Drought Resilience +10
High-level Meeting on National Drought Policy

مركز التغير المناخي
Climate Change Center

المركز الوطني للأرصاد
National Center for Meteorology

Managing Drought and Ecosystems in Arid regions: the case study of Saudi Arabia

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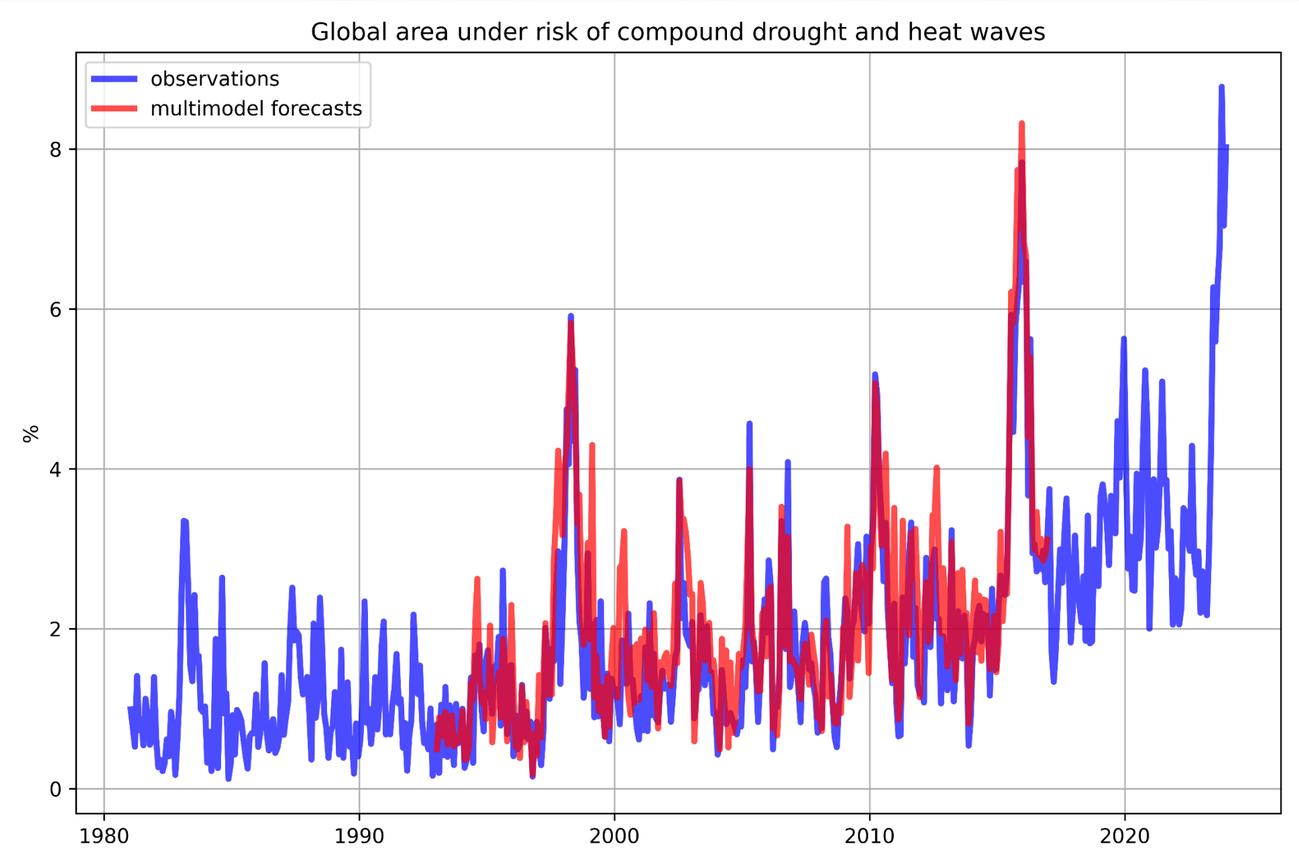
Outline

- Motivation
- Establishment of the Climate Change Center (CCC) in Saudi Arabia
- The Saudi Green Initiative (SGI) and the Middle East Green Initiative (MGI)
- The CCC support to the SGI and MGI:
  - Observational studies
  - Numerical simulations
- Summary of the *Drought and Ecosystems in Arid Environments* side event

Increase risk of compound drought and heat waves events



Since 1980, the global extent of area under risk of compound heat and drought events tripled.

Weather forecasts are crucial for early warnings, aiding societal adaptation to global warming.

Zampieri M, Ashok K, Toreti A, Bavera D, Hoteit I (2024) On the stationarity of the global spatial dependency of heat risk on drought. Geophysical Research Letters, in press.

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Climate Change Center – Saudi Arabia

Center Vision, Mission, and Objectives

المركز الوطني للأرصاد
National Center for Meteorology
المملكة العربية السعودية

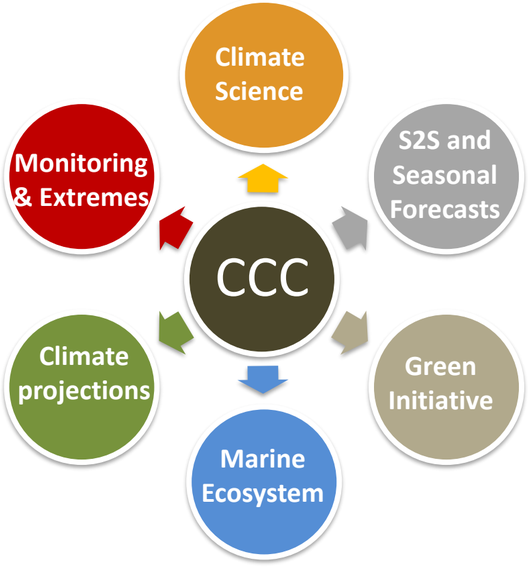
جامعة الملك عبدالله للعلوم والتقنية
King Abdullah University of Science and Technology

Thuwal,
5 Mar 2023

VISION

The CCC will be the focal point for climate change science in the Kingdom of Saudi Arabia (KSA).

The Center will provide tools and information to help the KSA cope with a changing climate, now and in the future.



MISSION

The Center will lead the development of climate information services nationally and regionally, with the aim of mitigating the impact of climate phenomenon and contributing to sustainable development by delivering sound climate information and advising decision-makers within the Kingdom and regionally.

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Saudi Green and Middle East Green Initiatives

Launched in 2021, the **Saudi Green Initiative (SGI)** is a national initiative that is focused on combating climate change, improving quality of life, and protecting the environment for future generations.

TARGETS

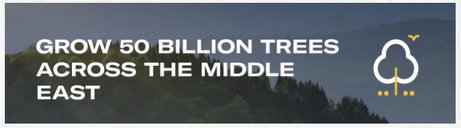
Energy transition, including emissions reduction across sectors and promoting renewable energy capacities.

Rehabilitate 74 million hectares of land - turn the desert green.

Increase protected areas, reinforce biodiversity and safeguard nature.

The **Middle East Green Initiative (MGI)** is a regional effort led by Saudi Arabia to mitigate the impact of climate change on the region and to collaborate to meet global climate targets

TARGETS



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CCC support to the SGI

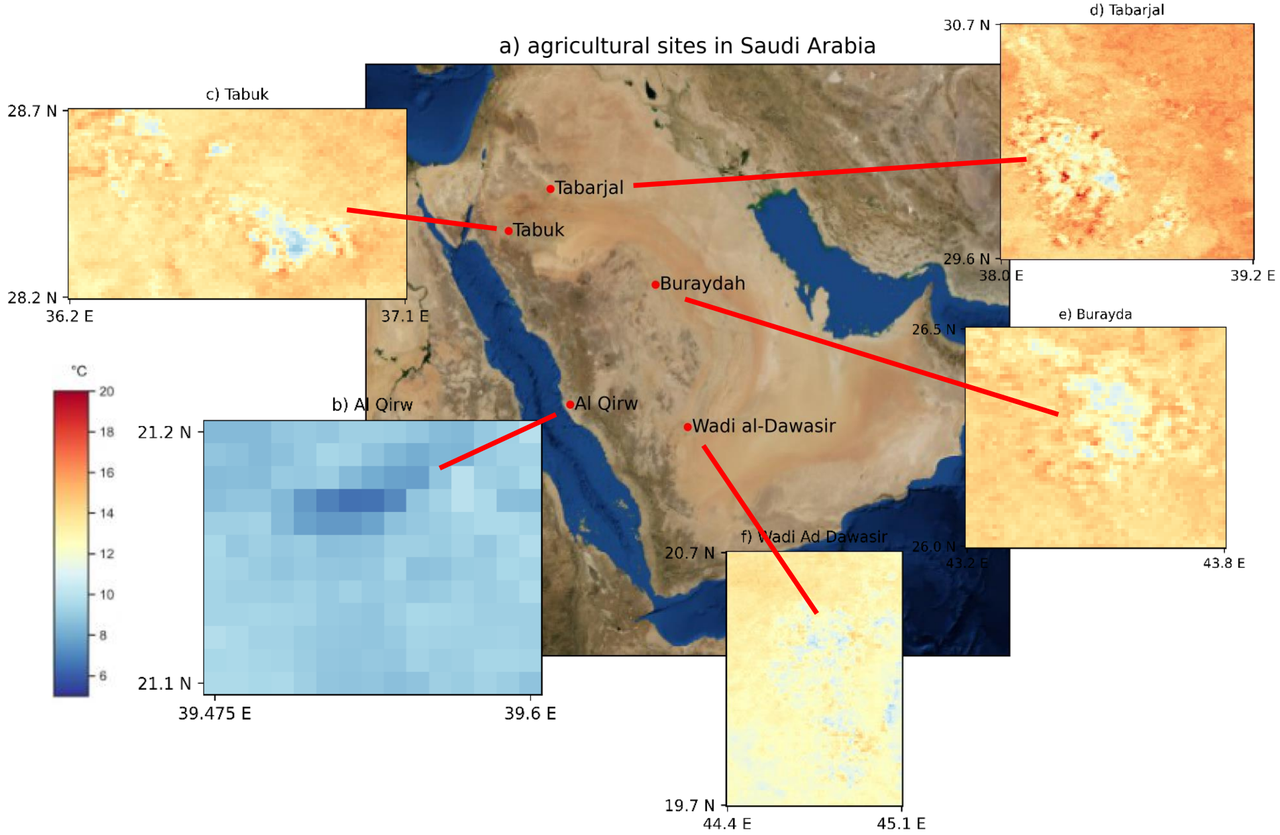
OBSERVATIONAL STUDIES

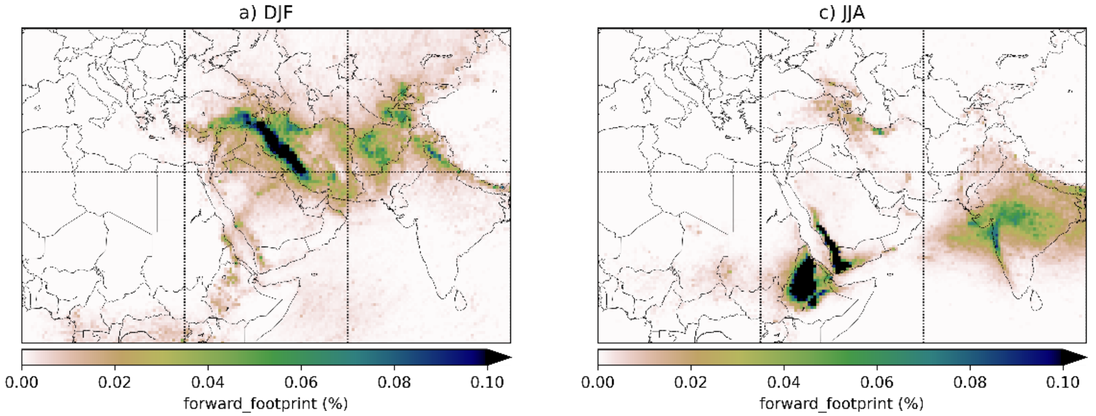
- **The potential for mitigation and adaptation in Saudi agricultural sites**

  Managed vegetation can reduce temperatures during heat waves by up to 4°C (Zampieri et al. 2023)

- **Saudi irrigation improves climates in neighboring Middle Eastern countries**

  Regions where water evaporating from Saudi irrigated sites is likely to precipitate again (Zampieri et al. 2024)





Zampieri M, Alkama R, Luong T, Ashok K, Hoteit I (2023): Managing vegetation for stronger cooling efficiency during hot days in the Arabian Peninsula. Ecological Indicators 154:1,10789.

Zampieri M, Luong TM, Ashok K, Dasari HP, Pistocchi A, Hoteit I (2024): Leveraging atmospheric moisture recycling in Saudi Arabia and neighboring countries for irrigation and afforestation planning. Regional Environmental Change 24, 124.

CCC support to the SGI

NUMERICAL SIMULATIONS

Land use change scenarios

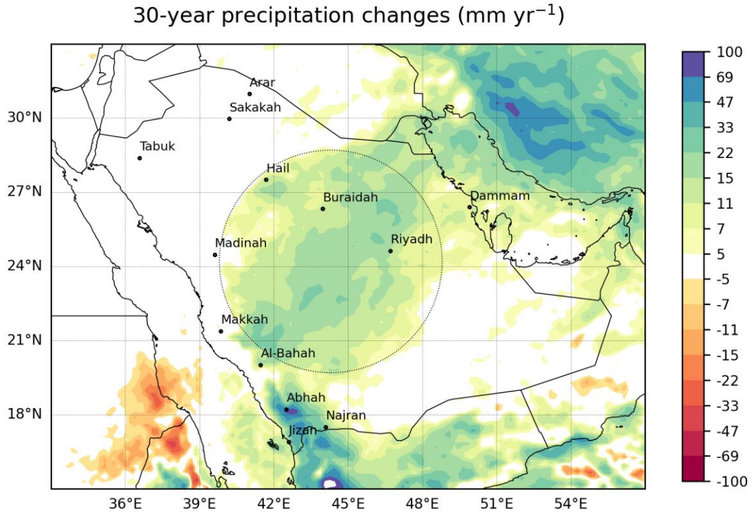
The potential impact of afforestation and greening on the Saudi climate is analyzed through high-resolution numerical simulations using a regional climate model.

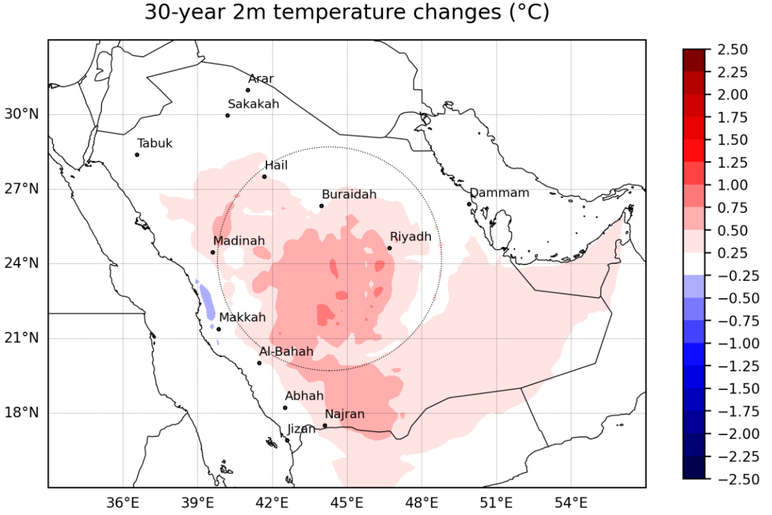
Afforestation in Saudi Arabia is projected to increase precipitation by up to 14 mm (+31%) but may also lead to surface warming (+0.4°C), primarily due to the albedo effect (Charney et al. 1975).

Groundwater processes will be resolved as well

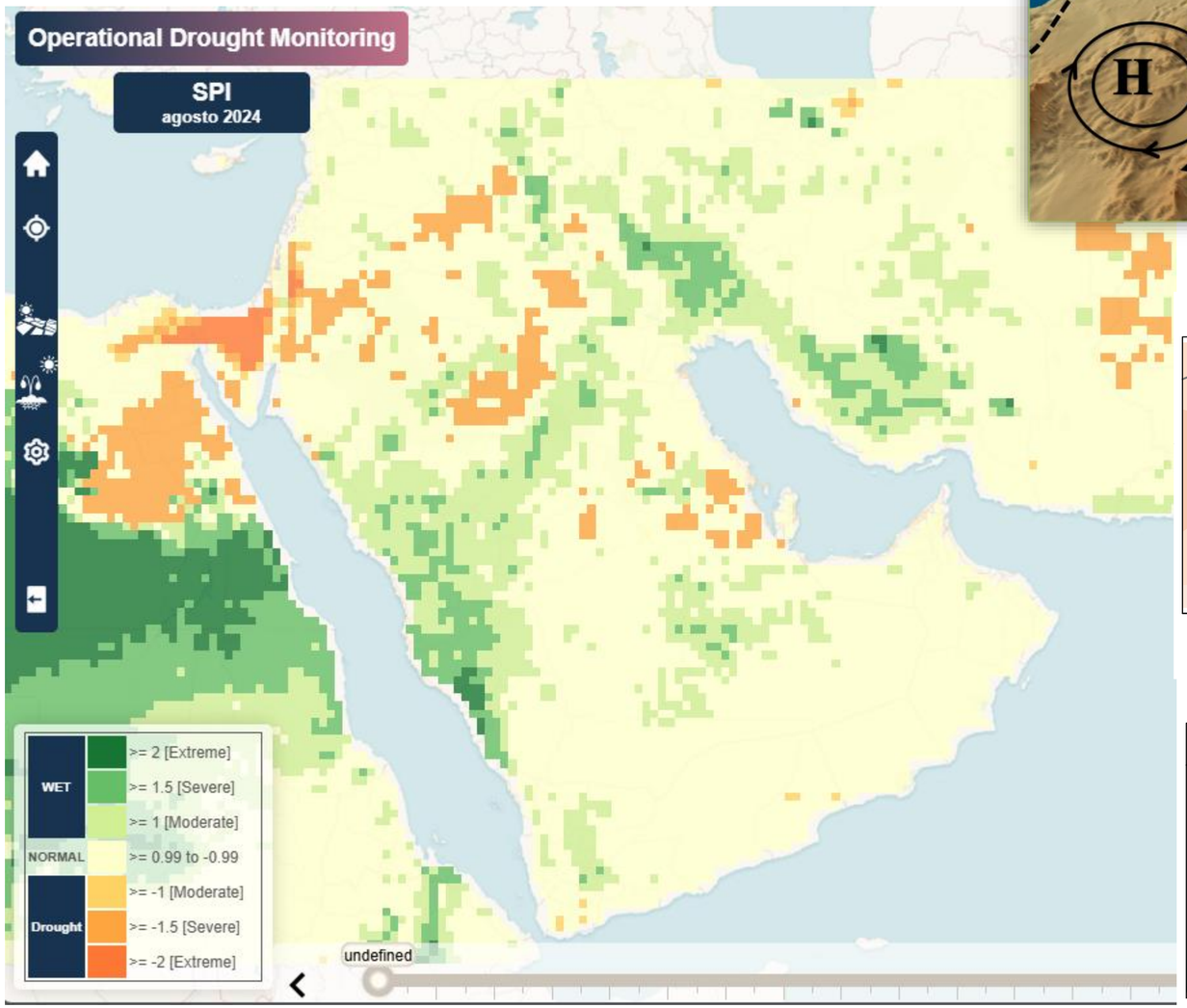
Luong TM, Zampieri M, Hoteit I et al. (2024): The Role of Afforestation in Modulating Arid Climate, In preparation

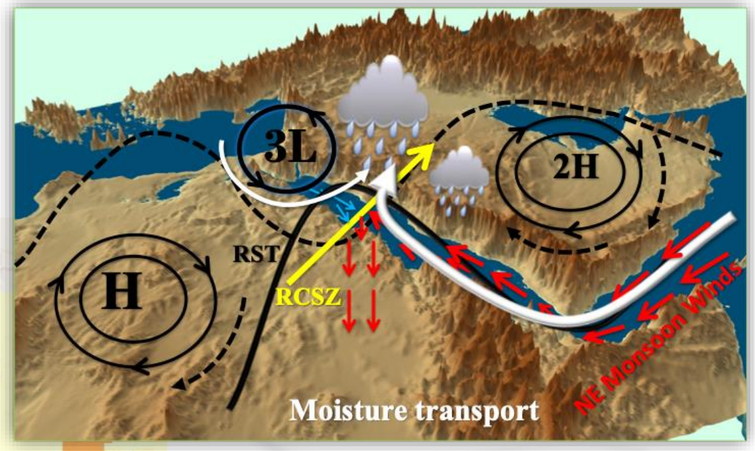
Charney, J., P.H. Stone, and W.J. Quirk, 1975: Drought in the Sahara: A biogeophysical feedback mechanism. Science, 187, 434-435, doi:10.1126/science.187.4175.434.

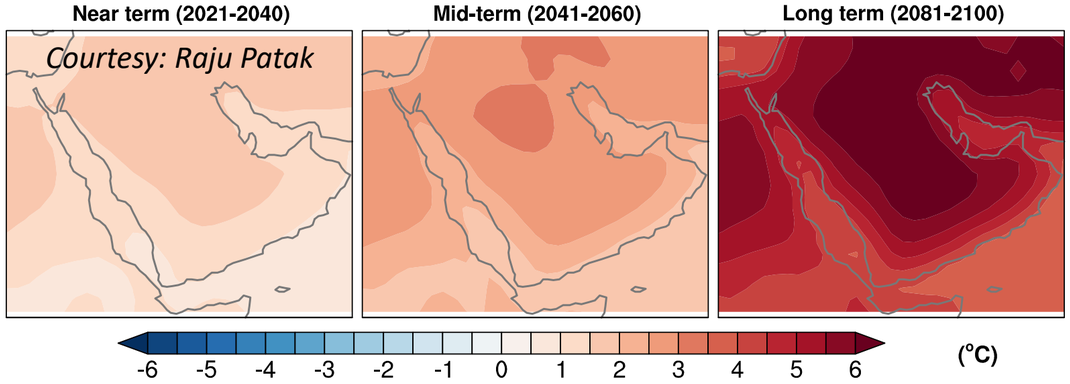


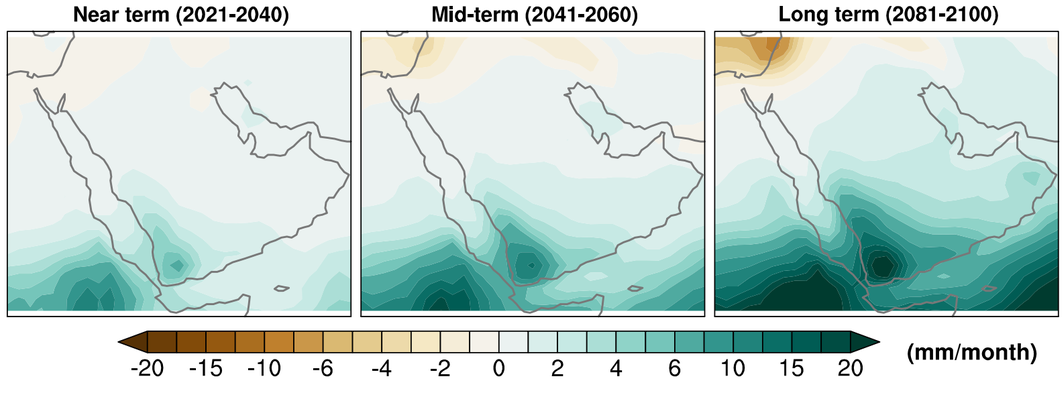


CCC activities



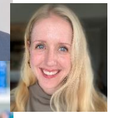




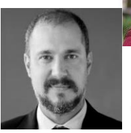


Side event:
Drought and Ecosystems in Arid Environments

Conveners: Matteo Zampieri (CCC, KAUST) – Ibrahim Hoteit (KAUST) – David Yates (NCAR)
Introduction: Ayman Ghulam (NCM)
Speakers:




- Francesco Pausata (UQAM) *Analysis of the Green Wall Initiative scenarios*
- Erin Dougherty (NCAR) *Modeling the ecosystem-climate interations in Saudi Arabia*
- Annalisa Molini (Tulane University) *Plants, salt, and droughts: How vegetation hydraulic traits mold salt-affected ecosystems*
- Souvik Chongder (Global Climate Care) *Mangroves: Patron of drought at India & Bangladesh for Climate Refugees*
- Nima Shokri (TUHH) *Pioneering New Approaches to Quantify Soil Degradation: Leveraging AI and Big Data*
- Cathy Hohenegger (MPI-M) *New Opportunities to Predict Drought and Ecosystem Degradation Globally Under Climate Change.*
- Kaveh Madani (UNU – INWEH) *Global Water Bankruptcy: Can AI and Data Help?*
- Segni Tesgera (Acacia Water) *Monitoring the impacts of nature based solutions for drought risk management.*

Discussion:

Key Recommendations and Challenges for Afforestation and Greening Programs in Arid Regions: best strategies and practices, caveats and lessons learnt, etc.

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Thank you!

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