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## Introduction

Umbrisols are characteristic soils of humid mountain areas, where precipitation considerably exceeds evapotranspiration throughout the year. Their name derives from latin "Umbra", showing the dark appearance of the diagnostic Umbric horizon which characterizes this soil Group.

The dark colour is an evidence of large organic matter content.

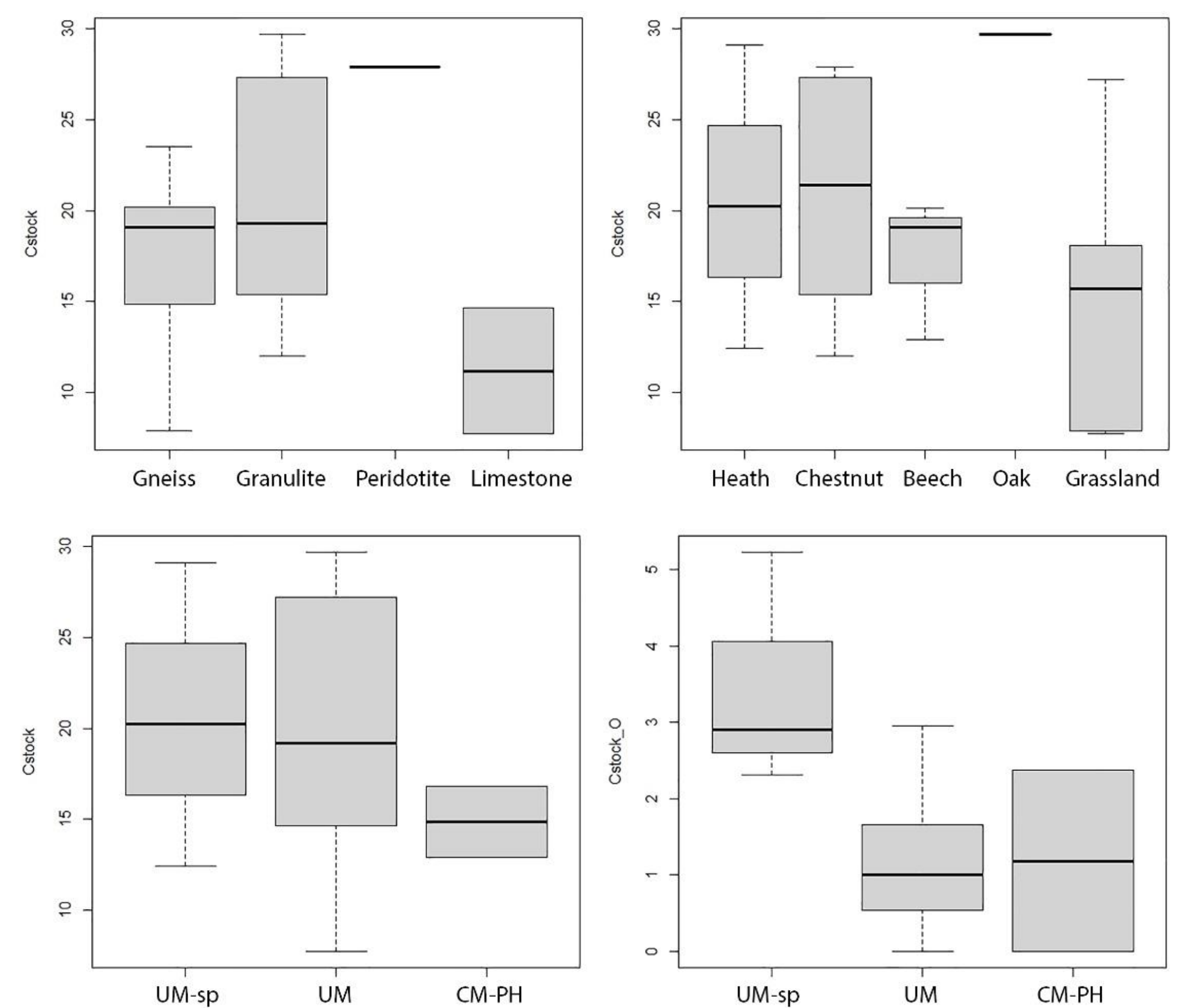
This study was performed in the Valgrande National Park, a wilderness area located in the south side of the Central Alps, characterized by a particularly high average rainfall (up to 2500-3000 mm/y).

The vegetation is mostly hardwood forest (chestnut, beech) and mixed at the highest elevations, and grassland on some steep slopes or in abandoned pastures. The rocky substrate is mostly acidic (gneiss or granulites), with localized mafic rocks and marbles.



## Methods

- 25 soil profiles
- Standard chemical analysis
- Bulk density measurement
- Carbon stock calculation
- Erodibility evaluation

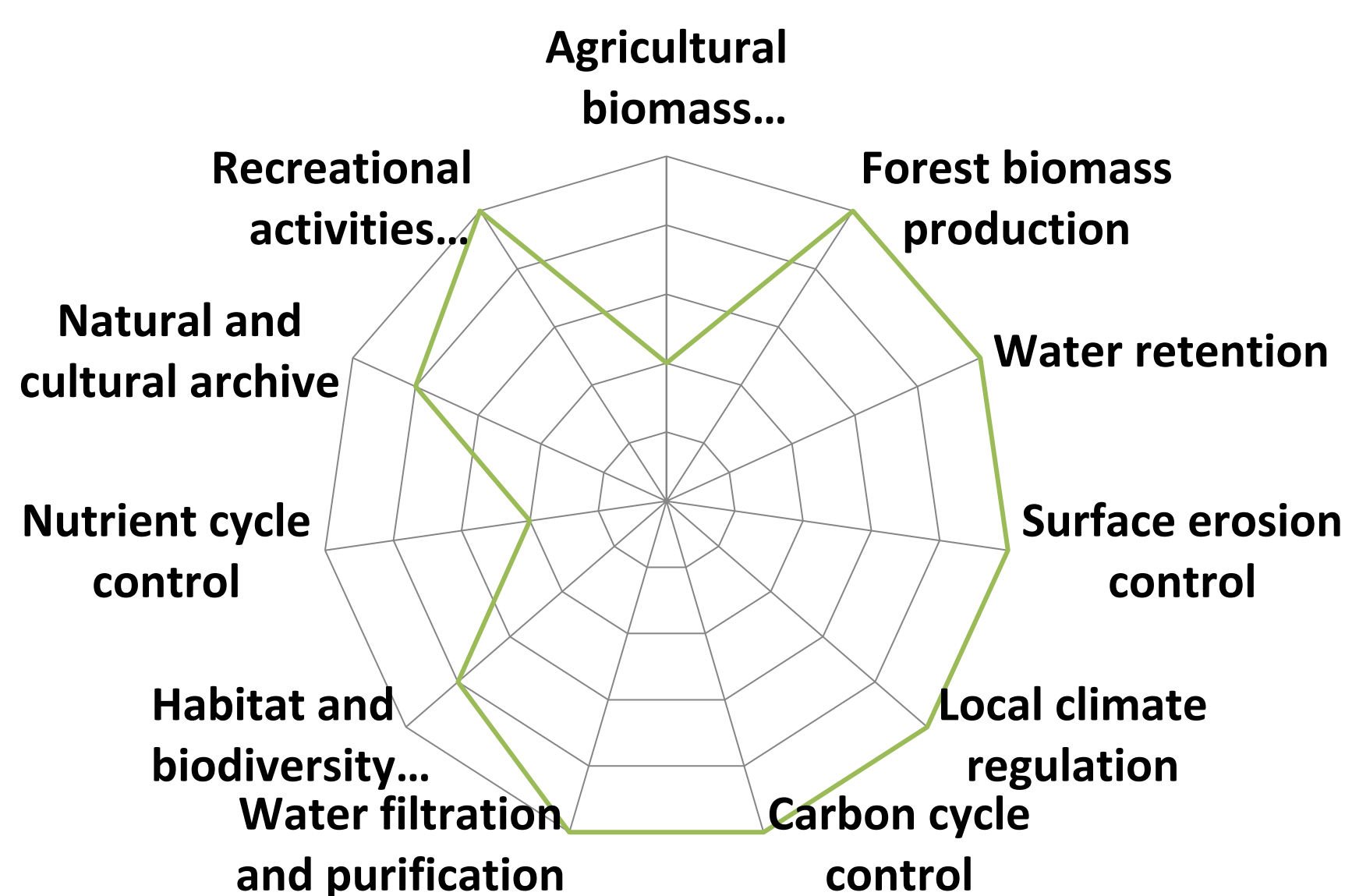


C stock in soils on the different lithological substrates, in the main land covers, in the main soil types (Spodic Umbrisol, Umbrisol, Cambisols/Phaeozems) and in organic layers.

## Results

- Umbrisols are the dominant soil types (locally Umbric Podzols at the higher elevations)
- Sombric horizons are widespread
- Carbon stocks are high (n the mineral horizon)
- C stocks in organic layers is 1-3 kg/m<sup>2</sup>, with highest values in Umbric Podzols
- 40-60% of C is stored below 30 cm of depth
- Nutrients are mainly stored in organic horizons and in the topmost A ones

### Soil-based ecosystem services in Valgrande Nat. Park



## Conclusion

- The usual sampling for C stocks in the top 30 cm of the mineral soil horizons would lead to a strong underestimation of soil carbon;
- High rainfall associated with high plant productivity and most mineralization make Umbrisols particularly resistant to erosion;
- The removal of litter associated with forest management could lead to a strong nutrient loss because of strong leaching caused by high average yearly precipitation and very low pH values