भारतीय वन्यजीव संस्थान
Wildlife Institute of India

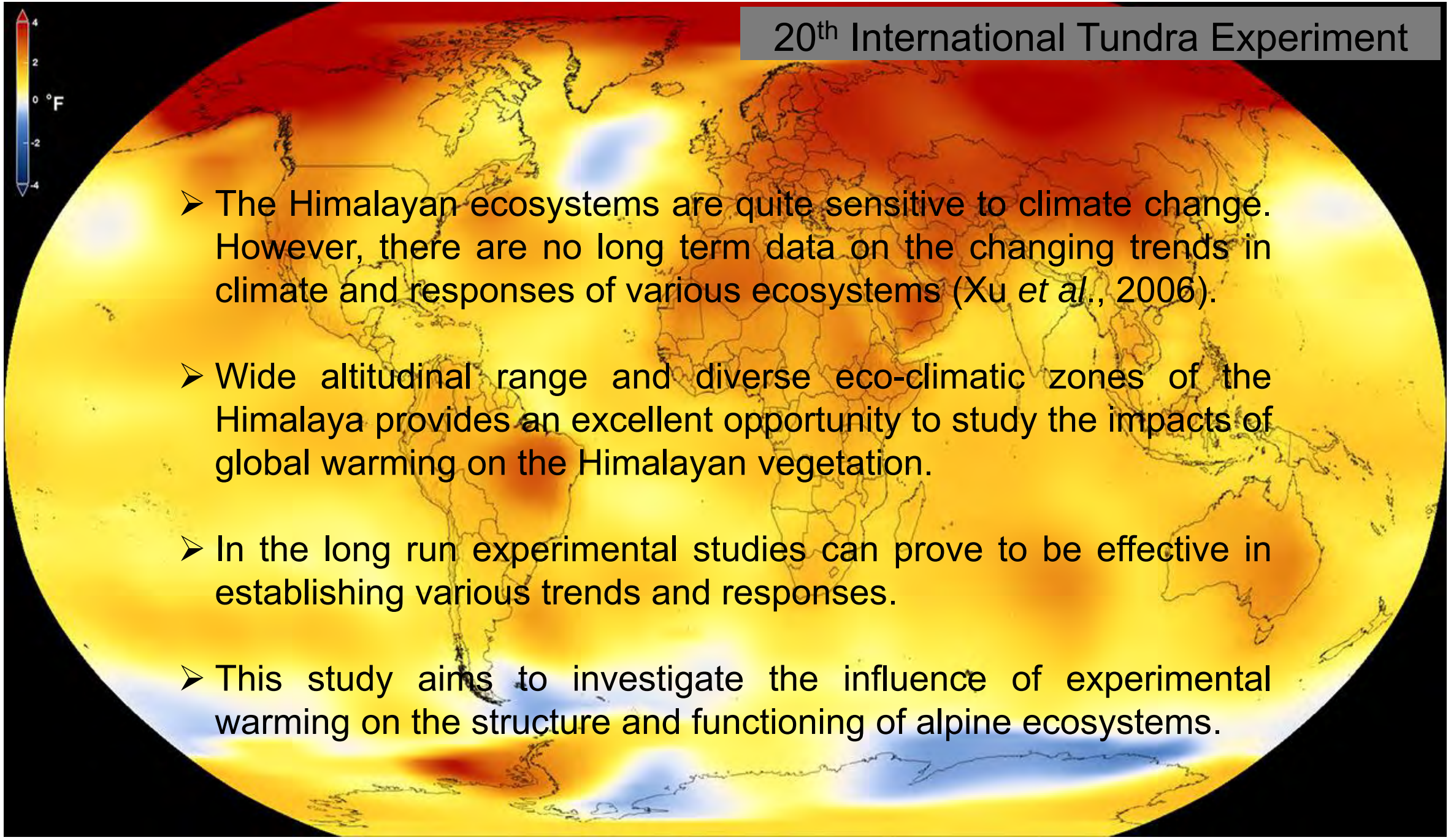
20th International Tundra Experiment

An Experimental approach to assess the impact of climate warming in Indian Himalayan Region

Research Scholar: Chirag Girdhar

Principal Investigators: Dr. G.S Rawat

20th International Tundra Experiment



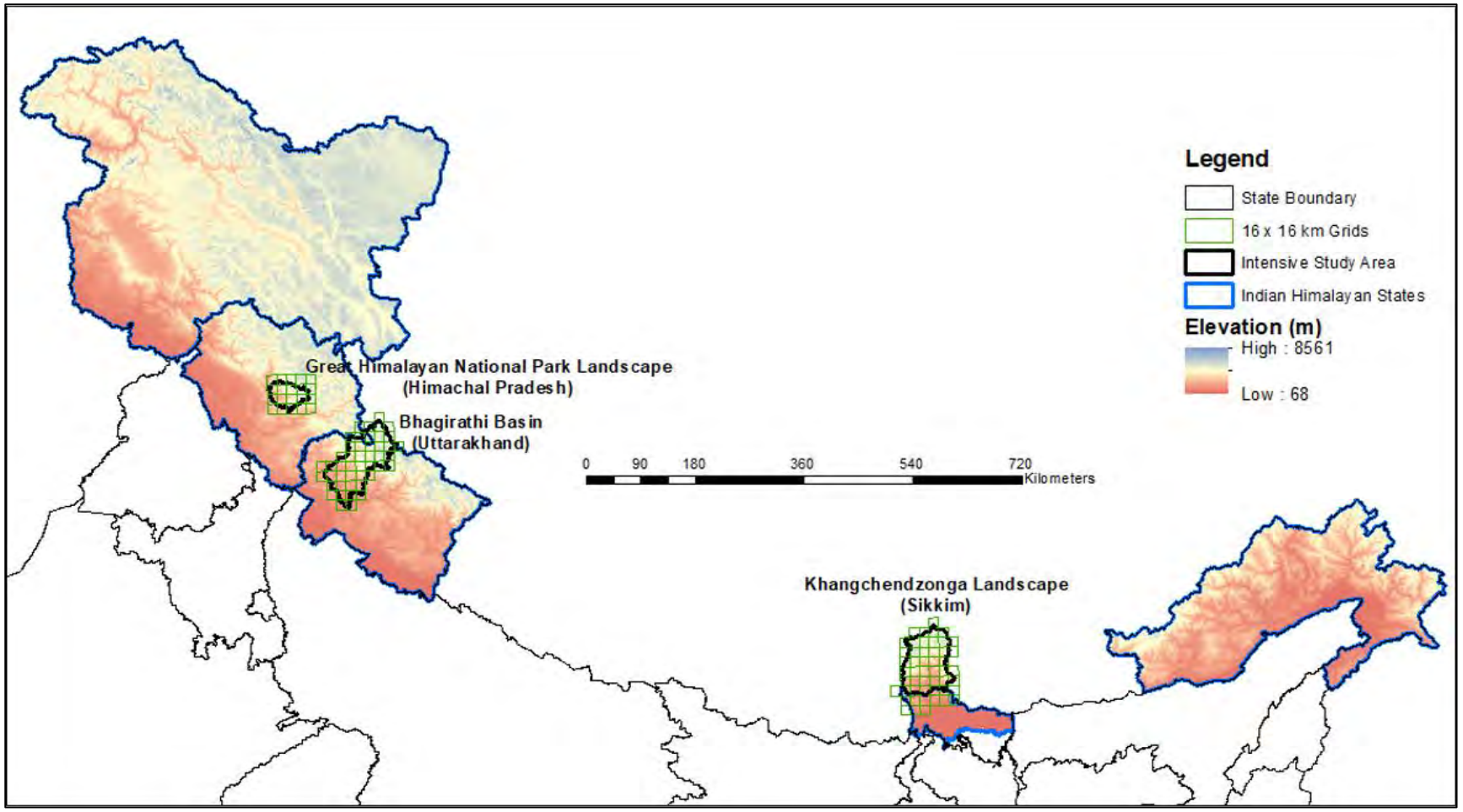
- The Himalayan ecosystems are quite sensitive to climate change. However, there are no long term data on the changing trends in climate and responses of various ecosystems (Xu *et al*., 2006).
- Wide altitudinal range and diverse eco-climatic zones of the Himalaya provides an excellent opportunity to study the impacts of global warming on the Himalayan vegetation.
- In the long run experimental studies can prove to be effective in establishing various trends and responses.
- This study aims to investigate the influence of experimental warming on the structure and functioning of alpine ecosystems.

Objectives and Study Area

20th International Tundra Experiment

I. To assess responses of alpine plant communities in biomass production, phenology and nutrient relations to simulated warming experiments

II. To identify key climatic variables and establish relationship with plant responses in natural and warming conditions



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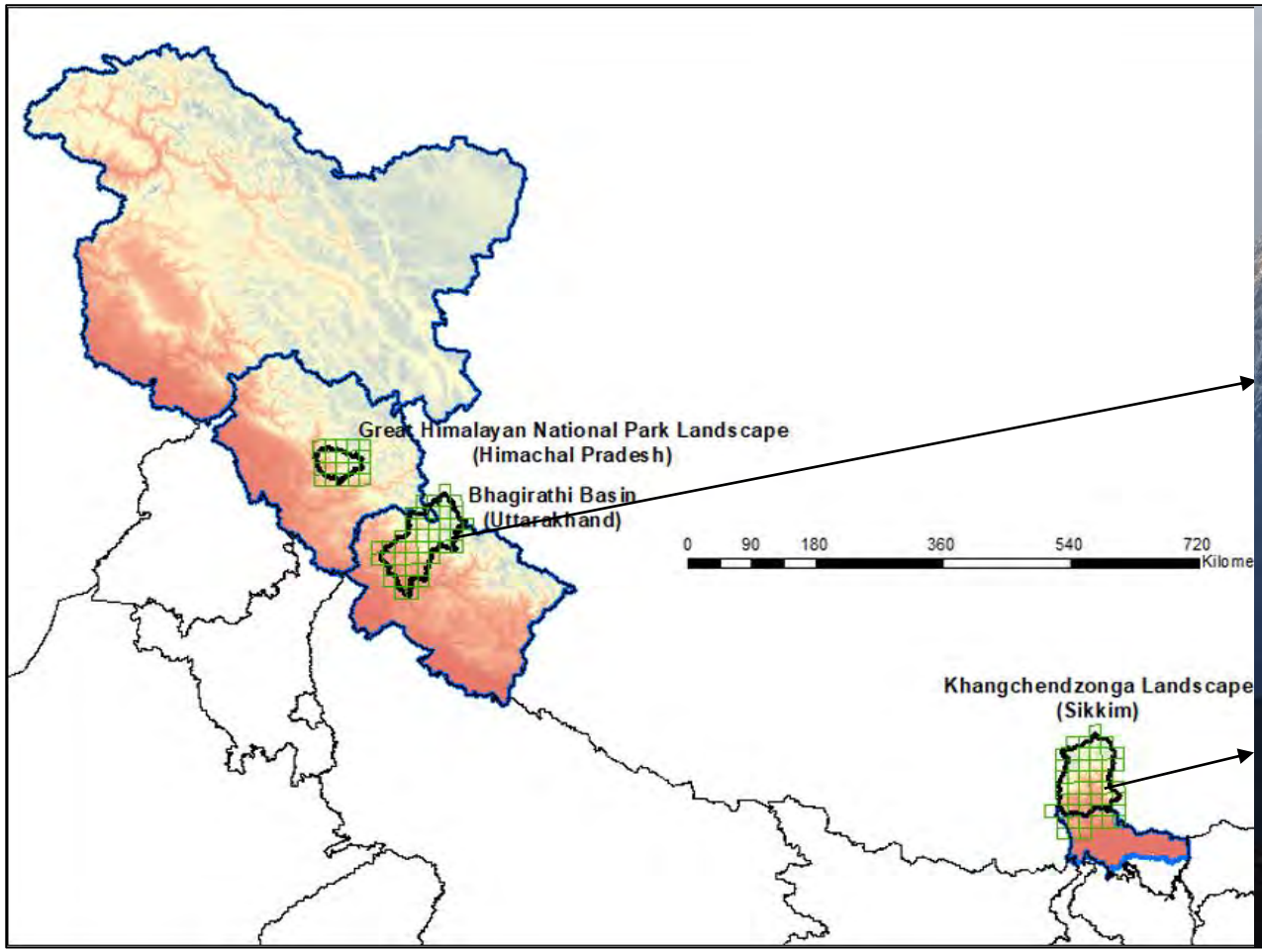

(OTC) installation (n=25)

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Methodology Adopted

20th International Tundra Experiment

Open Top Chamber

Field Sampling

1. Community Composition- 50×50cm^2 quadrat
2. Biomass 25×25cm^2
3. Phenological monitoring and nutrient analysis
4. Litter Decomposition- Litter bag method 5gm of *Betula utilis* fallen leaves in a nylon bag.

Environmental Parameters

1. Air and Soil temperature
2. Relative Humidity
3. Soil physico-chemical properties

Micoflora

1. Lichenometry inside and outside the OTC

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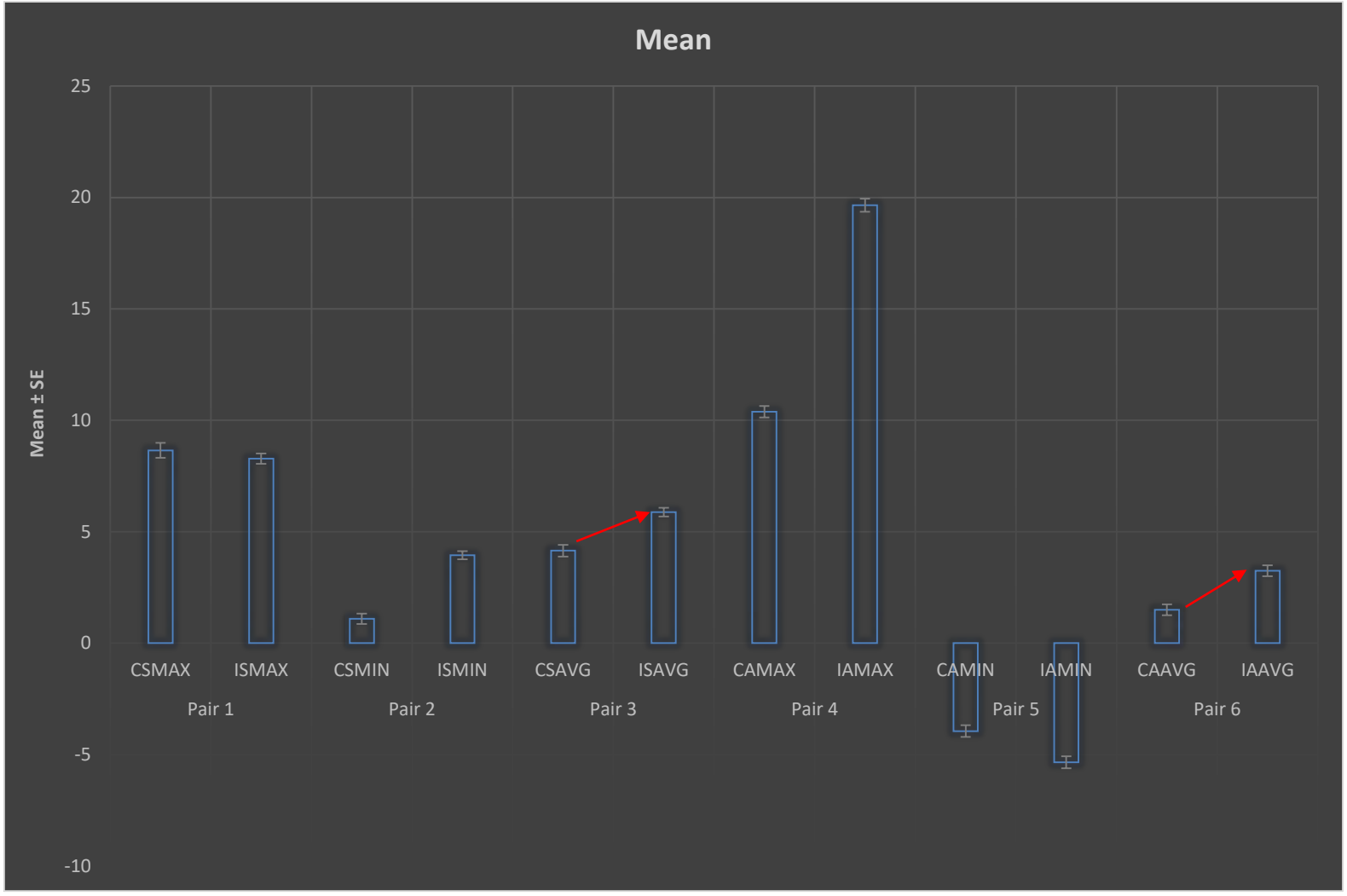
Selection and Further target species suitable for the OTC experiments in the Indian Himalayan Region

Target species across the globe/ITEX	Species in alpine Himalaya suitable for OTC experiments
Cassiope tetragona	Cassiope fastigiata
Salix herbacea	Salix lindleyana
Saxifraga oppositifolia	Saxifraga jacquemontiana, S. pulvinaria
Bistorta vivipara	Bistorta vivipara
Carex stans	Carex setosa
Oxyria digyna	Oxyria digyna
Silene acaulis	Silene inflata
Ranunculus nivalis	Ranunculus diffuses, R. hirtellus
Pedicularis lanata	Pedicularis pectinta, P. oederii
Bistorta bistortoides	Bistorta macrophyla, B. affinis

Perliminary findings

- Air and soil temperature inside the OTC was elevated by 1.8°C and 2.5°C respectively, which is well within the projected scenario of climate change.



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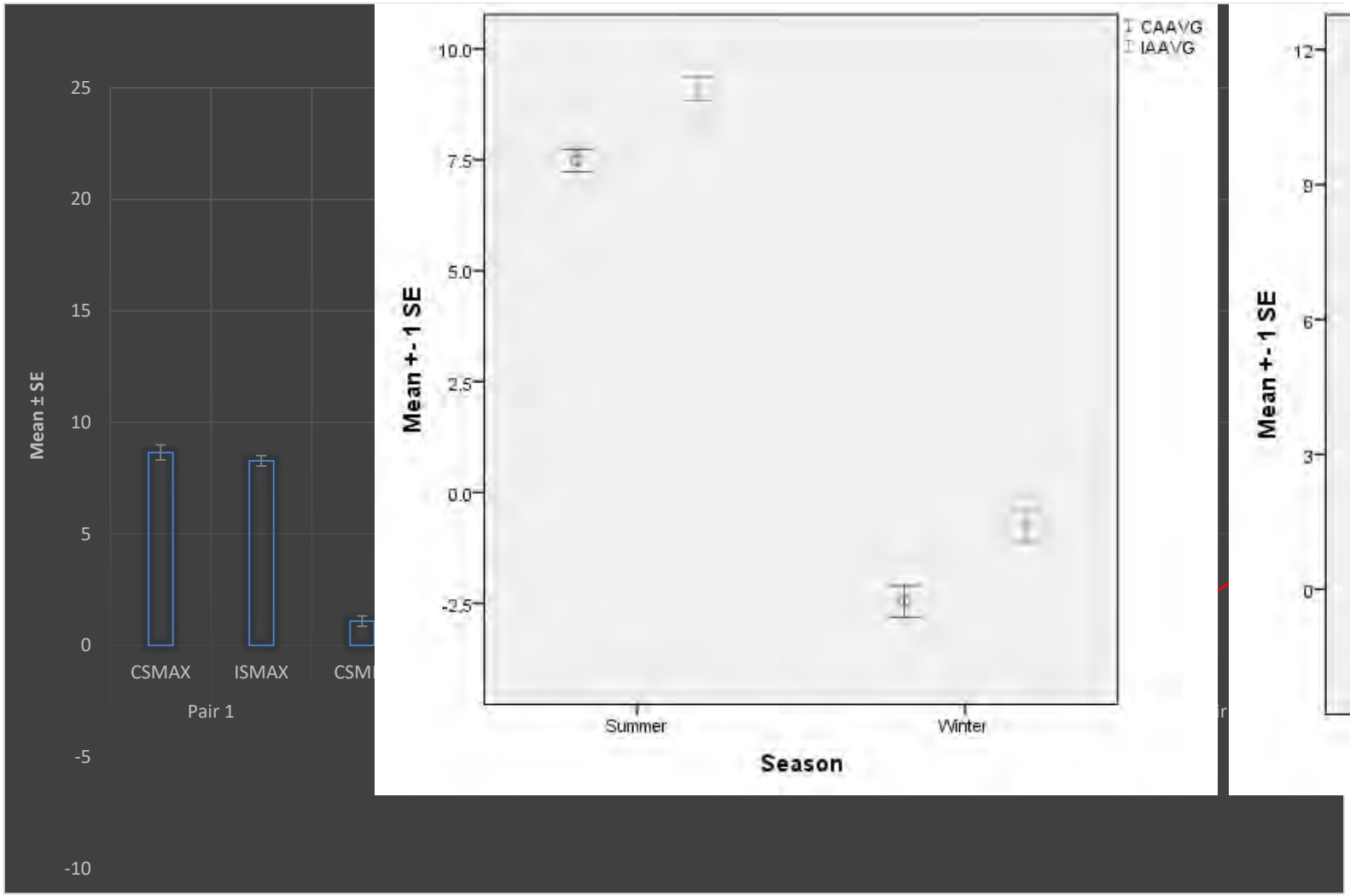

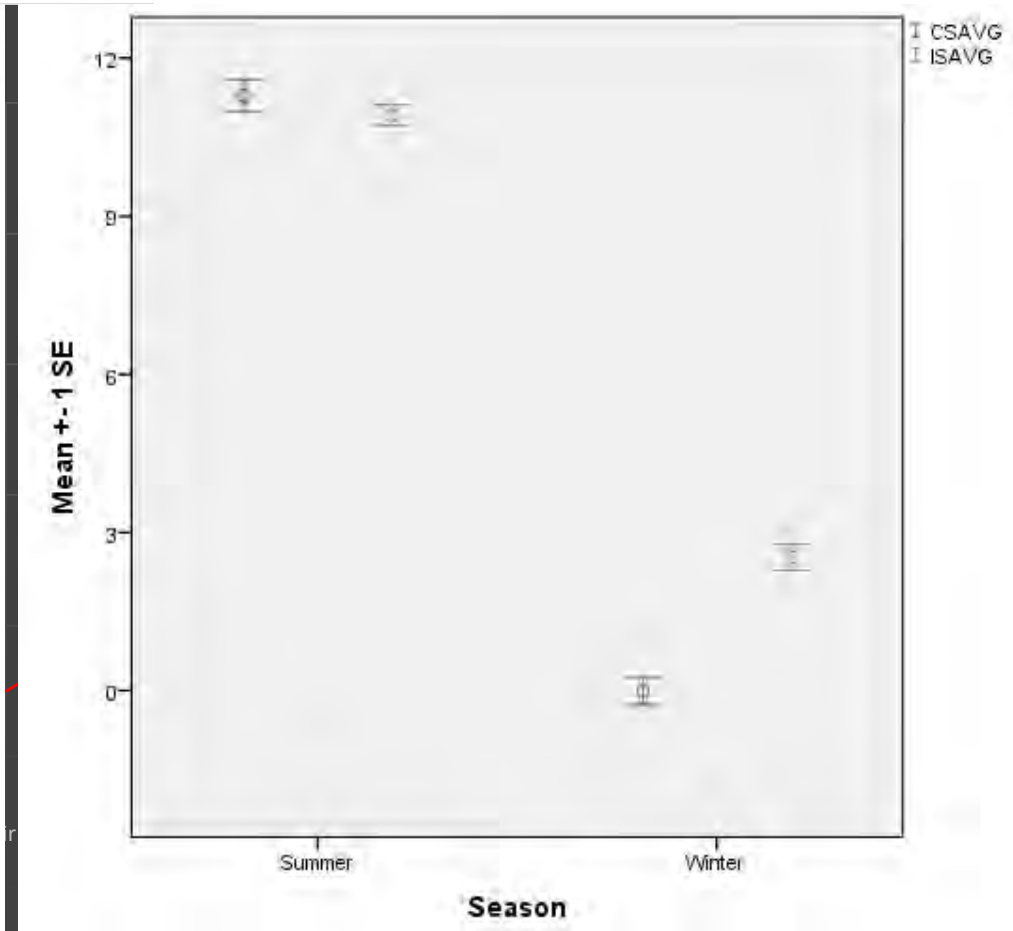

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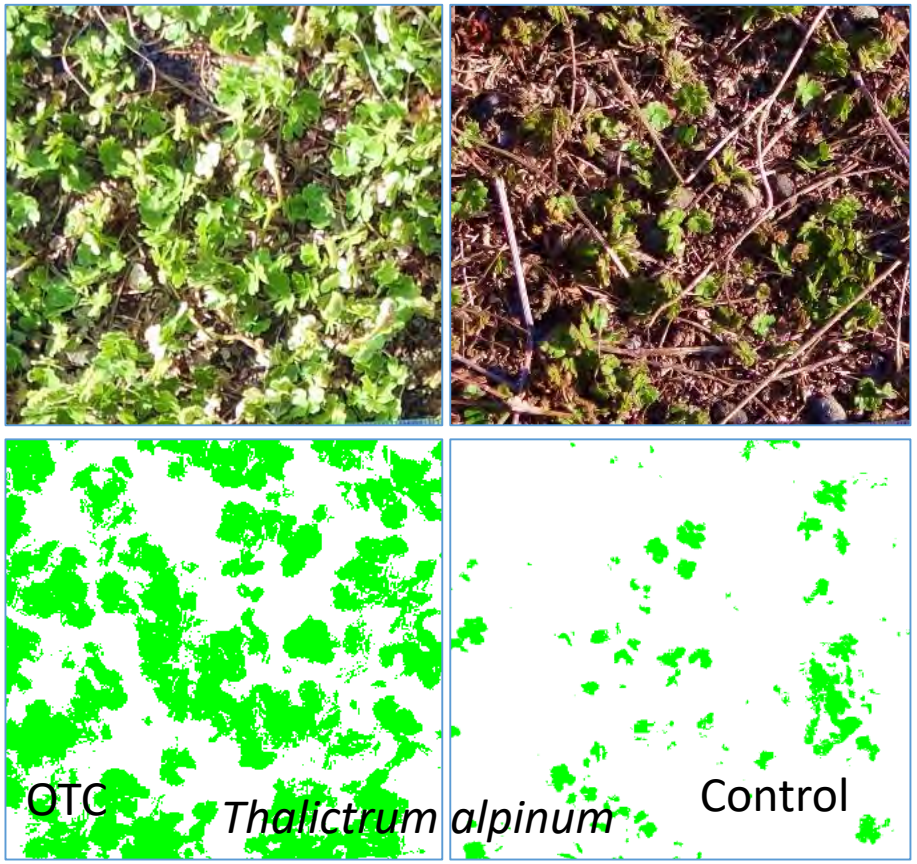
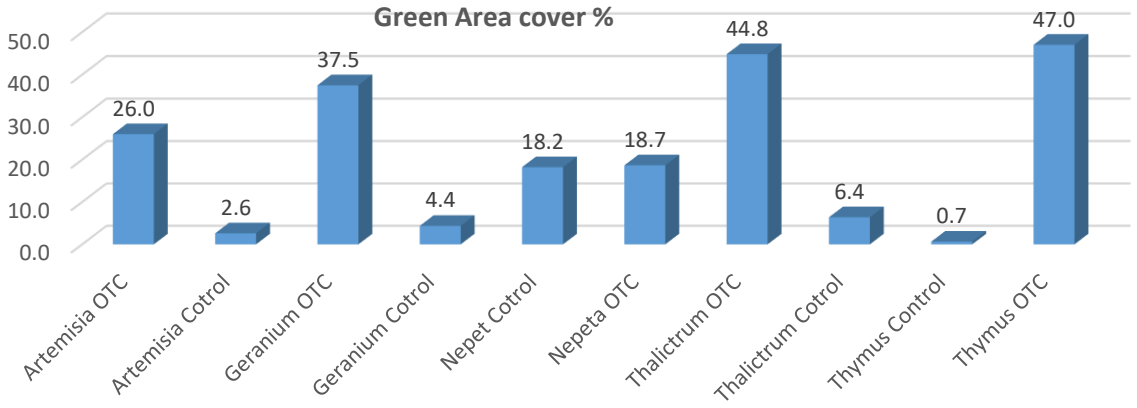


Biomass of dominant species in OTC and natural conditions (gram m^{-2})

	Nepata discolor	*Geranium himalayense*	*Polygonatum graminifolium*	*Gentiana tianshanica*
OTC	78.45	60.82	12.65	9.58
Control	65.30	29.20	9.12	8.33



Early initiation of growth, as shown in terms of green cover; as well as increased biomass of dominant species was found inside the OTC after two year of experimental warming.

Conclusions

- Significant difference in the air and soil temperature inside the Open Top Chamber as compared to natural conditions, which is well within the projected scenario of climate change.
- The two-year warming resulted in increased above ground productivity which may be due to increased soil microbial activity and availability of soil nitrogen.

Key message

- The present study revealed OTC based studies are an important tool for monitoring ecosystem responses in future climatic scenarios in the Himalayan region.
- The study need to have multiple sites in the Himalayan region to assess ecosystem responses at landscape level.

Acknowledgements

- International Tundra Experiment Team
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- Team Work: Dr. Ishwari Dutt Rai, Gaurav Pant
- Research Coordinator and Faculty Members, WII

Thank you

Acroscyphus sphaerophoroides: Rare lichens, from west Sikkim