create climate model for the this region in future.
- This project provide understanding about paloclimate and oceanography conditions for this region.
- This study can be used for education purpose for the following subjects Marine Geology, Paleoclimatology, paleoceanography, Environmental Science and Meteorology

#### 15. WHETHER ANY Ph.D. ENROLLED/PRODUCED OUT OF THE PROJECT

Ph.D Enrolled : YES

Candidate Name : A. Siva Chandiran

Enrolled on : October 2013.

Status : Final stage to complete his Phd Degree.

#### 16. NO. OF PUBLICATIONS OUT OF THE PROJECT

## PUBLICATIONS FROM THIS PROJECT

- Siva Chandiran. A, V. **Yoganandan**, K. Selvaraj(2018) Paleoceanographic variation in the Southeastern Arabian Sea: Evidence from benthic foraminiferal biofacies. *Journal of Coastal Sciences*. Vol.5 (2) pp. 37-44.
- Siva Chandiran. A, V. **Yoganandan**, K. Selvaraj, P.Balachandiranand M. Ravichandran.Benthic foraminiferal species diversity and variations in the southeastern Arabian Sea over the last 14430 cal years BP. **(To be submit)**
- Siva Chandiran. A, V. **Yoganandan**, K. Selvaraj and M. Prakasam“ Indian summer monsoon variability during the Holocene and Younger Dryas from the Southeastern Arabian Sea **(In Preparation)**.

## CONFERENCE PROCEEDINGS FROM THIS PROJECT

- A. Siva Chandiran V. **Yoganandan** and K. Selvaraj (2015) “**Biotic Records of Indian Summer Monsoon Variability from the Southeastern Arabian Sea**”Proceeding volume of the “**National Climate Science Conference**”held on 2-3 July 2015.Organized by **Divecha Centre for Climate Change Indian Institute of Science, Bangalore, India.**
- A. Siva Chandiran V. **Yoganandan** and K. Selvaraj, (2015) “**A High Resolution Planktonic Foraminifer Records of Indian Summer Monsoon Variability from Southeastern Arabian Sea**” Proceeding volume of the “**CLIVAR-ICTP workshop on Decadal Climate Variability and Pridictability**” held at **Trieste, Italy** during 16-24 November 2015.
- A. Siva Chandiran V. **Yoganandan** and K. Selvaraj (2015) “**High-Resolution Paleoproductivity record from southeastern Arabian Sea**”Proceeding volume of the“**Climate Change and Coastal Zone Management**” held on 27 and 28 November 2015 Organized by **S.D.M College of Engg.& Tech., Dharwad, India.**
- A. Siva Chandiran V. **Yoganandan** and K. Selvaraj (2015) “**High Resolution Foraminifera Records of Indian Summer Monsoon Variability from the Southeastern Arabian Sea**”Proceeding volume of the “**XXV Indian Colloquium on Micropaleontology and Stratigraphy-2015**” held on 18 to 20December 2015 Organized by post graduate **Department of Geology Institute of Science,Aurangabad,India.**

- A. Siva Chandiran V. **Yoganandan** and K. Selvaraj (2016) “**Indian paleomonsoonal variability during the Holocene as seen in Sediments of the Southeastern Arabian Sea**” Proceeding volume of the “**Quaternary Climate: Recent Findings and Future Challenges**” held on 28-30 April 2016 at the **National Institute of Oceanography, Dona Paula, Goa, India.**
- A. Siva Chandiran V. **Yoganandan** and K. Selvaraj (2016) “**Microfossils Records of Decadal Climate Variability from the Southeastern Arabian Sea**” Proceeding volume of the “**Connecting Paleo and Modern Oceanographic Data to Understand AMOC over Decades to Centuries**” held on 23 – 25 May 2016 at **National Climate and Atmospheric Research Center (NCAR), in Boulder, Colorado, United States of America.**
- A. Siva Chandiran V. **Yoganandan** and K. Selvaraj (2017) “**Climate Variability during the Holocene from the Southeastern Arabian Sea**” Proceeding volume of the “**2<sup>nd</sup> National Geo Research Scholars Meet**” held on 17 – 20 May 2017 at **Wadia Institute of Himalayan Geology (WIHG) Dehra Dun, India.**