Spring temperatures in the far-western Nepal Himalaya since AD 1640

reconstructed from *Picea smithiana* tree-ring widths

Uday K. Thapa
Santosh K. Shah
Dinesh R. Bhuju
Narayan P. Gaire
Scott St. George

Where is Nepal??

Source: www.wikitravel.com

Maximum Temperature Trends in the Himalaya and Its Vicinity: An Analysis Based on Temperature Records from Nepal for the Period 1971–94

ARUN B. SHRESTHA,* CAMERON P. WAKE,+ PAUL A. MAYEWSKI,+ AND JACK E. DIBB+

Climate Change Research Center, Institute for the Study of the Earth, Oceans, and Space, University of New Hampshire, Durham, New Hampshire

(Manuscript received 3 August 1997, in final form 2 November 1998)

ABSTRACT

Analyses of maximum temperature data from 49 stations in Nepal for the period 1971–94 reveal warming trends after 1977 ranging from 0.06° to 0.12°C yr^{-1} in most of the Middle Mountain and Himalayan regions, while the Siwalik and Terai (southern plains) regions show warming trends less than 0.03°C yr^{-1}. The subset of records (14 stations) extending back to the early 1960s suggests that the recent warming trends were preceded by similar widespread cooling trends. Distributions of seasonal and annual temperature trends show high rates of warming in the high-elevation regions of the country (Middle Mountains and Himalaya), while low warming or even cooling trends were found in the southern regions. This is attributed to the sensitivity of mountainous regions to climate changes. The seasonal temperature trends and spatial distribution of temperature trends also highlight the influence of monsoon circulation.

The Kathmandu record, the longest in Nepal (1921–94), shows features similar to temperature trends in the Northern Hemisphere, suggesting links between regional trends and global scale phenomena. However, the magnitudes of trends are much enhanced in the Kathmandu as well as in the all-Nepal records. The authors' analyses suggest that contributions of urbanization and local land use/cover changes to the all-Nepal record are minimal and that the all-Nepal record provides an accurate record of temperature variations across the entire region.

Nepal
0.12 °C/yr

World
0.006 °C/yr

Clim. Past, 10, 1277–1290, 2014
www.clim-past.net/10/1277/2014/
doi:10.5194/cp-10-1277-2014

Climate of the Past
Open Access

Treeline dynamics with climate change at the central Nepal Himalaya

N. P. Gaire[1,2], M. Koirala[2], D. R. Bhuju[1,2], and H. P. Borgaonkar[3]

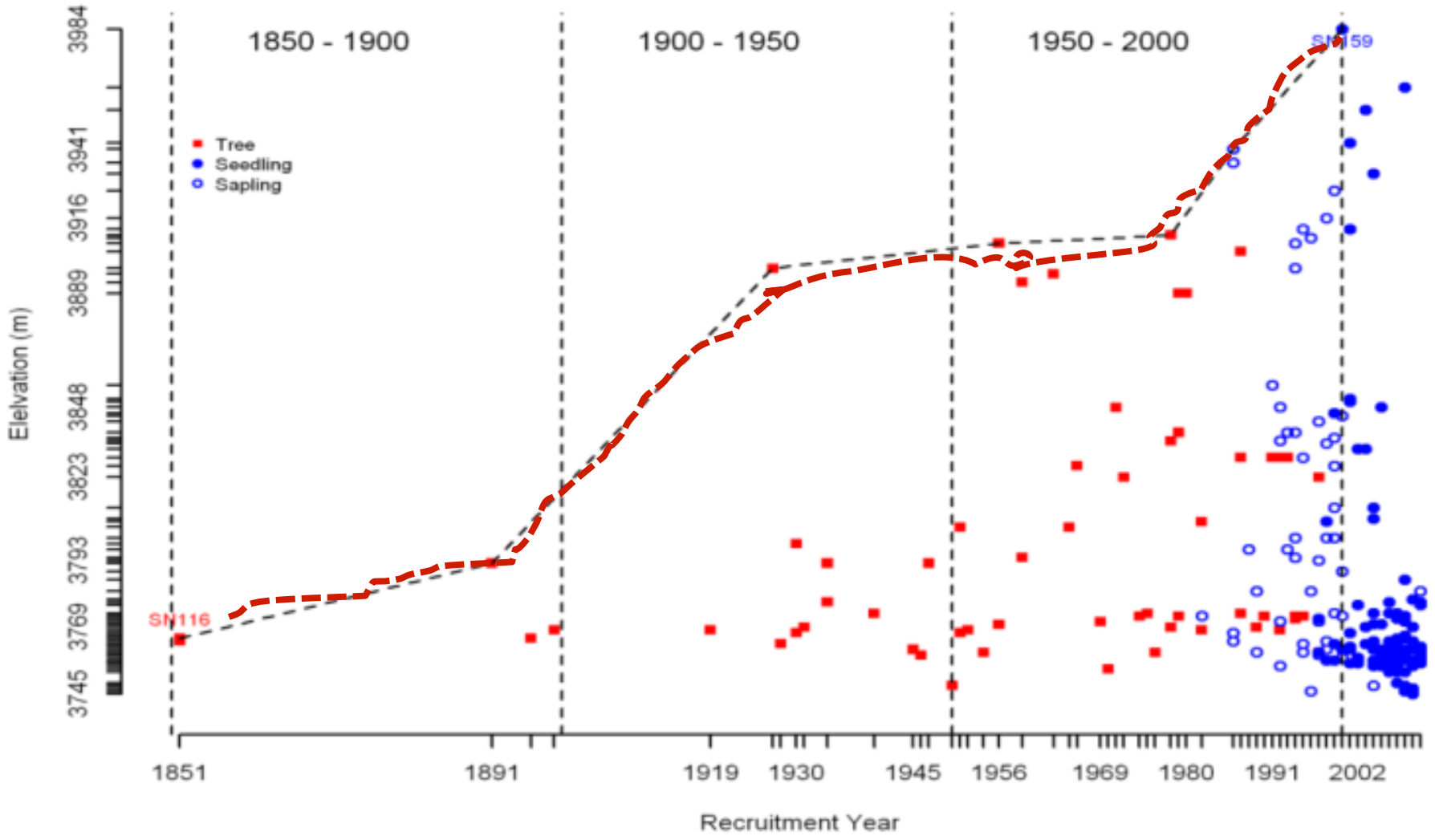
[1]Faculty of Science, Nepal Academy of Science and Technology, Khumaltar, Lalitpur, GPO Box 3323, Kathmandu, Nepal
[2]Central Department of Environmental Science, Tribhuvan University, Kathmandu, Nepal
[3]Indian Institute of Tropical Meteorology, Pune, India

Correspondence to: N. P. Gaire (npgaire2007@gmail.com)

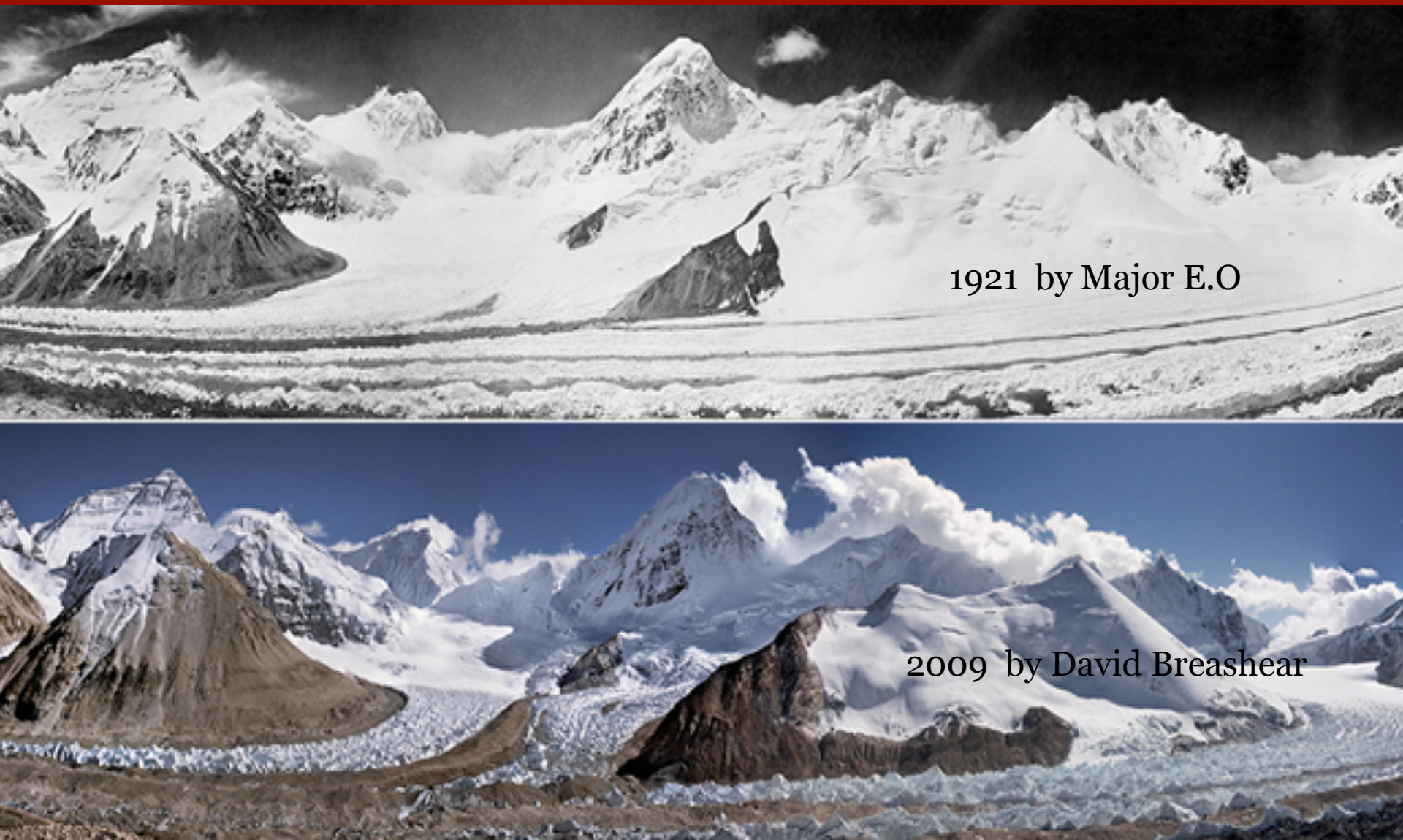
Received: 7 August 2013 – Published in Clim. Past Discuss.: 28 October 2013
Revised: 22 April 2014 – Accepted: 15 May 2014 – Published: 4 July 2014

Abstract. Treeline shifting in tandem with climate change has widely been reported from various parts of the world. In Nepal, several impacts of climate change on the physical environment have been observed, but study on the biological average temperature. The growth of the *B. utilis* was mainly limited by moisture stress during the pre-monsoon season. As these two species presented species-specific responses to climate change with differential pattern in regeneration con-

Himalayan trees are climbing up!!



Himalayan glaciers are melting!!



All climate change studies in Nepal Himalaya
are limited by shorter records

INTERNATIONAL JOURNAL OF CLIMATOLOGY
Int. J. Climatol. **23**: 707–732 (2003)
Published online in Wiley InterScience (www.interscience.wiley.com). DOI: 10.1002/joc.911

DENDROCLIMATIC SIGNALS IN LONG TREE-RING CHRONOLOGIES FROM THE HIMALAYAS OF NEPAL

EDWARD R. COOK,[a]* PAUL J. KRUSIC[a] and PHILIP D. JONES[b]
[a] *Lamont–Doherty Earth Observatory, Palisades, NY 10964, USA*
[b] *Climatic Research Unit, University of East Anglia, Norwich NR4 7TJ, UK*

Received 9 January 2002
Revised 10 March 2003
Accepted 10 March 2003

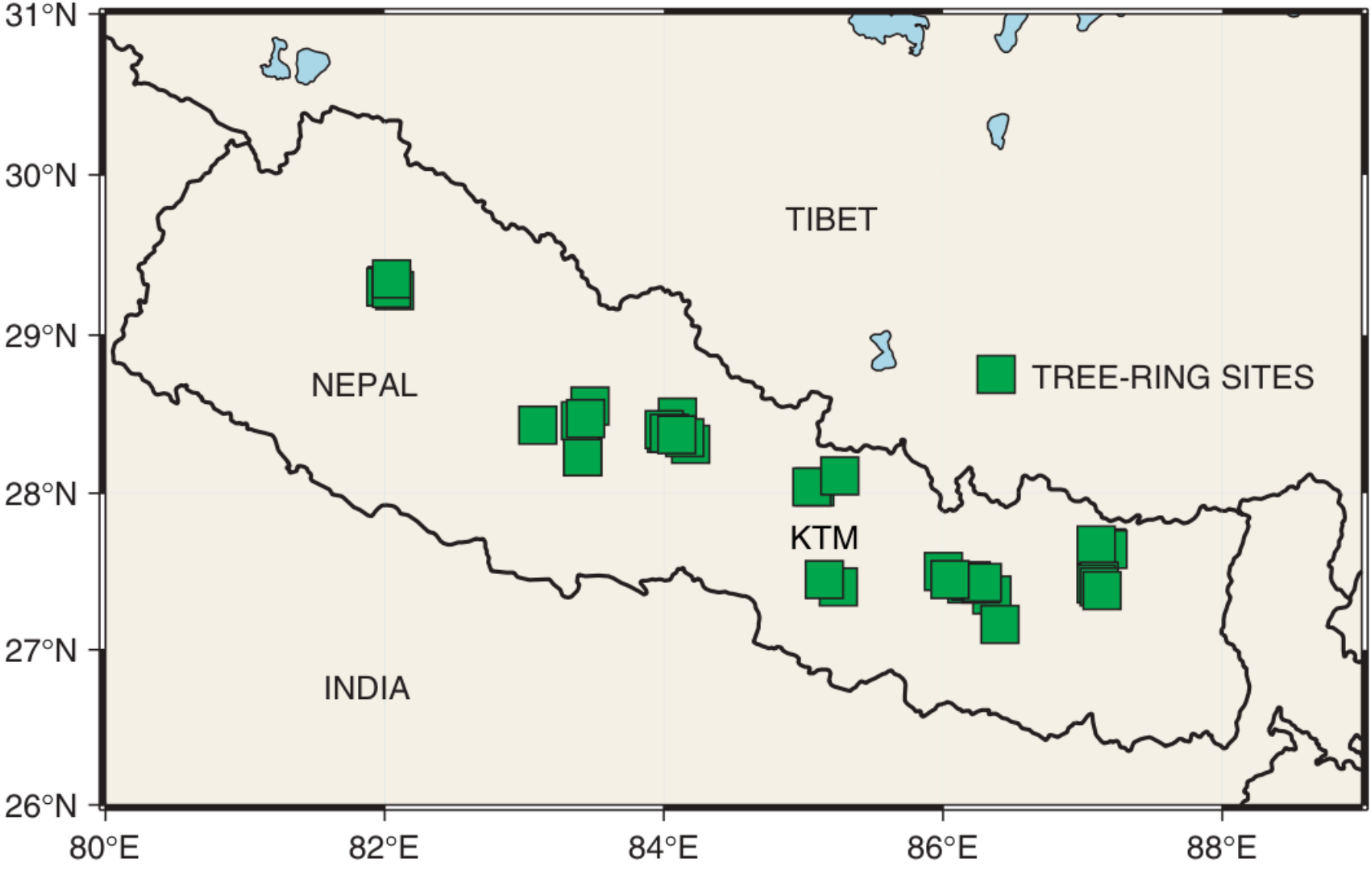
ABSTRACT

We describe the development of a tree-ring chronology network in Nepal that is suitable for reconstructing temperature-related climate forcing over the past few hundred years. The network is composed of 32 tree-ring chronologies and is represented by five indigenous tree species. An empirical orthogonal function analysis of the chronologies over the common interval 1796–92 indicates the existence of coherent large-scale signals among the tree-ring chronologies that are hypothesized to reflect, in part, broad-scale climate forcing related to temperatures. A long monthly temperature record for Kathmandu is developed and used to test this hypothesis. In so doing, significant monthly and seasonal temperature responses are identified that provide guidance for the formal reconstruction of two temperature seasons: February–June (1546–91) and October–February (1605–91). Each reconstruction indicates the occurrence of unusually cold temperatures in 1815–22, which coincides with the eruption of Tambora in Indonesia. A novel method is also used to add probable missing multi-centennial temperature variance to each reconstruction. The resulting 'adjusted' reconstructions strongly reflect patterns of temperature variability associated with Little Ice Age cooling and warming into the 20th century, with the October–February season exhibiting the strongest increase in temperature over the past ~400 years. Only the October–February season shows any evidence for late- 20th century warming, whereas February–June temperatures have actually cooled since 1960 (as with the observational series).

KEY WORDS: Himalayas; Nepal; tree rings; dendroclimatology; temperature reconstruction; monsoon; Little Ice Age; climate change

NEPAL TREE RING NETWORK

by Cook et al (2003), International Journal of Climatology



Available online at www.sciencedirect.com
SCIENCE DIRECT®
ELSEVIER
Dendrochronologia 23 (2005) 83–92
DENDROCHRONOLOGIA
www.elsevier.de/dendro

ORIGINAL ARTICLE

Temperature variations since the mid-18th century for western Nepal, as reconstructed from tree-ring width and density of *Abies spectabilis*

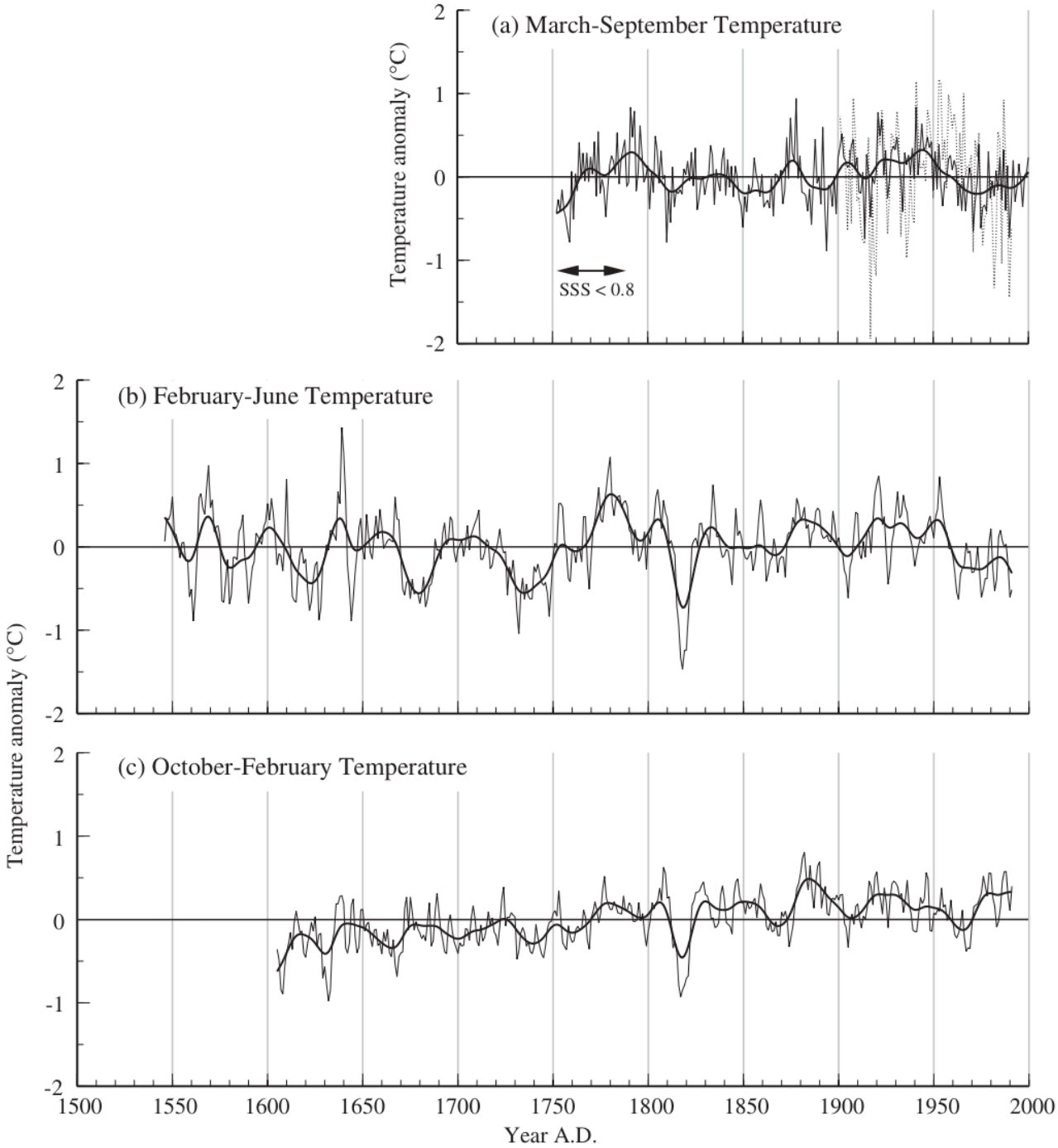
Masaki Sano*, Fumito Furuta, Osamu Kobayashi, Tatsuo Sweda

The United Graduate School of Agricultural Sciences, Ehime University, Tarumi 3-5-7, Matsuyama 790-8566, Japan

Received 15 March 2005; accepted 1 August 2005

Abstract

The climate of western Nepal was reconstructed for the past 249 years using ring width and wood density of *Abies spectabilis* (D. Don) Spach from western Nepal. A total of 46 increment core samples were collected from 23 individual trees growing in an open *A. spectabilis* stand near timberline of 3850 m a.s.l. in Humla District, western Nepal. The core samples were subjected to densitometric analysis to obtain chronologies of ring width and three kinds of intra-annual bulk densities, i.e., minimum, maximum, and mean. Response analysis of tree-ring parameters with climate records revealed that the ring width was correlated negatively with March–May (pre-monsoon) temperature and positively with March–May precipitation, while the minimum density was correlated positively with March–July temperature and negatively with March–May precipitation. On the other hand, the maximum and mean densities were positively correlated with August–September and March–September temperatures, respectively. These results indicate that the ring width and minimum density are primarily controlled by the pre-monsoon temperature and precipitation, while the latewood density by the late monsoon temperature. Finally based on these results of the response analysis, a transfer function was established, with which March–September temperature was reconstructed for the past 249 years, which shows a warming trend from 1750s until approximately 1790, followed by cooling until 1810, then by a gradual warming trend extending to 1950, and a notable cold period continuing up to the present. No evidence of a consistent warming trend over the last century or two commonly appearing in higher latitudes was found in the present reconstruction, but possible factor behind the widespread glacial retreat in the Nepal Himalayas was discussed.


(a) March-September Temperature
(b) February-June Temperature
(c) October-February Temperature
Temperature anomaly (°C)
SSS < 0.8
2
1
0
-1
-2
1500
1550
1600
1650
1700
1750
1800
1850
1900
1950
2000
Year A.D.

Most of the studies in Himalaya reported spring and early summer temperature limits the tree growth

Clim Dyn
DOI 10.1007/s00382-014-2457-1

Spring temperatures in the far-western Nepal Himalaya since AD 1640 reconstructed from *Picea smithiana* tree-ring widths

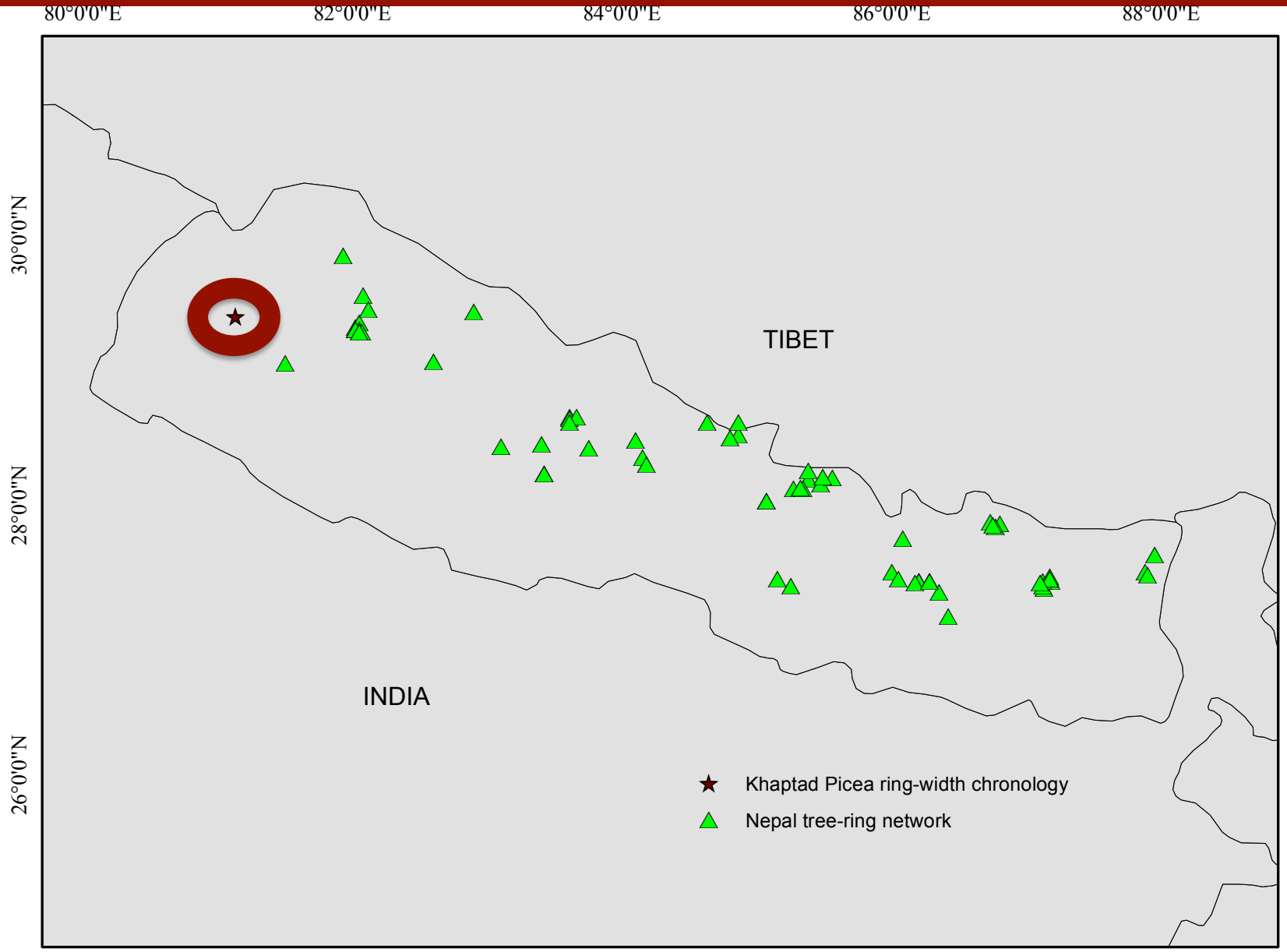
Udya Kuwar Thapa · Santosh K. Shah · Narayan Prasad Gaire · Dinesh Raj Bhuju

Received: 24 June 2014 / Accepted: 16 December 2014

Abstract We developed a new, 422-year long tree-ring width chronology (spanning AD 1591–2012) from *Picea smithiana* (Wall.) Boiss in Khaptad National Park, which is located in the far-western Nepalese Himalaya. Seasonal correlation analysis revealed significant indirect relationship with spring temperature and lead to the reconstruction of March–May average temperature for the past 373 years (AD 1640–2012). The reconstruction was found significant temperature revealed relationship with different Sea Surface Temperature index over the equatorial Pacific Ocean, which showed linkages with climatic variability in a global scale.

Keywords Khaptad National Park · Nepal · *Picea smithiana* · Spring temperature · Tree-rings

The new Khaptad National Park *Picea chronology* site



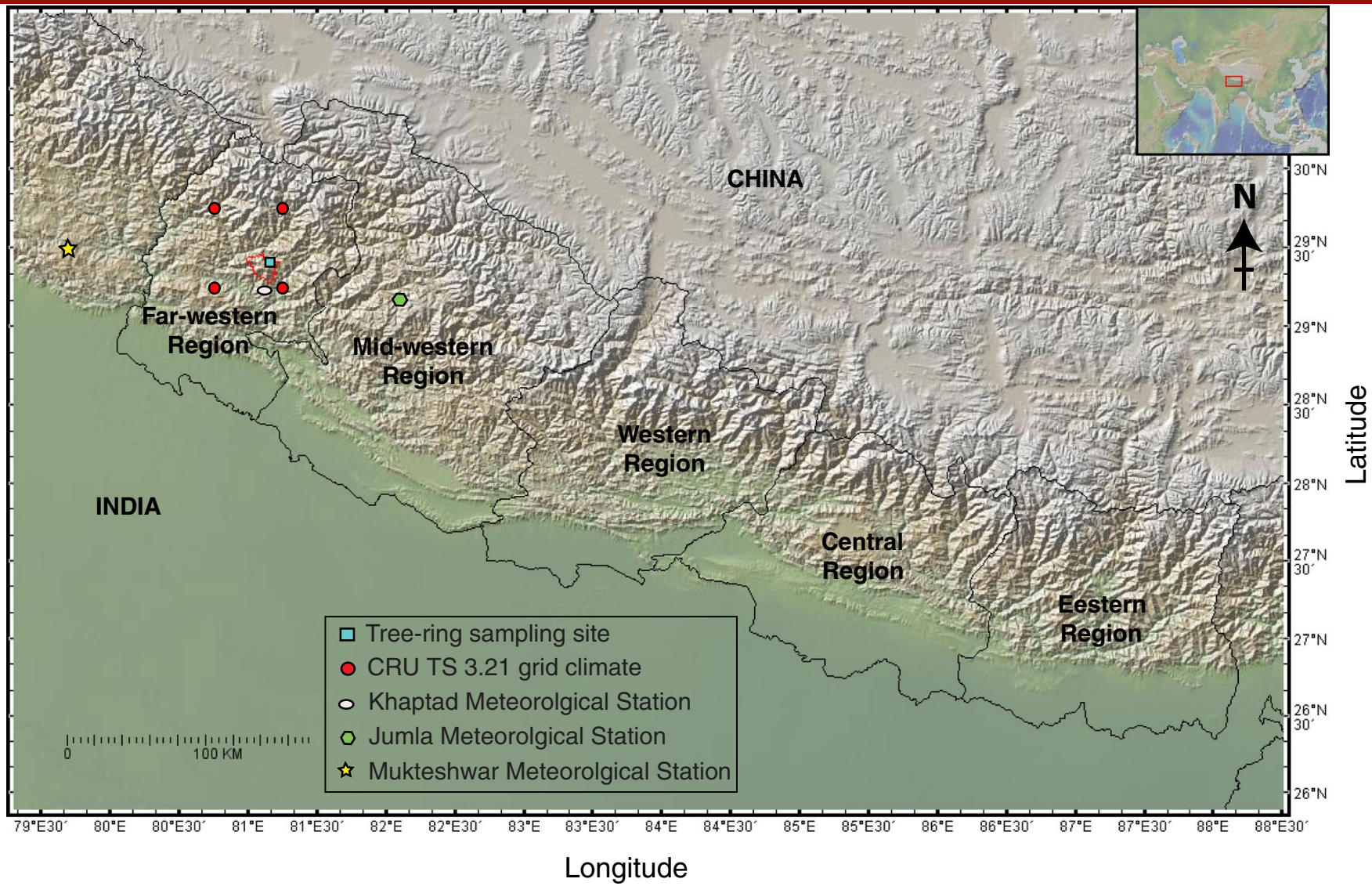
Questions??

1. Is *Picea* chronology in west Nepal limited by the same spring/early summer temperature?

2. Did west Nepal experience the LIA or Tambora cooling during spring temperature?

3. Does temperature in west Nepal has any connections with the broader climate system?

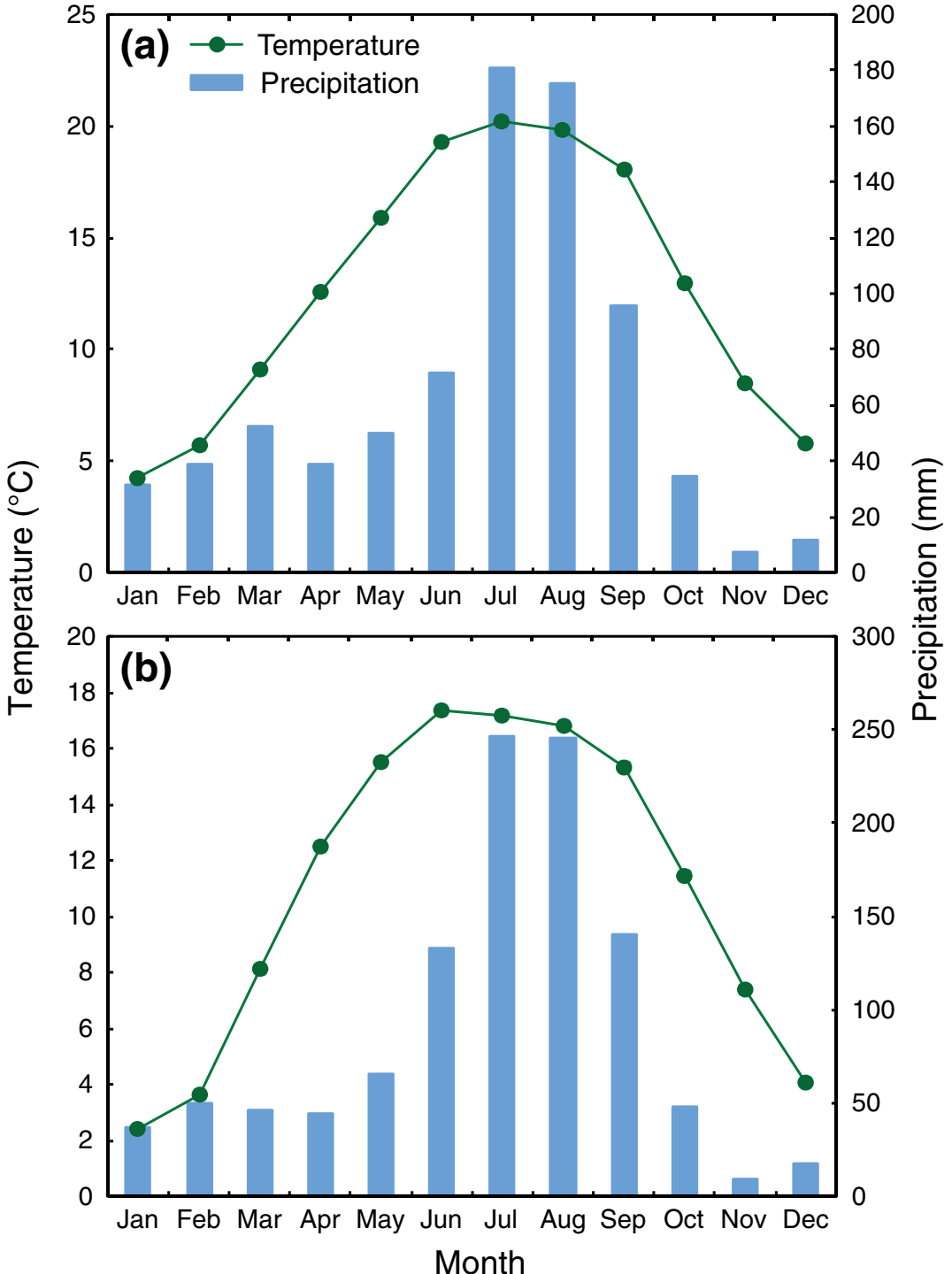
Study Area: Khaptad National Park, west Nepal



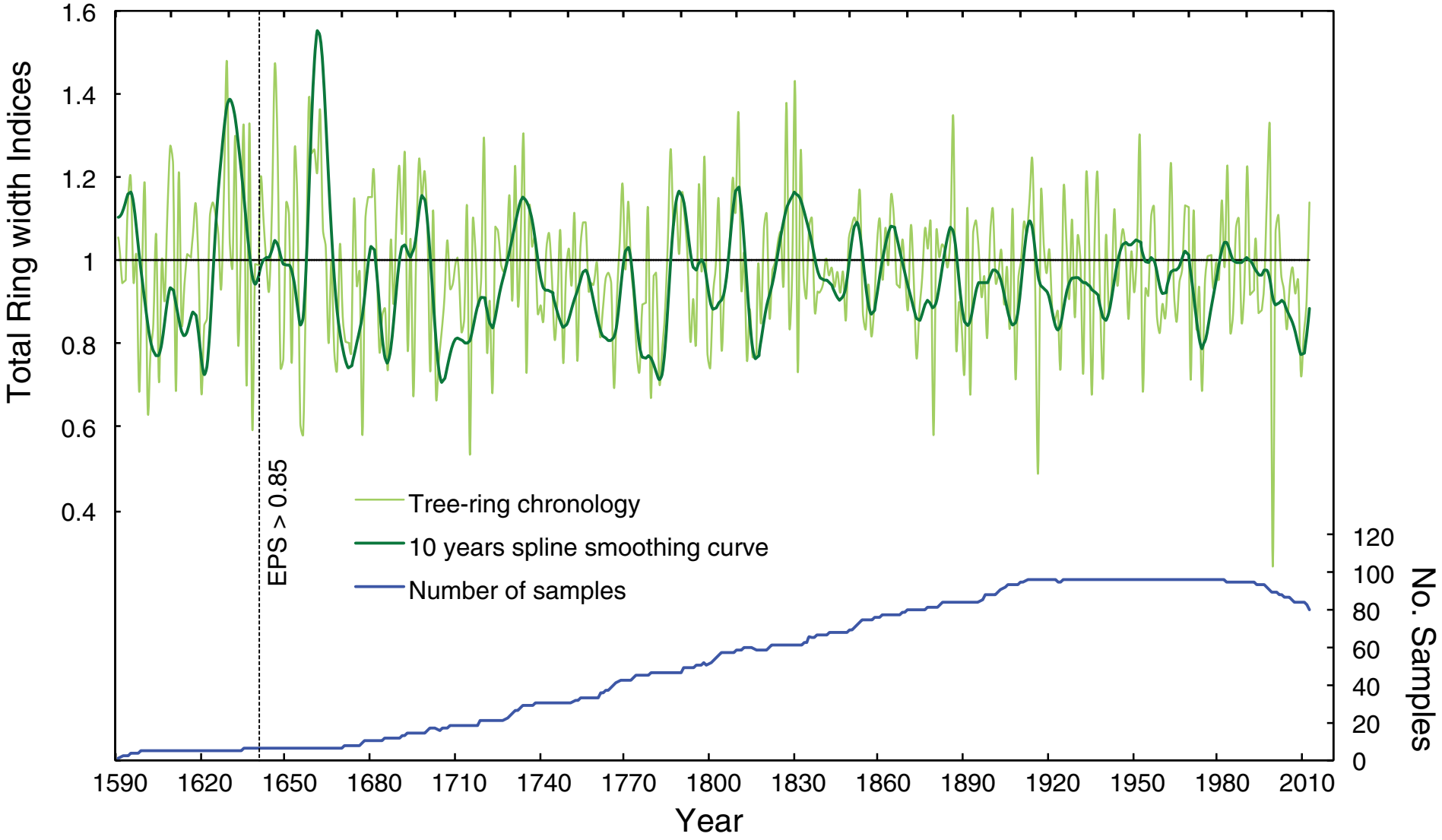
Climate of study area

(a) Jumla station

(b) Mukteshwar station

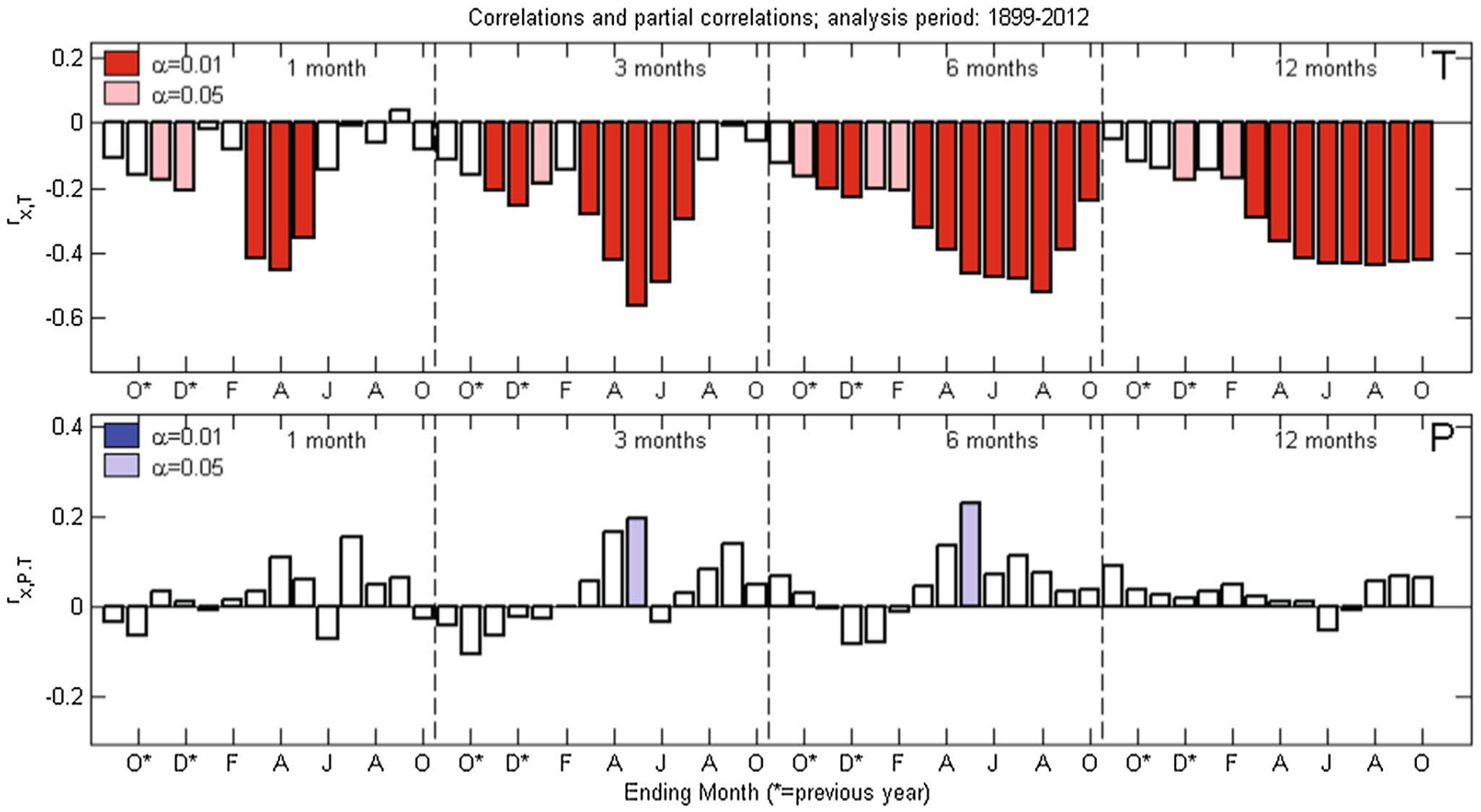


422 year long Khaptad *Picea* ring-width chronology



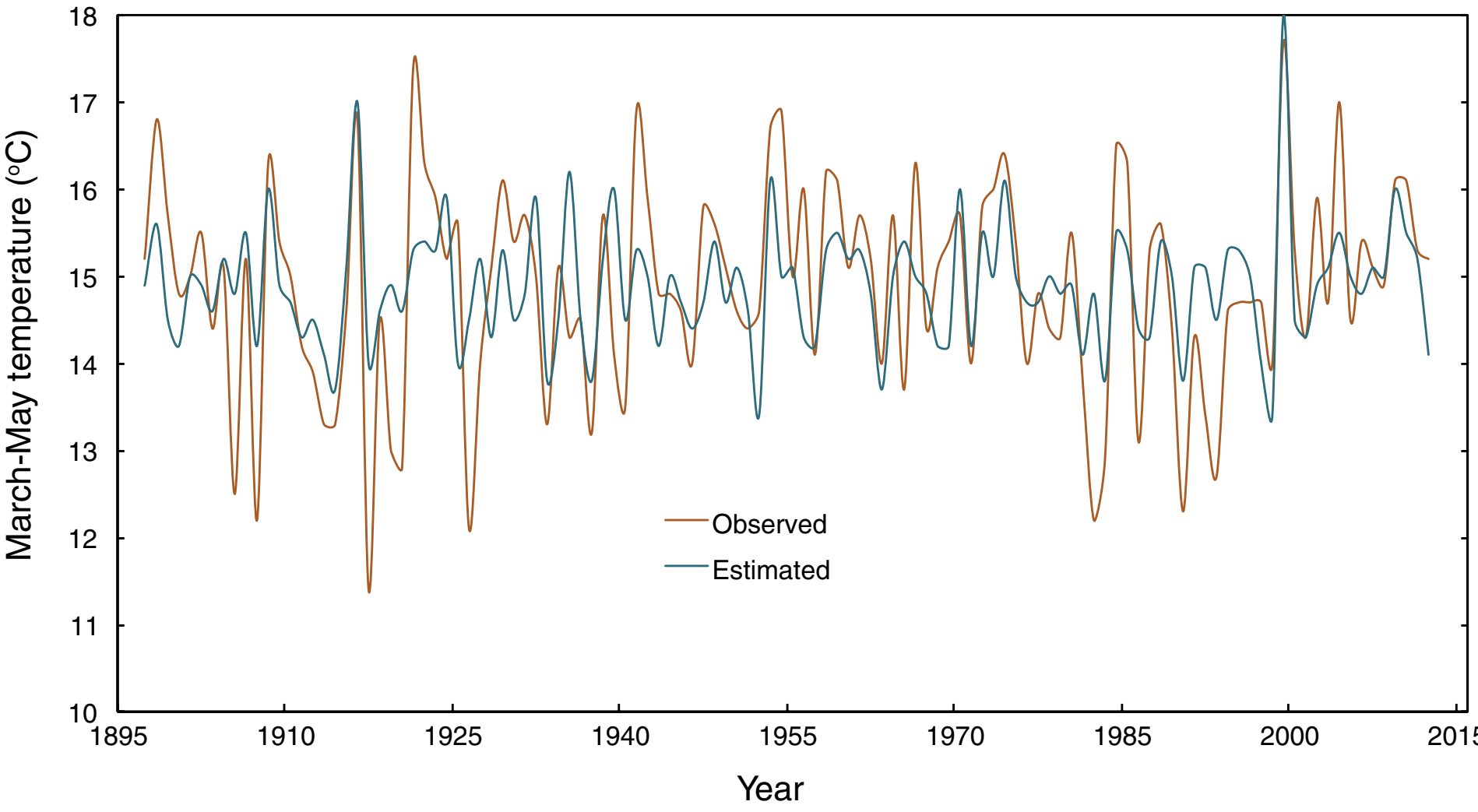
Spring temperature

primarily controls the growth of Khaptad *Picea* growth



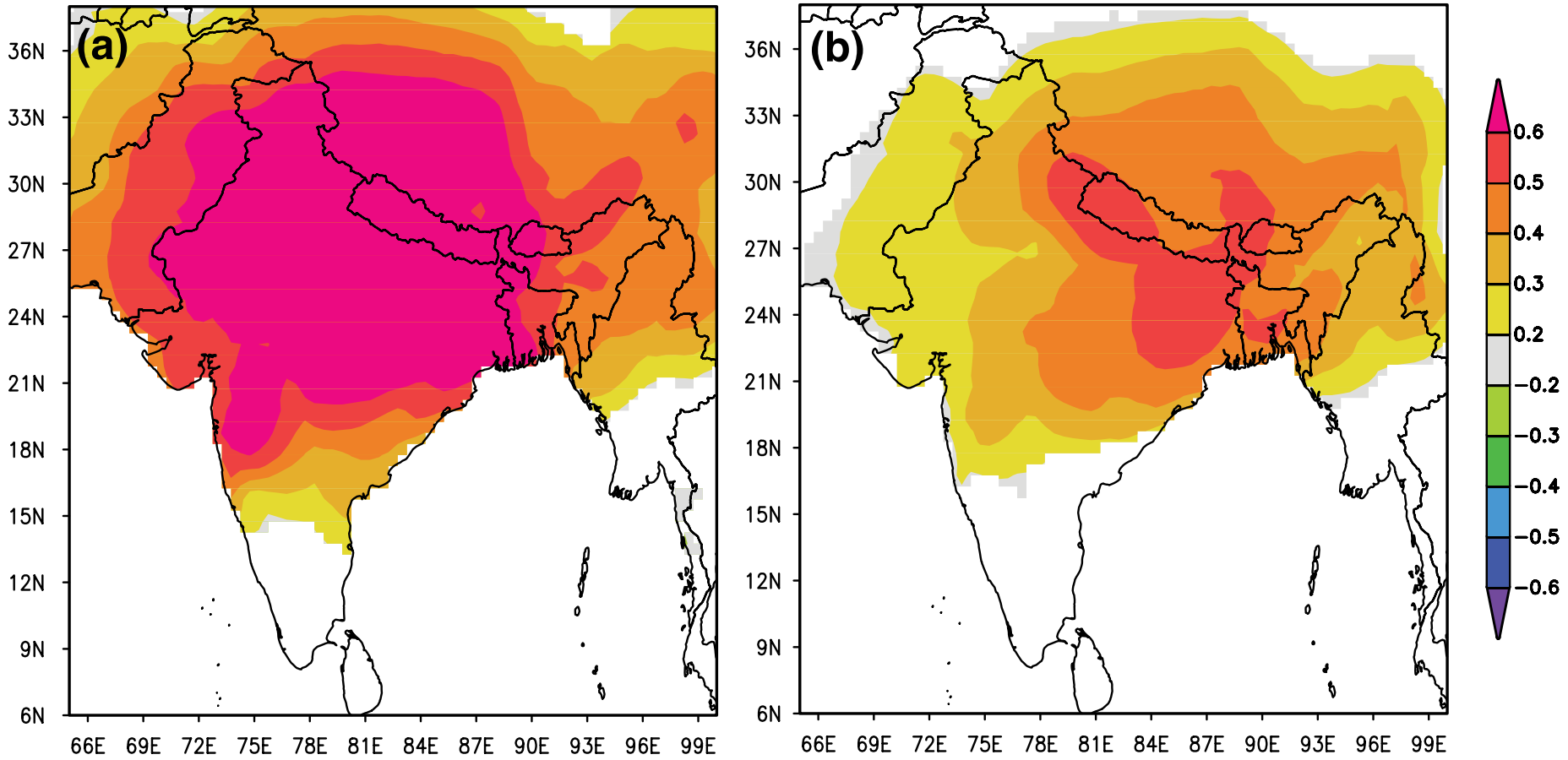
Comparison

Observed Vs Estimated spring temperature



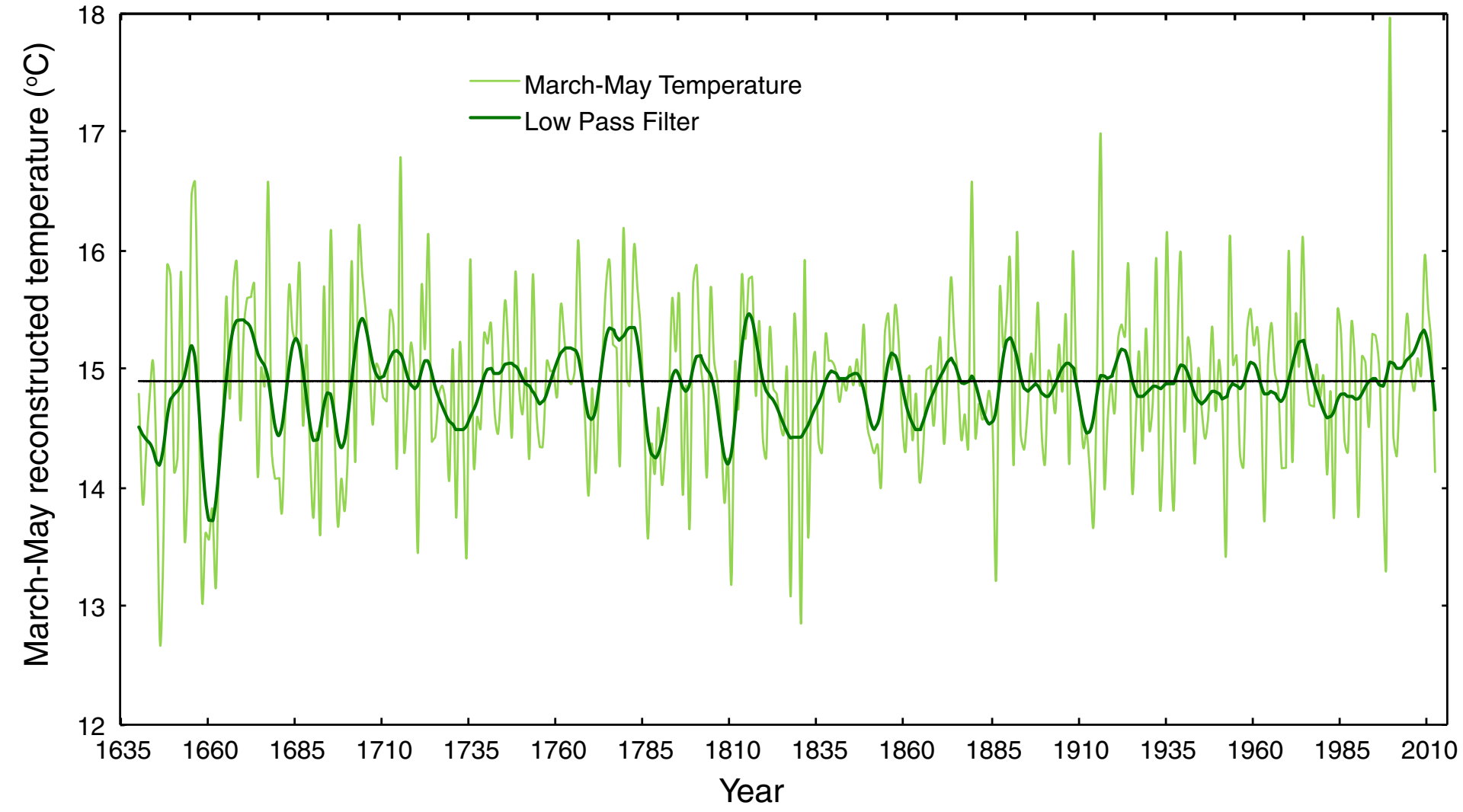
Comparison

(a) Observed and (b) Estimated with CRU TS 3.21 Temperature



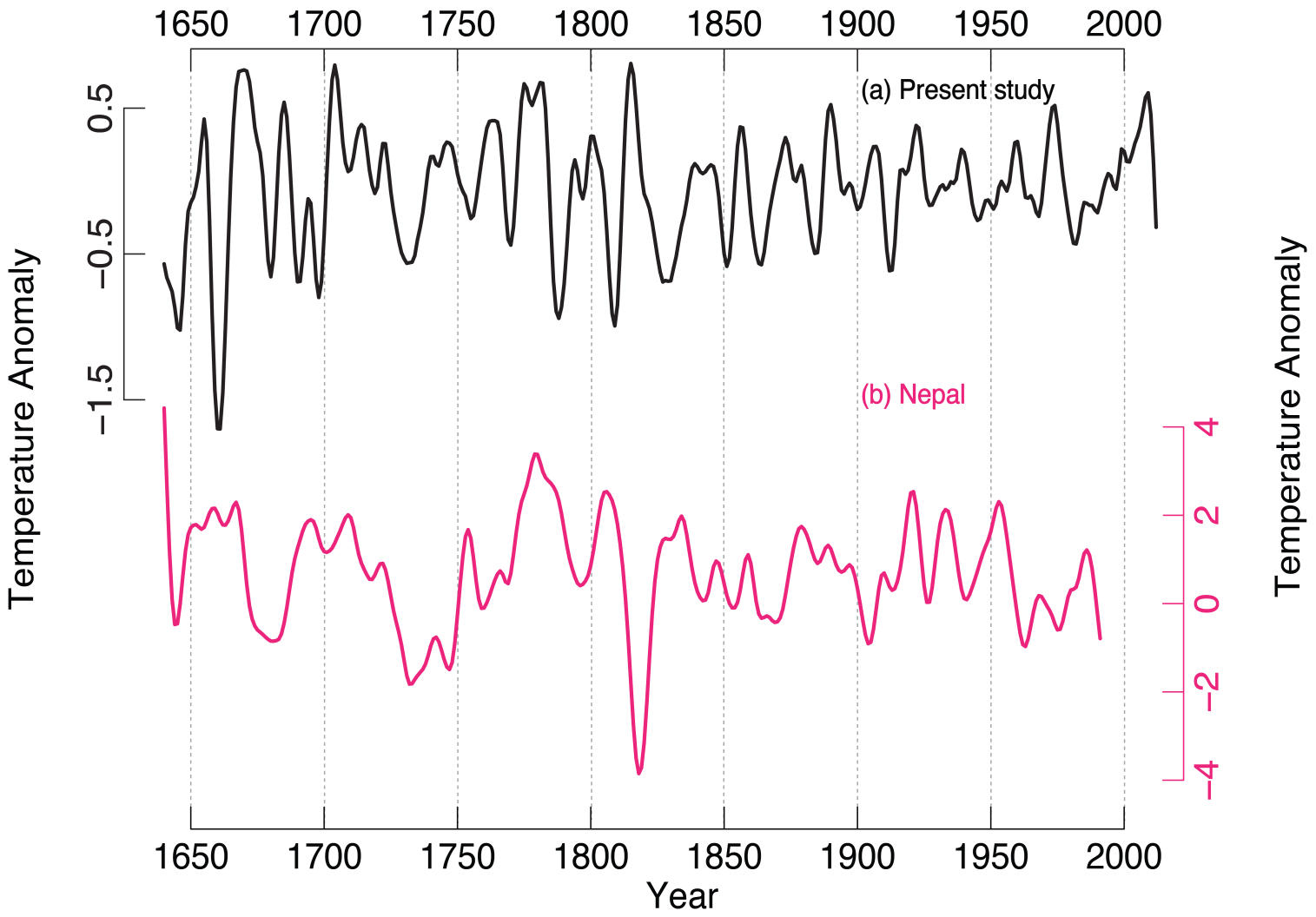
Spring temperatures

over last four centuries in far-west Nepal

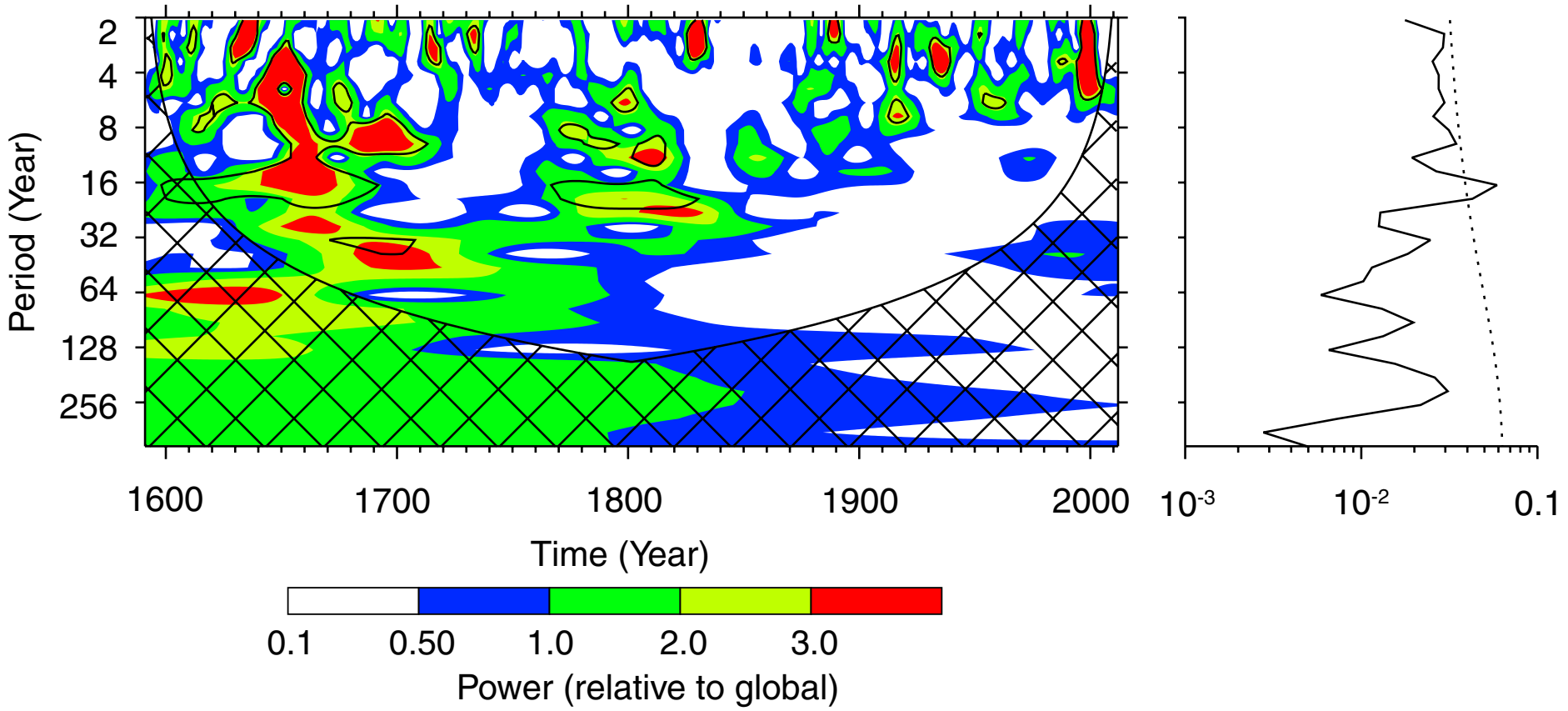


Comparison of current reconstruction

with all Nepal reconstruction by Ed Cook

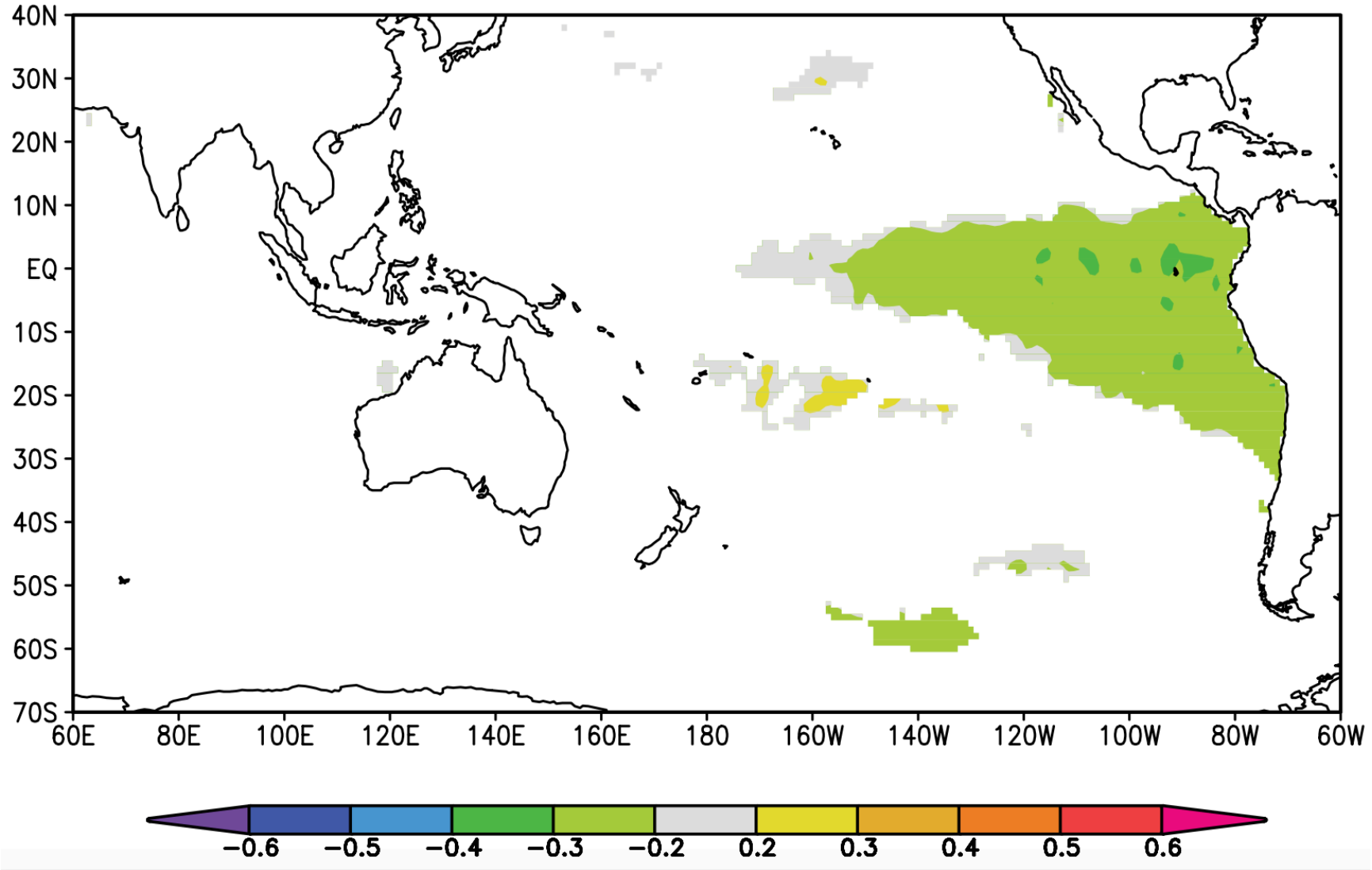


High frequency variation in Spring temperature



Does cool monsoon and pre-monsoon in Pacific

cause warm spring in west Nepal??



BIG THANK YOU

BIG THANK YOU

ISET-N
Institute for Social and Environmental Transition - Nepal

"Build capacity to solve problems as and when they emerge"

Google™ Custom Search

HOME | ABOUT US | PROJECTS | PUBLICATIONS | NEWS & EVENTS | OPPORTUNITIES | GALLERY | DONORS | RECENT ACTIVITIES

ISET-N | ABOUT US

ISET-Nepal was established in 2001 as a non-governmental and not-for-profit organization to study and analyse developmental issues of rapidly changing social and environmental context that demand new insights into the emerging challenges to manage resources for sustainable development.

Readmore...

BIG THANK YOU

BIG THANK YOU

NEPAL ACADEMY OF SCIENCE AND TECHNOLOGY

Science & Technology for National Development

About | Faculties | Divisions | Publications | Downloads | Multimedia | Friends of NAST | Linkages | Career

NEWS UPDATE | Full Researcher Proposal Approved List for Publication | Research Grant Program Notice | Full Researcher P | Invitation for Bids |

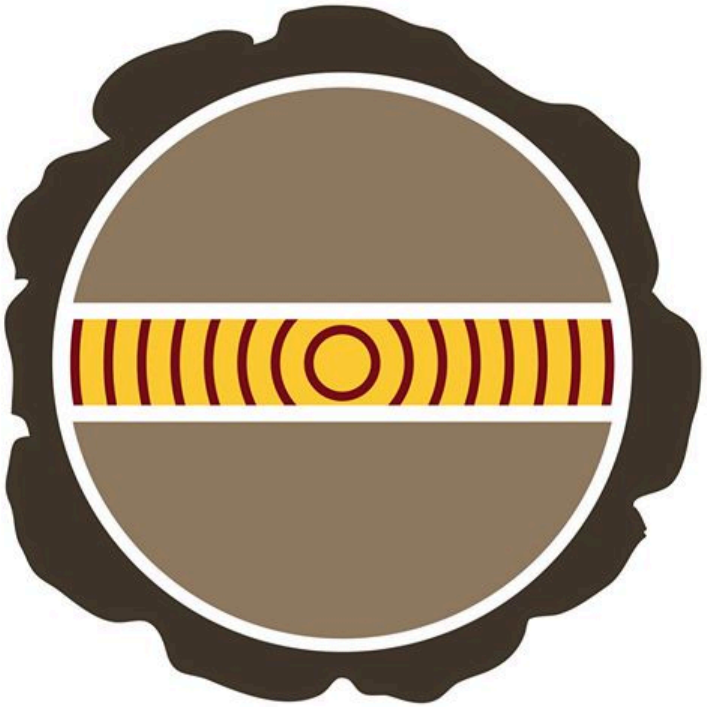
Latest News

- Research Grant Program Notice
- Full Researcher Proposal Approved List for Publication
- Invitation for Bids

Latest Publication

Introduction of NAST

Nepal Academy of Science and Technology (NAST) is an autonomous apex body established in 1982 to promote science and technology in the country. The Academy is entrusted with four major objectives: advancement of science and technology for all-round development of the nation; preservation and further modernization of indigenous technologies; promotion of research in science and technology; and identification and facilitation of appropriate technology transfer.



CENTER FOR DENDROCHRONOLOGY

UNIVERSITY OF MINNESOTA

Driven to Discover℠