

Influence of the North Atlantic Oscillation on Central European Heating Energy Demands

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Abstract

This paper aims to show the relation between the North Atlantic Oscillation (NAO) and the heating energy demand in Europe. Due to the constant increasing demand of energy, this topic demonstrates an highly important correlation between weather and the energy industry.

The NAO can be characterized as a pattern of pressure anomalies in the North Atlantic, especially during the winter months and so it influences the climatic atmospheric conditions in Europe significantly. Using the NAO-Index, a quantitative measurement of the NAO, and a temperature dataset created by the Climatic-Research Unit (CRU) the correlation between those two indicators were examined. This was done with the help of regression- and correlation analysis. To be able to take a quantitative estimation of the heating energy demand data from both the statistic Federal Agency of Germany and a population dataset from the Socioeconomic Data and Applications Center (SEDAC) was used. To calculate the heating energy merit certain simplifications concerning the loss of heat energy of a house and also concerning the estimation of the number of residential buildings were made. To quantify the temperature-related caloric value measurements about the heating degree merit were made. Furthermore to find significant results regression- and correlation analysis were used but only the winter months December, January, February, March were included in the calculations, because during this time of the year the influence of the NAO is highly distinctive. The research area was not focused tightly to Europe but expanded to the bordering areas, like North Africa and Russia. The area reaches between the 29,75 and the 75,25 geographical latitude and the -15,25 and the 29,25 geographical longitude.

The result shows a particular high significant correlation between the NAO and temperatures during the month of January and February whereas the remaining months, namely December and March only show a lower correlation. The regression analysis shows a negative correlation at the northern areas of Europe and a positive correlation at the southern areas under investigation. The results fluctuate between -200KWh/standard deviation*dwelling in Norway and 50KWh/standard deviation*dwelling in North Africa. Including the population distribution the NAO especially influences the northern European agglomerations concerning the heating energy demand. The smallest correlation was determined in the Mediterranean region.