

# Holocene vegetation, climate, and culture in Northeast India: a pollen data–based review

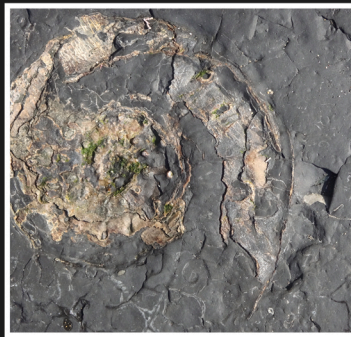
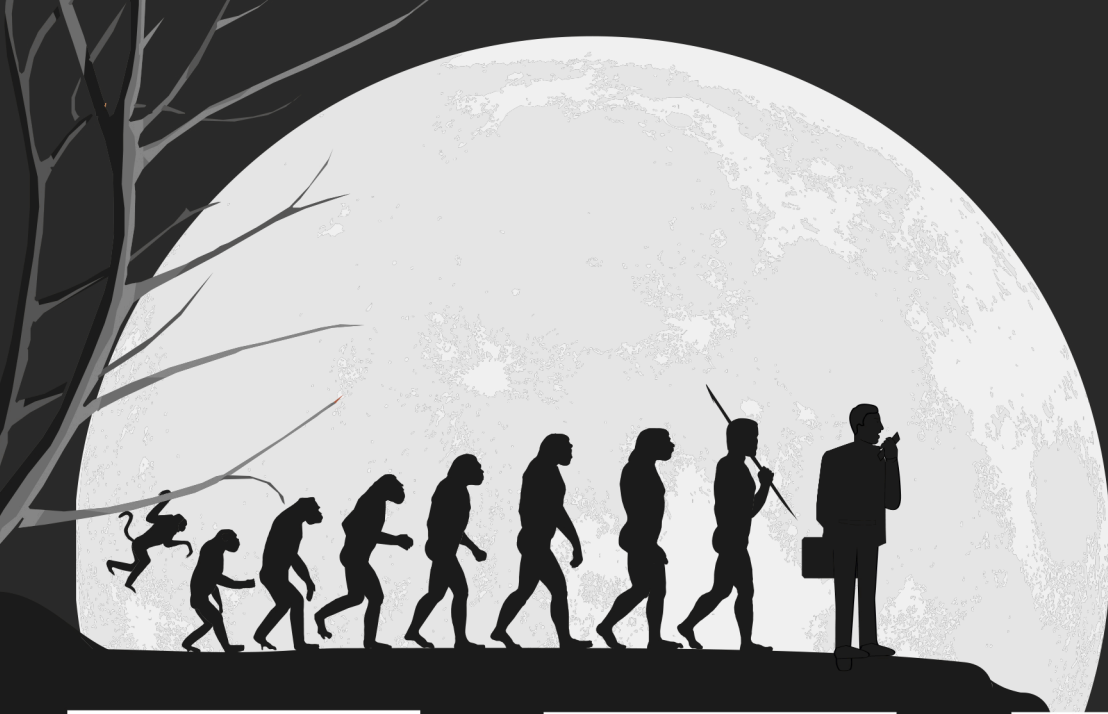
Anjali Trivedi

*Birbal Sahni Institute of Palaeosciences, Lucknow, Uttar Pradesh, India*

## 24.1 Introduction

The Holocene, covering about 11,500 years onwards, began to recede ice sheets and ended with the last glaciation. This period has continuous and fast climatic fluctuations that impacted the natural archives, play a vital role in human evolution/civilization and crop economy. It is well recognized that the empirical records on climate are only available for the last 150 years that is since 1863 CE for India. The densely inhabited Indian subcontinent's socioeconomy is primarily influenced by the Indian Summer Monsoon (ISM). It brings a significant amount of summer rainfall that accounts for ~70%–80% of the total annual rainfall (Webster et al., 1998; Gadgil, 2006). The ISM significantly influenced the agrarian-based Indian economy and is considered the most potent climate system nourished governing complete forest vegetation cover (Behre, 1981; Champion & Seth, 1968; Gadgil, 2006; Lamb, 1965; Yang et al., 2008; Xie et al. 2019; Trivedi et al., 2020). Proxy data from geographically diverse regions of the Indian subcontinent have been used to understand the climate variability during the late Quaternary (Chauhan, 2000; Prasad and Enzel, 2006; Juyal et al., 2009; Bhattacharayya et al., 2011, Srivastava et al., 2018). However, regional high-resolution paleoclimatic records are limited; yet, it suggested that abrupt climate variability has been catastrophic and associated with the rise and fall of the ancient human civilizations (William, 1999; Farmer, 2004; Prasad et al., 2014; Sarkar et al., 2016).

The northeast (NE) India, known for its diverse and most extensive lush forest cover, comprises 64% of the total geographical area (Jain et al., 2013). It is a global biodiversity hotspot, meeting region of temperate east Himalayan flora, paleoArctic flora of Tibetan highland, and wet evergreen flora of south-east Asia and Yunnan forming a bowl of biodiversity (Hara, 1965; Hooker, 1906). NE India has mostly relied on pollen-based reconstructions from sedimentary sequences (e.g., Basumatary et al., 2015; Bhattacharyya et al., 2007; Chauhan and Sharma, 1996; Dixit and Bera, 2011, 2012a, 2012b; Ghosh et al., 2014; Mehrotra et al., 2014; Mishra et al., 2020 and references therein). The problem gets further enhanced in the NE India region due to limited climate reconstruction records with poorly constrained chronologies throughout the region, which experiences maximum rainfall during the monsoon. Henceforth, to develop our understanding of the Holocene ISM variability and enhance our predictive capabilities for its future variability, there is a prerequisite to reconstruct the paleovegetation-climate vis-à-vis climate-culture relationship before the instrumental period. For this chapter (Fig. 24.1), a list of the pollen study (Table 24.1) pursued from diversified geographical regions of NE India and their allocation based on altitudinal categorization and vegetation types is shown in Fig. 24.2



# Holocene Climate Change and Environment



**Edited By**  
**Navnith Kumaran**  
**Damodaran Padmalal**

Elsevier

Radarweg 29, PO Box 211, 1000 AE Amsterdam, Netherlands

The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, United Kingdom

50 Hampshire Street, 5th Floor, Cambridge, MA 02139, United States

Copyright © 2022 Elsevier Inc. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without permission in writing from the publisher. Details on how to seek permission, further information about the Publisher's permissions policies and our arrangements with organizations such as the Copyright Clearance Center and the Copyright Licensing Agency, can be found at our website: [www.elsevier.com/permissions](http://www.elsevier.com/permissions).

This book and the individual contributions contained in it are protected under copyright by the Publisher (other than as may be noted herein).

### Notices

Knowledge and best practice in this field are constantly changing. As new research and experience broaden our understanding, changes in research methods, professional practices, or medical treatment may become necessary.

Practitioners and researchers must always rely on their own experience and knowledge in evaluating and using any information, methods, compounds, or experiments described herein. In using such information or methods they should be mindful of their own safety and the safety of others, including parties for whom they have a professional responsibility.

To the fullest extent of the law, neither the Publisher nor the authors, contributors, or editors, assume any liability for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions, or ideas contained in the material herein.

### British Library Cataloguing-in-Publication Data

A catalogue record for this book is available from the British Library

### Library of Congress Cataloging-in-Publication Data

A catalog record for this book is available from the Library of Congress

ISBN: 978-0-323-90085-0

For Information on all Elsevier publications visit our website at  
<https://www.elsevier.com/books-and-journals>

*Publisher:* Candice Janco

*Acquisitions Editor:* Marisa LaFleur

*Editorial Project Manager:* Ruby Gammell

*Production Project Manager:* Kumar Anbazhagan

*Cover Designer:* Greg Harris



Typeset by Aptara, New Delhi, India