Understanding trends and dynamics over the last four decades of vegetation greenness in Chile

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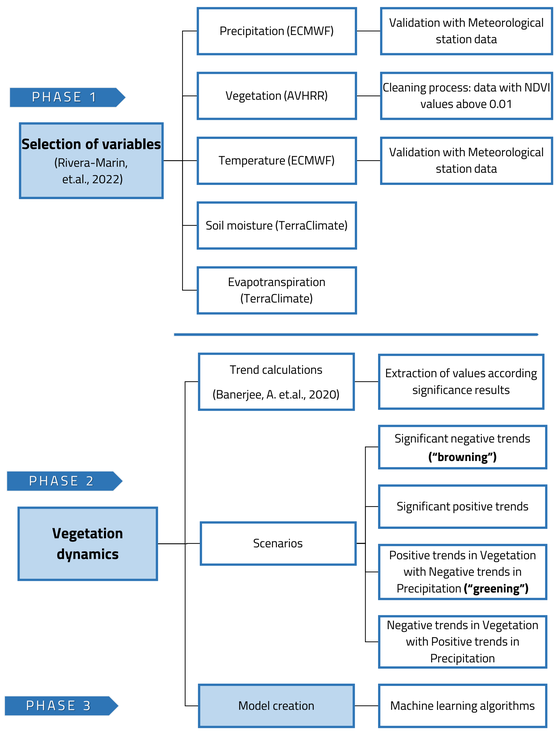
RESEARCH AIM

This study aim to understand growth dynamics of vegetation in Chile in relation to other physical variables such as precipitation, temperature, soil moisture and evapotranspiration over the last 37 years. There is a lack of studies that makes a relation between vegetation state and the different processes that might affect its present and future distribution and coverage, especially in the selected study area, Chile.
The respective trends of the previous mentioned physical variables will be evaluated on a yearly basis and in the respective wet season (May to October), to determine the why and where of the changes on vegetation dynamics.

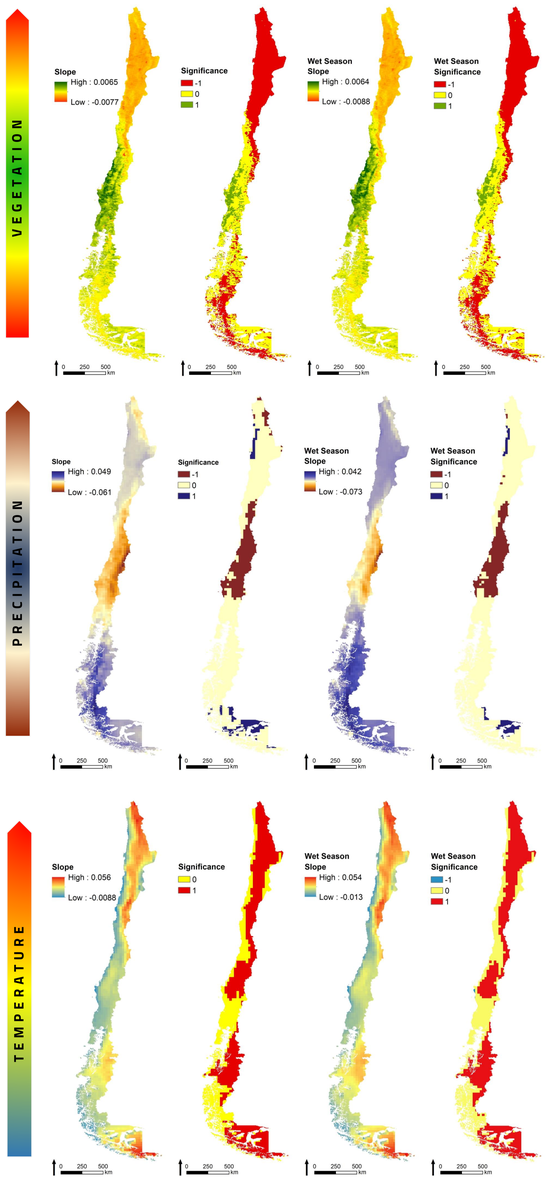
METHODOLOGY

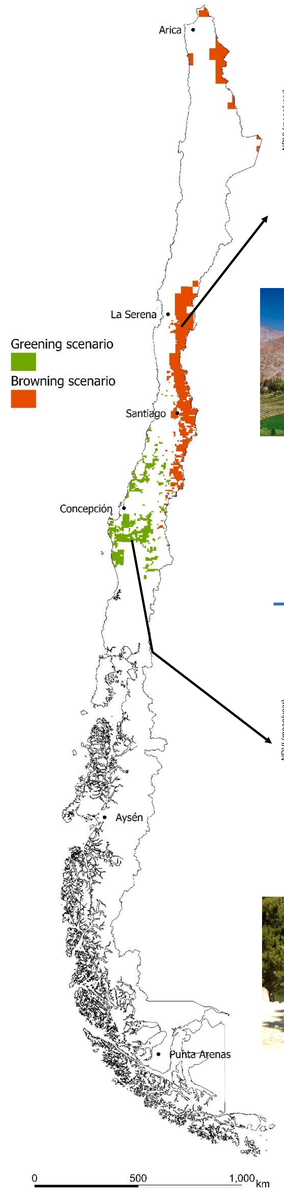


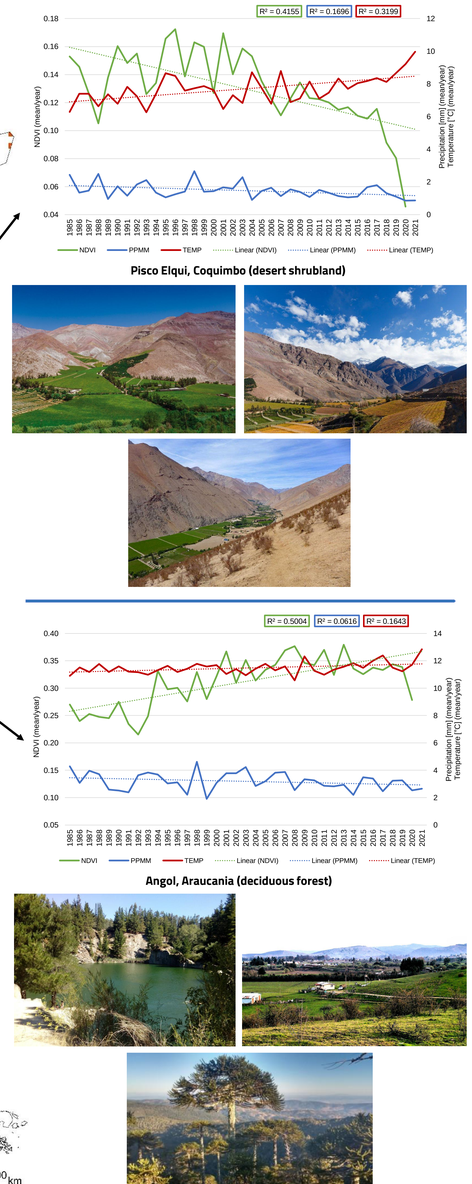
References

Full Abstract EGU 2023
Rivera-Marin et. al., 2022
Banerjee, et.al., 2020
Luebert, F. & Pliscoff, P. 2017

RESULTS







DISCUSSION

Initial results suggest that:

- Vegetation trends display significant negative trends in both extremes of Chile, and a significant positive trend in the central to southern area of the country. It is worth noticing that in the same areas that present a significant increment in NDVI values, there are also areas with no significant changes over the last 40 years.
- Precipitation, as a variable and possible driver, presents a significant negative trend in the central/south area of Chile, affecting mainly temperate to evergreen forest and shrublands (Luebert, F. & Pliscoff, P. 2017).
- Temperature displays a positive trend all along the country, which can be translated to an increment on temperature on a range between 0.4 to 0.8 °C. The rest of the continental territory display no significant trends (either positive or negative)
- From Coquimbo to Los Lagos, there is an ongoing "greening" process (~29 km²), this area presents a positive trend in its NDVI values over the last four decades.
- This "greening" process, is not affected by the negative trends of precipitation or the increment in temperature over the last 40 years. Future work will explore the reasons and drivers of this process, beyond the physical variables evaluated, but at the moment, changes in vegetation greenness is mainly controlled by changes in precipitation.
- The opposite scenario or "browning" is present at the moment in ~67 km² of the continental territory of Chile. It affects mainly semi-arid (shrublands) environments in the north and temperate environments in the central zone of Chile.
- This "browning" process is highly affected and sustained by negative precipitation trends over the last 40 years. Future work will explore beyond the physical variables effects and look upon the human effects in the same area.

FUTURE WORK

- Further spatial analysis will be undertaken to identify geographic distribution of **key drivers of vegetation changes in the past and future scenarios**.
- **Evaluation of different phenomena that can affect vegetation cover and its distribution**, such as land degradation, desertification or changes related to human and urban densification.
- **Evaluation of changes in land cover use**, agriculture and agriculture migration, effects of urbanization and population density, looking to understand the different dynamics within the territory **and how this dynamics does not always result in a diminution of vegetation cover**.
- Links to different phenomena that can and does affect the country, especially **desertification**, will be analysed including **both physical and human variables results**. Exploring land and vegetation degradation, types of vegetation affected and what are the human drivers of changes in land use and land cover.
- **Machine learning** algorithms such as linear regression, support vector regression, and random forest **will be developed to model the patterns of present and future vegetation covers** considering all possible drivers of vegetation change.
- Finally, **key areas of changes in vegetation cover under future climate change and development scenarios will be identified** to develop a management strategy.

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