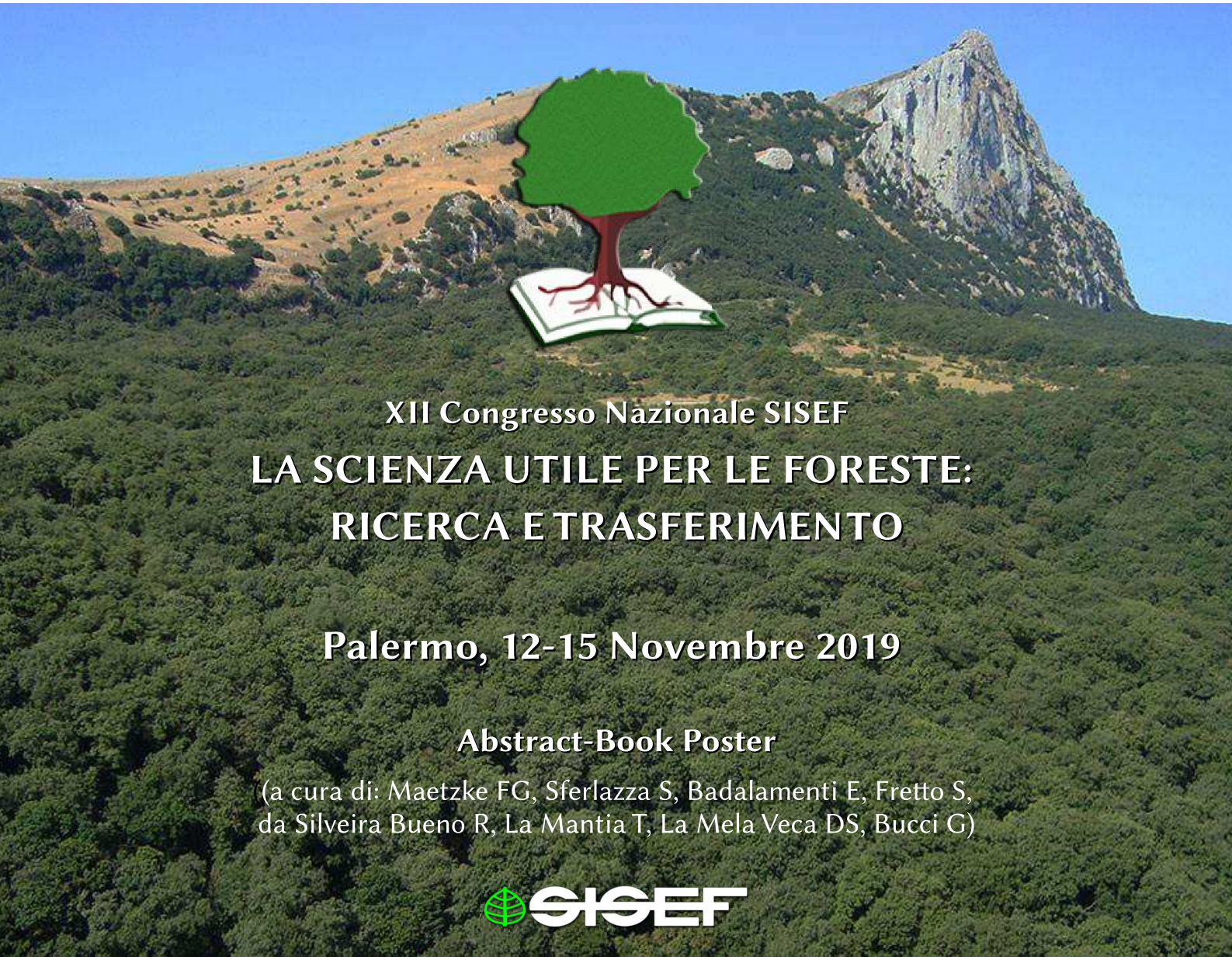

XII Congresso Nazionale SISEF

LA SCIENZA UTILE PER LE FORESTE: RICERCA E TRASFERIMENTO

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Abstract-Book Poster

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Martedì 12 Novembre 2019 (18:30-20:00)
Atrio Dip.to SAAF

Shahla Asgharinia [1], Riccardo Valentini [1], Damiano Gianelle* [2]

New technologies for forest monitoring in Alpine Region

Using IoT technologies represents a novel combination of disciplines (plant ecophysiology and hydrology) to unravel the vulnerability of ecosystem to climatic stress. Taking advantage of IoT, a new device (the Tree-Talker), is developed to measure simultaneously important individual tree-scale ecophysiological parameters as well as some additional ecosystem-related variables. Key parameters are: (i) tree radial growth, as an indicator of photosynthetic carbon allocation in biomass; (ii) sap flow, as an indicator of tree transpiration and functionality of xylem transport; (iii) xylem moisture content as indicator of hydraulic functionality; (iv) light penetration in the canopy in terms of fractional absorbed radiation; (v) light spectral components related to foliage dieback and physiology; (vi) tree stability parameters to allow real-time forecast of potential tree fallings. Additional parameters such as soil temperatures and moisture and meteorological variables will be also monitored at high frequency to have comparable time-scale between abiotic parameters and short term plant responses. In this research, by using of 100 Tree-Talkers, the changes in forest have been monitored in northern Italy. In every tree, particular emphasis is placed on the hourly, daily, monthly and seasonal sap flow, xylem moisture content and plant movement fluctuations under different meteorological and soil moisture conditions. Granier-type thermal dissipation probe and heat pulse velocity (Vh) family of methods (heat ratio method and Tmax) were considered to measure and compare sap flow on the main stem of trees. In addition, the relation between diurnal-nocturnal xylem moisture content and sap flow have been defined in different species in Alpine area. Moreover, the risks of windthrow and uprooting have been studied by recording trees oscillation data in xyz axis due to the gravity. A direct relationship between the sap flow and air temperature has been demonstrated for a number of species with different conditions on an hourly scale. Conversely, xylem moisture content and air relative humidity have an inverse relation to sap flow. Our results revealed that sap flow has a different correlation with vapour pressure deficit (VPD) base on natural logarithm function in different species which show stomata behaviour in wet or dry conditions. In addition, although sap flow significantly correlated with air temperature, the highest sap flow occurs a few times before the maximum daily temperature. Since by closing the stomata, plant responses to high midday temperature stress to reduce water loss.

Parole chiave: tree ecophysiology, internet of things, sap flow, microclimate, tree oscillation, xylem moisture content, stomata

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