

A Study on the Impact Pattern of the North Atlantic Oscillation (NAO) on Global land NDVI Changes

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Abstract:

The North Atlantic Oscillation (NAO) is a multi-annual climate fluctuation quantified by an index based on the winter pressure differences between the Icelandic low and Azores high. These pressure variations play an important role for temperature and precipitation patterns all over the world, especially around the North Atlantic, thus affecting vegetation growth. NDVI responds to changes in amount of green biomass, chlorophyll content, and canopy water press. It is simple and easy to implement, and can be effective in predicting surface properties when vegetation canopy is not too dense or too sparse. The study of the impact pattern of NAO on global surface can make prediction for global surface biomass applying the directing function of NAO index, especially with the expectation that this information will improve crop and resource management.

The existence and spatial distribution of possible teleconnections between NAO and global NDVI are investigated in the present paper, and the moving patterns of teleconnections are also discussed. Teleconnections are searched by cross-correlating monthly spatio-temporal time series of 8km assimilated resolution NDVI, measured from AVHRR from 1982 to 2003, with indices characterizing the North Atlantic variability: the NAO indices. The study shows the influence of NAO on NDVI is concentrated in Europe and North America and spread globally, with certain moving rules. Nevertheless, Except for Europe and the most parts of North America, obvious teleconnections are concentrated in other several typical regions, including Central South America, Northwest Africa, South Africa, Central Asia, East Asia, Northeast Asia, and Northeast Australia. As expected by geographic proximity, the correlations between NDVI and NAO Index are found at different time lag in different place, which provides possible and useful directions for crop production prediction and agricultural water resources management of the above regions. Results also indicate that the impact of teleconnections all over the world is not geographically uniform.

Key words: teleconnections; the North Atlantic Oscillation; AVHRR; NDVI