Stomatal ozone deposition effects on carbon assimilation in a Mediterranean forest

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Tropospheric ozone is a powerful oxidant of particular concern for plants when it penetrates stomata and leads to oxidative stress, being stomata the major ozone sink in forest canopies. Damage to cells is often accompanied by early senescence and compromised stomatal functioning. Studying these dynamics in Mediterranean region is particularly relevant because of its climate characterised by high temperatures during the vegetative season and strong insolation that favour tropospheric ozone formation. Vegetation in this region has developed adaptations to the dry-hot summer conditions that could make them avoid or reduce the ozone stress. With the aim to verify if and how much ozone could affect the ecophysiological processes of the Mediterranean vegetation, we applied a multi-layer canopy model to a holm-hoak forest at Castelporziano, a natural reserve near the city of Rome (Italy) and ICOS candidate for level I site. We tested different models of stomatal conductance and different methods to assess ozone impact on stomatal aperture and Gross Primary Productivity. A suite of semi-empirical methods were parameterized with ecophysiological values measured at the leaf level, and the overall predictions were compared with continuous Eddy Covariance (EC) data. We analyzed which method could best work in a peculiar ecosystem such as the evergreen mediterranean forest. With this work we want to highlight the importance of integrating environmental monitoring and modelling for a deeper understanding of the complex mechanisms that affect forest ecosystems.