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Impact of the North Atlantic Oscillation on the European vegetation inferred from satellite data during 1981 to 1988

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Vegetation covers roughly three-fourths of Earth's land surface. However, its extent at the regional scale can change dramatically at the long -but also at the short- time scales. Therefore, it is important to understand changes in vegetation activity, namely those related to changes with near surface climate variables. Over the last 2 decades, the continuous monitoring of vegetation with satellite platforms as allowed to interpret major changes in vegetation as being conditioned by corresponding changes of surface climatic variables. The present study analyses the relation between satellite-based measures of vegetation greenness and climate over Europe. For this purpose, we use the normalised difference vegetation index (NDVI), retrieved between 1981 and 1988 from the AVHRR instrument. The year-to-year variations in European vegetation greenness were estimated and related to the dominant mode of climate variability in the northern hemisphere, the North Atlantic Oscillation - NAO. Furthermore, we made an effort to understand the most probable physical mechanisms responsible for the changes induced in vegetation by the NAO mode. Therefore, atmospheric circulation and climatic impacts were assessed by computing maps of correlation coefficient between the NAO index and different variables, namely low tropospheric temperature and geopotential height as well as land surface air temperature, evaporation, precipitation and different radiation parameters. The most relevant result observed is obtained for the winter-spring seasons, where we can observe that the positive phase of winter NAO signal is associated with positive temperature anomalies well into March, throughout most of northern Europe and Eurasia continental landmasses, with en-

hanced net long wave radiation. Naturally, these conditions favour vegetation growth and above normal green vegetation cover conditions over large regions of northern Europe and Asian Russia. Taking into consideration the seasonal variability, the most relevant results were found for spring and autumn seasons. The regions presenting maximum response for spring patterns are the Baltic Sea area and central Europe, while the Black Sea region reveals a maximum response during other seasons (summer and autumn). It is found that during the springtime (the most important vegetation growing period), the spatio-temporal structures of vegetation activity at the hemispheric scale are highly modulated by overlying patterns of surface temperature, net long wave radiation and evaporation rate.