The Biological Reclamation and Monitoring of Disturbed Lands
September 12–16, 2022, Satka, Russia

The Role of Meteorological Monitoring on Disclosing Climate Functions of Forests**

Ugur Kezik*, Sezgin Hacisalihoglu

Karadeniz Technical University, Faculty of Forestry, 61080 Trabzon, Turkey

*kezik@ktu.edu.tr

Abstract

Forest ecosystems, together with soil and vegetation, are considered as systems with ecological, economic and social functions. Forests, which have their own unique structure and function, have begun to be managed today as units that provide a habitat for wildlife and at the same time produce functional products and services in the ecosystem. Carbon sequestration is perhaps the largest-scale climatic function of forests in terms of climate function, which is subordinate to ecological functions. Carbon dioxide is the most important greenhouse gas, and the steady increase in CO_2 concentrations in the atmosphere in recent years is considered to be the main cause of global warming. In addition, dynamic climate parameters such as temperature, precipitation, solar radiation and wind speed at the local scale also come to the fore. Determining these functions will, on the one hand, ensure the optimal evaluation of the products and services provided by natural forest ecosystems, on the other hand, it will be an important tool in the use of plant material and ecosystem-based planning of urban areas. However, when these parameters are evaluated within the scope of forest ecology and hydrology, they are also considered as climate components that affect evapotranspiration processes. Therefore, monitoring these climate variables is important for ecological and hydrological studies.

In this study, climatic variables were investigated for 21 months in the Oriental Spruce and Norman Fir stands distributing at the Eastern Black Sea Region, Turkey. Obtained climatic data were evaluated according to the open area as time periodly. As a result of this study, it has been determined that forest ecosystems have a significant effect on particularly dynamic climate parameters such as wind, solar radiation and temperature. These effects varied depending on the species components and stand characteristics of the forests. Consequently, forest canopy significantly decreased wind speed, reduced precipitation intensity, and superiorly, almost completely blocks solar radiation.

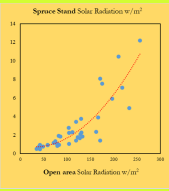
Keywords: Solar radiation, Climate function, Forest ecosystem

***Note:** This study was supported by TUBITAK (217O359) and the data were taken from the doctoral thesis of the first author.*

The Role of Meteorological Monitoring on Disclosing Climate Functions of Forests

Ugur Kezik* Sezgin Hacisalihoglu,
Karadeniz Technical University, Faculty of Forestry, 61080 Trabzon, Turkey





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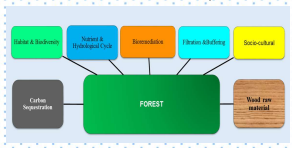
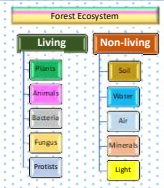
Introduction

The main functions of forest ecosystem

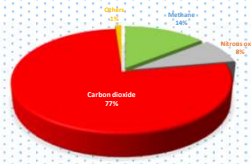




Forest ecosystems, together with soil and vegetation, are considered as systems with ecological, economic and social functions.

Introduction

Major Greenhouse gases

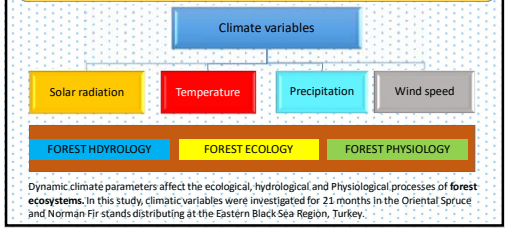


FOREST ROLE

Carbon sequestration is perhaps the largest-scale climatic function of forests in terms of ***climate function***, which is subordinate to ecological functions.

Carbon dioxide is the most important greenhouse gas in the atmosphere in recent years is considered to be the main cause of global warming...

Introduction



Dynamic climate parameters affect the ecological, hydrological and Physiological processes of **forest ecosystems.** In this study, climatic variables were investigated for 21 months in the Oriental Spruce and Norman Fir stands distributing at the Eastern Black Sea Region, Turkey.

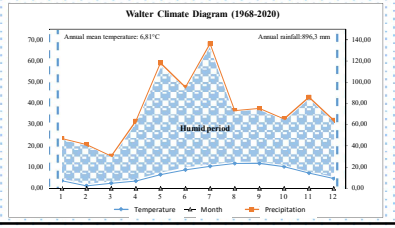
Material & Methods

Study Area

Macka / Trabzon / TURKIYE

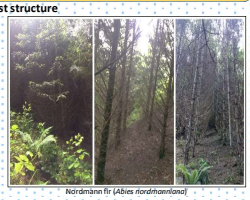


Material & Methods



Material & Methods

Forest structure

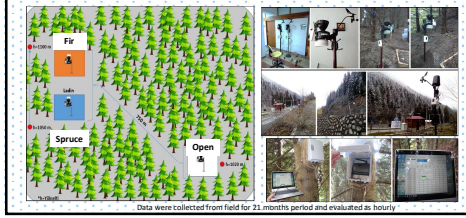



Oriental Spruce (*Pica orientalis*)
Stand diameter (d1.30)= 25,53 cm
Stand height: 17,39 m n=800/ha

Nordmann fir (*Abies nordmannlana*)
Stand diameter (d1.30)= 15,15 cm
Stand height : 12,21 m n=1450/ha

Material & Methods

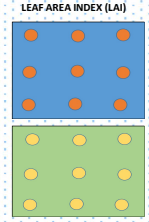
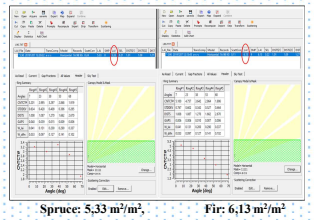
Climate stations



Data were collected from field for 21 months period and evaluated as hourly

Results & Discussions

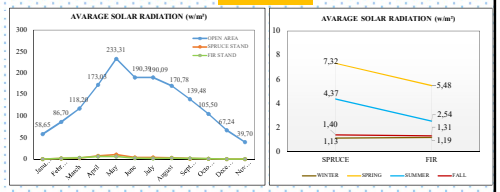
LEAF AREA INDEX (LAI)

Spruce: 5,33 m^2/m^2, Fir: 6,13 m^2/m^2

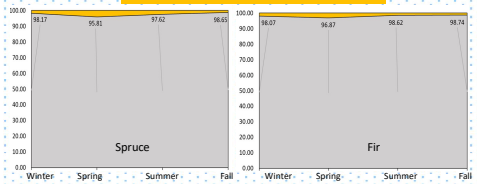
Results & Discussions

Solar Radiation



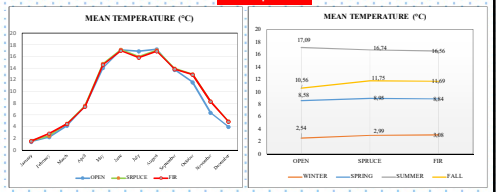
Results & Discussions

SOLAR RADIATION PREVENTED BY FOREST CANOPY (%)



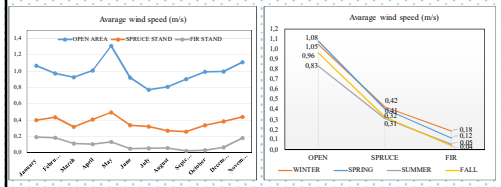
Results & Discussions

Air Temperature



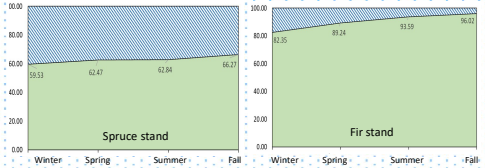
Results & Discussions

Wind Speed



Results & Discussions

Wind Speed prevented by forest canopy (%)



Conclusions

- While the annual average solar radiation values (**w/m²**) are **131.09 in open area**, this value is **3.56 in Spruce** and **2.63 in Fir**.
- The annual average **temperature** was 9.7°C in open area, this value was **10.1 in Spruce** and **10.4 in Fir.**
- The average value of the annual wind speed is **0.98 m/s in open area**, this value is **0.37 in Spruce** and **0.10 in Fir.**

Consequently, forest canopy significantly decreased wind speed, reduced precipitation intensity, and superiorly, almost completely blocks solar Radiation that is important on global warming issues…

Acknowledgement

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- The authors would like to thank *TUBITAK*

TÜBİTAK

Thank you!