

Evapotranspiration of an Abandoned Grassland in the Italian Alps: Modeling the impact of shrub encroachment

Original

Evapotranspiration of an Abandoned Grassland in the Italian Alps: Modeling the impact of shrub encroachment / Canone, Davide; Gisolo, Davide; Bevilacqua, Ivan; Gentile, Alessio; van Ramshorst, Justus; Previati, Maurizio; Ferraris, Stefano. - In: GEOPHYSICAL RESEARCH ABSTRACTS. - ISSN 1607-7962. - (2023). (Intervento presentato al convegno European Geoscience Union 2023 tenutosi a Vienna nel 23-28 aprile 2023) [10.5194/egusphere-egu23-1313].

Availability:

This version is available at: 11583/2977671 since: 2023-03-31T12:25:24Z

Publisher:

Geophysical Research Abstracts

Published

DOI:10.5194/egusphere-egu23-1313

Terms of use:

openAccess

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)



Evapotranspiration of an Abandoned Grassland in the Italian Alps: Modeling the impact of shrub encroachment

Davide Canone¹, **Davide Gisolo**¹, Ivan Bevilacqua², Alessio Gentile¹, Justus van Ramshorst³, Maurizio Previati², and Stefano Ferraris¹

¹Polytechnic of Turin, DIST, Torino, Italy (davide.canone@unito.it)

²Envicons, Torino, Italy

³Bioclimatology, Faculty of Forest Sciences and Forest Ecology, University of Gottingen, Busgenweg 2, 37077 Gottingen, Germany

Shrub encroachment of grasslands in the Alps is still a poorly studied phenomenon. Therefore, this study analyses the possible effect of shrub encroachment on actual evapotranspiration (ET_a) at an abandoned grassland in the Northwestern Italian Alps, colonised by *Elaeagnus Rhamnoides* shrubs. This is done by means of micrometeorological and eddy covariance data collected during four growing seasons. Additionally, the Hydrus 1D hydrological model modified to account for a soil column with two vegetation types is used. This modified model is run with a variable percentage of shrubs on evapotranspiration, ranging from 0 to 80% and it is validated by using the measured eddy covariance-derived ET_a. The Hydrus 1D model is also applied in its usual set-up, having only one vegetation type, to estimate the ET_a from both grassland and shrubs separately.

The performance of the modified model with two vegetation types is acceptable, although it is very variable between different growing seasons and in dry condition it could be further improved (R between 0.50 in 2016 and 0.73 in 2014 considering the probable actual percentage of ET_a affected by shrubs. The percentage varies between 20% in 2016 and 60% in 2014). Besides, the model captures the inter-annual variability of ET_a. The agreement of cumulative simulated and observed ET_a is good, since the deviation between observed and modelled cumulative ET_a is always lower, in the four analysed growing seasons, than 50 mm.

The simulated ET_a approximates the eddy covariance-derived ET_a, however the modelled soil water content is very sensitive to precipitation events, more than the measured soil water content. Both models, with the modified and the usual setup, tend to overestimate the vegetation stress during dry periods. Nevertheless, the single vegetation model results allow us to conclude that the shrubs likely are responsible for an enhancement of ET_a and an alteration of the hydrological cycle accordingly. Finally, we explore how some micro-meteorological drivers of ET_a (vapour pressure deficit – VPD, net radiation, wind speed, air temperature and ground heat flux - G_0) affect the difference between modelled and simulated ET_a, and between simulated ET_a from shrubs and from grass. Frequently, higher deviations from zero are found especially with high VPD and G_0 .