

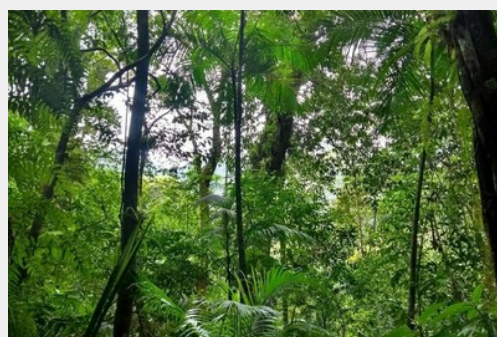
Large trees in Brazilian southern subtropical forests are an important resource

PhD student at the Postgraduate Program in Ecology is the lead author of a published article at an international scientific journal. The study on the variables that influence the biomass stock of forests from Rio Grande do Sul and Santa Catarina is the first about biomass quantification in these sites

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Researchers around the world seek knowledge and solutions to issues related to climate change¹ and environmental problems. Scientific international networks have the study of different types of forest formations and their role in carbon dioxide (CO₂) fixation from the atmosphere as one of their focal points. Since they are able to store significant amounts of biomass, forests are an important component of the carbon cycle, as plants absorb CO₂. However, the contribution of each type of formation in this process varies. At UFRGS², the PhD student [Kauane Maiara Bordin](#), from the [Postgraduate Program in Ecology](#), studied the subtropical forests of southern Brazil to quantify the biomass stored in them and evaluate which factors are related to such stocks. The first results of this research were published in an article titled "[Climate and large-sized trees, but not diversity, drive above-ground biomass in subtropical forests](#)" at the *Forest Ecology and Management* journal in March 2020. The study proved that the main factors related to the biomass stock in those forests are the climate and the proportion of large trees. Biomass is a measure for forest structure, closely related to carbon storage in trees. Its quantification is obtained from an equation that combines the height, diameter and wood density of trees.



The climate, characterized by annual temperature variations, negatively affects biomass storage, while the high proportion of large trees has a positive influence. Mature forests, which have large trees, are responsible for storing large amounts of biomass. The study indicates that these forests are playing a key role in the long-term persistence of carbon storage, since large trees account for 64% of the total biomass stored in the surveyed forests. On the other hand, the annual temperature variation had a negative effect, indicating that places that have a high thermal amplitude tend to accumulate less carbon over the years. The findings are important because they show that the conservation of these areas – which allows trees to reach larger sizes – is essential for maintaining carbon storage. Regarding the influence of the climate variable, Kauane explains that: "This climate effect has brought a sense of clarity to us, because climate change can cause extreme cold and heat events to occur in the future, negatively impacting biomass stocks and the carbon cycle in general". The variables studied are shown in [this image](#), in which the arrows indicate the relationships that have been tested. Result arrows with shades of red indicate negative relationships; and arrows with shades of green, positive relationships. The lighter-tone arrows indicate the variables that have not demonstrated an effect on biomass stocks: clay content in the soil (the more clay, the more water is retained in the soil); nitrogen content of the leaves (an important chemical element for photosynthesis); functional diversity (characteristics of plants, such as the variety of leaf sizes).

Professor and advisor [Sandra Cristina Müller](#), head of the [Plant Ecology Laboratory of UFRGS \(LEVEG\)](#), where Kauane is conducting her research, highlights that the great novelty of the study is that the relationship between the size of trees and the ability to store carbon was not yet investigated in the Brazilian Southern Region. "We have many studies about the Amazon region, the temperate regions of Europe, the United States, subtropical areas in China, but for the south of South America, which comprises this large subtropical area of forests, we hadn't seen yet any study that reported this pattern," says Sandra. She also explains that in other regions "the influence of other factors is known, but here the determinant was in fact the huge concentration of large trees that the forest has". The professor also draws attention to the fact that these areas could have a much greater capacity for biomass storage: "This entire region has undergone selective felling³ in most forests, with focus on large trees of commercial interest. So, the original carbon storage capability – thus maintaining a better climate ratio – is even bigger for the region than the one we found, because in the past there were certainly more large trees in these forests." The researchers emphasize that most of the 119 sites studied are within conservation units and advocate in the article for the conservation of these areas to achieve mature forests. According to Sandra, many of these sites are just fragments, "small stains", within the entire area that was once covered by forests. "Our sample is a sample of what we have today and makes, but it very clearly indicates the great potential this whole region has: to see its carbon stock enhanced once comprehensive forest restoration programs were in place," she says.

Network collaboration

Kauane has been dedicated to the study of forests since she was in her undergraduate program in Biological Sciences at the Community College of the Chapecó Region (UnoChapecó), where, as a scientific initiation fellow, in 2014, she identified and measured the trees of the Chapecó National Forest. For her master's dissertation research, already at the Graduate Program in Ecology at UFRGS, the researcher returned to Chapecó to make new measurements, following the changes in the area over time. Aiming to expand her studies to include further forest areas for her PhD, she chose to analyze other forests of the LEVEE's permanent plots and counted on a network of scientists from partner institutions and the laboratory itself, who, even, are coauthors of the article. This way, it was possible to characterize 119 sites of subtropical forests in Rio Grande do Sul and Santa Catarina in terms of biomass stock and arrive at the results presented in the article.

Translator's notes:

¹ Translator's note: In Portuguese, the author uses the equivalent for "global warming", since the term is now in disuse by the scientific community, I opted for an updated term. ² Universidade Federal do Rio Grande do Sul (UFRGS) or Federal University of Rio Grande do Sul (in English). It is a Brazilian public university subsidized by the federal government and located at the southern region. ³ Felling from the verb fell, presented by the Cambridge Dictionary as "FELL verb (CUT DOWN): to cut down a tree". Source: <https://dictionary.cambridge.org/dictionary/english/felling>

Translated into English by *Manuela Pereira Kliemann*, under the supervision and translation revision of *Elizamari R. Becker (PhD) – IL/UFRGS*

