Towards constructing the dataset for leaf-based climate proxy models – An approach using CLAMP and LMA for the Indian sub-continent

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Introduction

- Regional climate can directly influence the foliar physiognomy of plant assemblage (Bailey and Sinnot 1915, 1916) and there exits a correlation between leaf margin and mean annual temperature.
- CLAMP and LMA analysis are the two very precise methods for temperature estimations.
- There are no calibration data sets for Indian subcontinent.
- Our objectives are to find which among the trees and lianas are the better predictors.
- To compare the credibility of CLAMP and LMA methods.

Methodology

- CLAMP and LMA methods for temperature estimations
- Site selection - peninsular India
- Data collection – Woody plant inventory data
- Bioclimatic variables extracted from the worldclim.com using ArcGIS (Ver. 10.3)

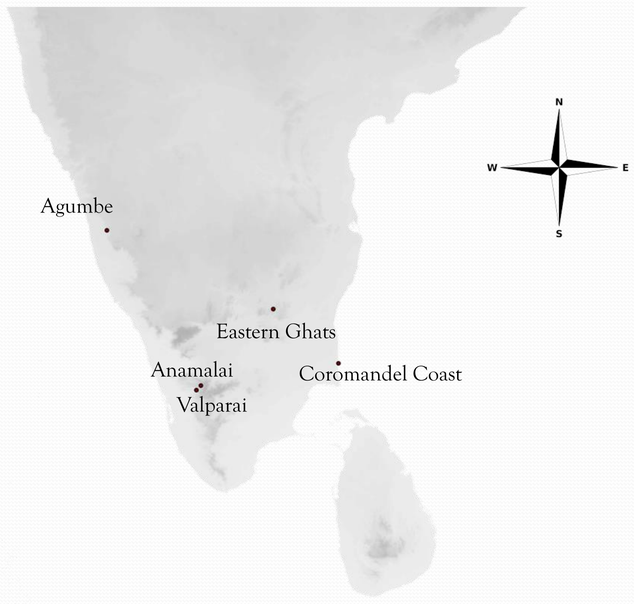

Fig.1 Location of the five study sites distributed in peninsular India

Results

➢ **CLAMP and LMA analysis**

- For the CLAMP analysis, we considered PhysgAsia 1 and PhysgAsia 2 calibration data sets and customized the CLAMP score file for the comparative study between trees and lianas.
- The CCA graphs of both Asia1 and Asia2 were feasible however, the predictions might differ based on the location of the study sites.
- Equations from 7 geographical models were used to calculate MAT through LMA and except few models ,all values were overestimated.
- Trees were the better predictors in most of the study sites

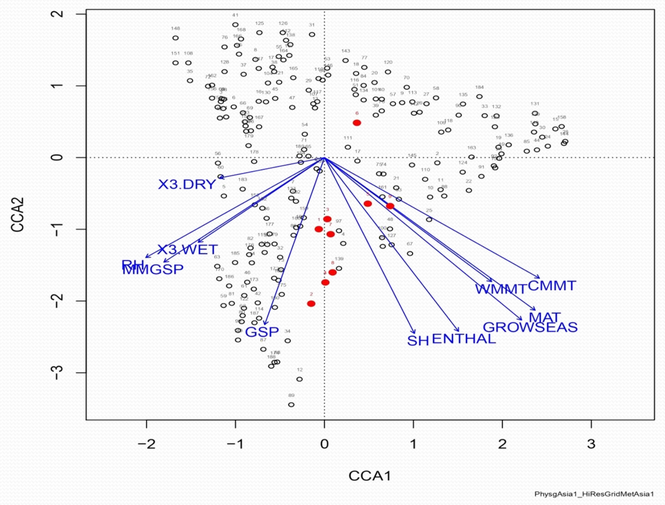

Fig.2 CCA Axes 1V2 showing 5 different sites for both trees and lianas for Asia 1 CDS

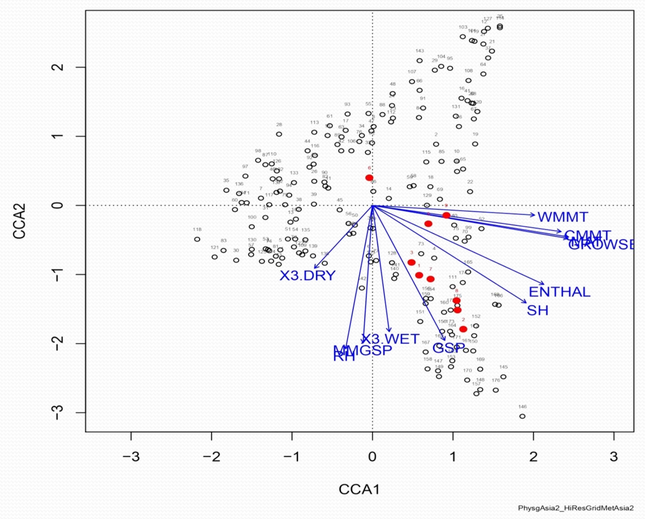

Fig.3 CCA Axes 1V2 showing 5 different sites for both tree and liana for Asia 2 CDS

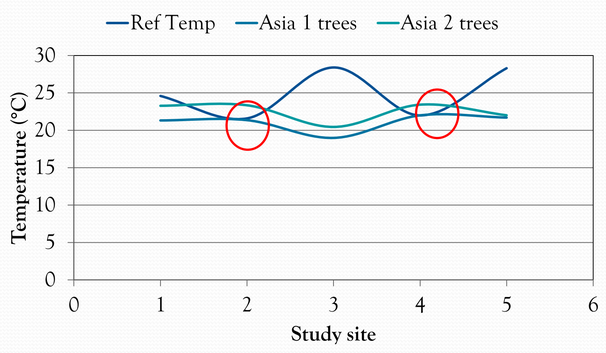

Fig.4 Plot showing comparison between reference temperature and the predicted temperature across the study sites using trees

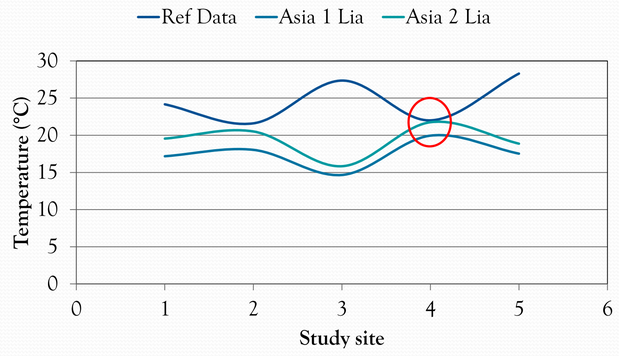

Fig.5 Plot showing comparison between reference temperature and the predicted temperature across the study sites using lianas

Discussion

- Trees were the better climate proxies than lianas, which can be attributed to the greater foliar longevity of trees than lianas.
- In rain forests, where water is not a limiting factor, lianas can retain their leaves for a longer time thus mimicking trees as proxies.
- Among the study locations considered , Coromandel coasts are having the highly diverse vegetation due to unequal distribution of ever green and deciduous species.
- Less number of species were highly abundant and are the true representators of the forest type which is a sign of endemism.
- Asia 1 and Asia 2 calibration sites were used because of geographical vicinity to the study sites and effect of monsoon.
- The deviations in the predictions can be due to the character loss, biased nature of calibration data sets etc.

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References

- Unit tree and liana database – Prof. Parthasarathy and team

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