CHAPTER

6 Holocene vegetation and climate change from central India: An updated and a detailed pollen-based review

Md. Firoze Quamar
Birbal Sahni Institute of Palaeosciences, Lucknow, Uttar Pradesh, India

6.1 Introduction

Vegetation dynamics and climate are strappingly related in a way that regional climate affects land surface processes over a range of scales with unprecedented speed (IPCC, 2007) and vegetation, in turn, affects climate through feedbacks via photosynthesis and evapotranspiration, changes in albedo and biogenic volatile organic compound emissions (Henderson-Sellers, 1993; Fang et al., 2003; Meng et al., 2011; Faubert et al., 2012; Wang and Dickinson, 2012; Henden et al., 2013; Li et al., 2014). Pollen grains and spores, produced by the vegetation itself, constitute a pollen assemblage after transport and mixing by wind and/or water, which represent vegetation characteristics, and contemporary climatic conditions or sedimentary environment at a specific time or area (Erdtman, 1952; Birks and Birks, 1980; Faegri et al., 1989). Pollen-derived vegetation records from an area will reveal variations in monsoon (here the Indian Summer Monsoon; ISM/Southwest Monsoon; SWM) rainfall (Kar and Quamar, 2019, 2020; Quamar, 2019, 2021; Quamar and Kar, 2020a; Quamar and Bera, 2020; Quamar et al., 2021, and references cited therein). India, being an agricultural country, is mostly dependent on the monsoon rain for its agricultural productivity, economy, and societal well-being (Webster et al., 1998; Gadgil, 2003; Gadgil and Gadgil, 2006).

The present communication reviews the studies on vegetation dynamics, associated climate change and the ISM variability during the Holocene from central India (the core of the monsoon zone-CMZ), comprising mainly the States of Madhya Pradesh (*Central Province*/*Central Territory*; also known as "*the heart of India*") and Chhattisgarh (*Thirty-Six Forts*; Fig. 6.1). The Holocene (~11.7 kyr BP to the Present), recently classified by the International Commission on Stratigraphy (ICS, 2018) into three ages—the Greelandian (11.7–8.2 kyr BP; Early Holocene); the Northgrippian (8.2–4.2 kyr BP; Middle Holocene); and the Meghalayan (4.2 kr BP to Present; Late Holocene), is the most recent Geological Epoch and the present Interglacial stage (Walker et al., 2019). The summer monsoon strengthened during the Early Holocene and subsequently weakened during the Mid- and Late-Holocene, especially at 8.2 ka BP and 4.2 ka BP (sudden rainfall reduction; Berkelhammer et al., 2012; Dixit et al., 2014a, 2018). The major forcing factors, which control the variability of the ISM during the Holocene are solar insolation and migration of the Inter Tropical Convergence Zone (ITCZ), North Atlantic Oscillation (NAO), and El-Niño and Southern Oscillation (ENSO; Fleitmann et al., 2003; Gupta et al., 2003;

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The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, United Kingdom
50 Hampshire Street, 5th Floor, Cambridge, MA 02139, United States

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